



## **Grossmont Union High School District**

### **VHS Battery Inverter Replacement CN-2559**

#### **Addendum No. 1**

Date: July 08, 2021

The following changes, additions, deletions or corrections shall become a part of the Contract Documents dated June 15, 2021 for the project named above and all other conditions shall remain the same. The bidders shall be responsible for transmitting this information to all affected subcontractors and suppliers prior to the closing of bids.

#### **Bid Opening:**

**The bid opening will remain at 2:00 p.m. on Tuesday, July 13, 2021, at the GUHSD Bond Trailer, 9600 Milden Street, La Mesa, CA.**

#### **Please incorporate the attached:**

1. Pre-bid Meeting Job-walk Notes Handout
2. June 29, 2021 Job-walk Sign-in Sheet
3. July 08, 2021 Pre-Bid RFI Log
4. DVBE Advertisement Proof of Publication
5. Ruhnau Clarke Architects Bid Addendum #1
6. Section 00730 – Supplemental Conditions Version 2 (Revisions shown in **RED**).

**THIS ENDS ADDENDUM NO. 1**

A handwritten signature in blue ink, appearing to read "Dena Johnson", written over a horizontal line.

Dena Johnson, Project Manager – GUHSD

**MANDATORY PRE-BID MEETING NOTES  
GROSSMONT UNION HIGH SCHOOL DISTRICT**

**CN-2559 Valhalla High School**  
**June 29, 2021 at 10:00 AM**

It is the responsibility of the bidder to read the bid documents in their entirety. Failure to do so will not relieve successful bidder from any contractual obligations entered into under this bid.

**1. Schedule:**

<b>Advertising Dates</b>	<b>June 21 and 28 2021</b>
<b>Pre-bid Conference &amp; Sitewalk</b>	<b>June 29<sup>th</sup> at 10:00 am</b>
<b>Substitution Requests Due</b>	<b>July 2, 2021</b>
<b>Questions due from Bidders</b>	<b>July 2, 2021</b>
<b>FINAL Addendum to Bidders</b>	<b>July 8 2021</b>
<b>Open Bids</b>	<b>July 14, 2021 at 2:00 pm Bond trailer</b>
<b>Protest Period Ends</b>	<b>July 21, 2021</b>
<b>Preliminary Notice of Award</b>	<b>July 22, 2021</b>
<b>Governing Board – Bid Award</b>	<b>July 27, 2021</b>
<b>Contract Submittals due to District</b>	<b>July 29, 2021</b>
<b>Preconstruction/LCP Meeting</b>	<b>TBD</b>
<b>Technical Submittals due to District</b>	<b>As requested by CM</b>
<b>Notice to Proceed</b>	<b>July 30, 2021</b>
<b>Start Date:</b>	<b>August 2, 2021</b>
<b>Project Completion Date:</b>	<b>October 22,, 2021</b>
<b>Estimate:</b>	<b>\$250,000</b>

**2.**

**Request for Information:**

Submit all questions by email or mail to the following not later than date above to:

Grossmont Union High School District  
Attn: Rian Pinson, Director of Purchasing  
[rpinson@guhsd.net](mailto:rpinson@guhsd.net)  
[1100 Murray Drive](#)  
El Cajon, CA 92020

CW Driver  
Attn: Cole Edging [cedging@cwdriver.com](mailto:cedging@cwdriver.com)

With a copy to the following:

Attn: Dena Johnson Project Manager

[dajohnson@guhsd.net](mailto:dajohnson@guhsd.net)

**We will not answer questions received beyond the above specified date and time**



**3. Public Works Project:**

Prevailing Wage applies. DIR # required, LCP Tracker required, and see Special Conditions.

**4. Substitutions:**

Whenever in specifications any materials, process, or article is indicated or specified by grade, patent, or proprietary name or by name of manufacturer, such specification shall be deemed to be used for the purpose of facilitating description of material, process, or article desired and shall be deemed to be followed by the words "or equal."

In accordance with Public Contract Code section 3400, district must provide for "submission of data substantiating a request for a substitution of 'an equal' item." Therefore, **by July 2, 2021**, as specified in Article 18 of the Information for Bidders, if the Contractor is requesting substitution of "an equal" item or product or work, the make and grade of the item, product or work, which is to be substituted shall be provided to the District representative. Substitutions will not be considered after this date.

**5. Bid Submittals:**

It is crucial that the appropriate documents be included with the bid, all items requiring notarization completed properly, and **ALL** subs listed:

- a. Bid Security Form (bid bond) or Bid Guarantee Form (no bid bond) - 00410
- b. Proposed Subcontractors Form (for listing subcontractors) – 00430
- c. List Of Proposed Prequalified MEP Or A/B Subcontractors Under ½ of 1% - 00430A
- d. Non-Collusion Affidavit – 00480
- e. Information Required of Bidder – 00490
- f. Iran Contract Form – 00750A
- g. Certification of Compliance with DVBE Policy (if applicable)- 00751
- h. Bidder's Acknowledgment of Project Schedule and Phasing - 00752
- i. Site Visit Certification - 00753
- j. Acknowledgment of Bidding Practices Regarding Indemnity – 00754
- k. DVBE and/or GFE – Attachment B

**6. Labor Compliance:**

Contractor is to retain all certified payrolls for a period of no less than (5) five years from date of completion as noted in the General Conditions. The District contracts with LCP Tracker, all documents regarding Labor Compliance must be uploaded to this system.

**7. Contract Submittals and Technical Submittals:**

It is imperative that the successful bidder provide submittals in a timely basis. Please be aware of the submittals dates noted in the Special Conditions and in this document. There are liquated damages attached the submittals should they be late.

**8. Special Conditions and Division 1 General Requirements:**

The Special Conditions may modify the General Conditions and Information to Bidders. Please read these carefully.

Please note: if there should exist a conflict between the Special Conditions and/or Division 1 General Requirements and the General Conditions/Information to Bidders, the language in the Special Conditions and/or Division 1 sections shall supersede.

**9. Fingerprinting:**

Fingerprinting and background checks ARE required of Supervisory Staff for the contractor and/or subcontractors on the job site when there is limited contact with students. Your company must have an ORI number from the Department of Justice for fingerprinting. The CM or Project Manager may determine that a job requires all employees to be fingerprinted if there might be direct contact with students. ORI numbers shall be obtained immediately after receiving a PNOA for your project.

**As a reminder all Primes are REQUIRED to have an ORI number. You must obtain the ORI from the DOJ after awarded the contract. All workers on site MUST be badged by the District.**

**10. Subcontracting:**

Contractor must list all subs. All subs under ½ of 1% must be listed on form 430A if they had to be prequalified, meaning they hold a MEP license.

**11. Senate Bill 854:**

All contractors and subcontractors (any tier) must be registered with the DIR. Number must be provided within 24 hours of the bid. Please visit the following website for more information: <http://www.dir.ca.gov/PublicWorks/PublicWorks.html>

This project is subject to the requirements under SB 854, which include registration of all contractors, and the submission of certified payroll to the State of California. Additionally, GUHSD requires all contractors to submit their certified payroll into LCP Tracker software monthly, for District purposes.

**SIGN IN SHEET, ADDENDAS AND BID RESULTS WILL BE POSTED ONLINE AT:**

<http://www.guhsd.net/Departments/Business-Services/Purchasing/Solicitations/Construction-Bids/index.html>



# PRE-BID SIGN IN SHEET

GROSSMONT UNION HIGH SCHOOL DISTRICT  
VHS Battery Inverter Replacement

CN-2559

June 29, 2021 @ 10:00 AM

PLEASE PRINT LEGIBLY

LICENSE INFORMATION IS REQUIRED FOR BOARD REPORT

	COMPANY	CONTACT	LICENSE CLASS	PHONE	FAX / EMAIL
1	De La Fuente Construction, Inc.	Hector Ojeda	A, B	619-622-8411	<a href="mailto:estimating@dlfci.com">estimating@dlfci.com</a>
2	GEM Industrial, Inc.	Michelle MacLachlan	A, B	858-486-1758	<a href="mailto:info@gemindustrialinc.com">info@gemindustrialinc.com</a>
3	SWCS, Inc.	Emanuel Guerrero	B	619-258-9944	<a href="mailto:estimating@swcs-inc.com">estimating@swcs-inc.com</a>
4	Baker Electric	Brian Marner	B,C-10	760-690-6602	<a href="mailto:bmarner@baker-electric.com">bmarner@baker-electric.com</a>
5	SD Remodeling, Inc.	Dimitriy Zagorodniy	B	858-756-5001	<a href="mailto:sdremodels@gmail.com">sdremodels@gmail.com</a>
6	Fordyce Construction	Brian Fordyce	B	619-449-4272	<a href="mailto:estimating@fordyceconstruction.com">estimating@fordyceconstruction.com</a>
7	Baker Electric	Phil Brault	B,C-10	760-4848-1187	<a href="mailto:pbrault@baker-electric.com">pbrault@baker-electric.com</a>
8	Vasquez Construction	Jason Sanders	B	619-237-3607	<a href="mailto:Jason@vasquezco.com">Jason@vasquezco.com</a>

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2	GEM Industrial Inc	Michelle MacLachlan	A, B	858-486-1758	info@GEMIndustrialinc.com
3	SWCS, Inc.	Emanuel Guerrero	B	619-288-9944	estimating@swcs-inc.com
4	Baker Electric	Brian Marney	B-C-10	760-690-6662	bmarney@baker-electric.com
5	SD Remodeling, Inc	Dmitriy Zagorodniy	B	(858) 756-5001	sdremodels@gmail.com
6	Forde & Cowy	Brian Forde	ME	619-449-4272	ESTIMATING@FORDYERCONSTRUCTION.COM
7	BAKER ELECTRIC	Phil Brault	B-C-10	760-484-1187	PBRAULT@BAKER-ELECTRIC.COM
8	VASQUEZ CONSTRUCTION	JASON SANDERS	B	619-237-3607	JASON@VASQUEZCO.COM





VHS Battery Inverter Replacement Pre-Bid RFI Log Issue Date: 7/8/21

RFI #	Question	Response
I	Do you have DVBE Subcontractor Listings for the above project?	The listing is available on the Quality Bidders Website - <a href="https://www.qualitybidders.com/pages/district">https://www.qualitybidders.com/pages/district</a> - Vendor List by Business Certification
	End RFIs	
<b>Substitution Requests</b>		
	End Substitution Requests	

# W/M/S/DVBE CONTRACT & CONSTRUCTION NEWS

"A Statewide Publication for the State of California"

*The Voice of the Minority, Women, Disadvantaged, Small Business and Disabled Veteran  
Contractors and other Business Enterprises.*

P.O. Box 892135, Temecula, CA 92589 (800) 570-7070 Fax (800) 548-4237

## Official Proof of Publication

(COPY OF ADVERTISEMENT)

**Grossmont Union High School District  
Requesting Bid Submissions From  
DVBE Subcontractors, Suppliers and Vendors**

**Project: GUHSD VHS Battery Inverter Replacement**

**Bid Date: July 14, 2021 at 2:00 pm**

**Project consists of:** Replacing the existing battery inverter at the Valhalla High School (VHS) Central Plant. The project also includes new fan coils and condensing units for climatization in the VHS Central Plant. The project is located at 1725 Hillsdale Rd, El Cajon, CA 92019.

For information on how to obtain bid documents  
Contact: Cole Edging, [cedging@cwdriver.com](mailto:cedging@cwdriver.com)  
Phone 619-696-5100 Fax 619-696-5110

Contracting Agency: Grossmont Union High School District  
Bid Bonds, Payment and Performance Bonds are required  
Prevailing Wage

**C.W. Driver, LLC is an equal opportunity employer**

The Date(s) of Publication

***Tuesday, June 22nd, 2021 through Friday, July 2nd, 2021***

*I certify (declare) under penalty of perjury that the foregoing is true and correct. The above advertisement was published statewide in W/M/S/DVBE CONTRACT & CONSTRUCTION NEWS*



T Gieseman, Editor  
W/M/S/DVBE CONTRACT & CONSTRUCTION NEWS



**the *THOMAS* BID REGISTER**  
**A BI-WEEKLY TRADE PUBLICATION**

**P.O. Box 892135, Temecula, CA 92589 (800) 570-7070 Fax (800) 548-4237**

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I certify (declare) under penalty of perjury that the foregoing is true and correct.  
The above advertisement to be published statewide in **the *THOMAS* BID REGISTER**.



**T Gieseman, Editor  
the *THOMAS* BID REGISTER**



July 08, 2021

## ADDENDUM NO. 1

TO THE CONTRACT DOCUMENTS

**FOR**

VALHALLA HIGH SCHOOL BATTERY REPLACEMENT

**FOR THE**

GROSSMONT UNION HIGH SCHOOL DISTRICT

1100 Murray Drive

El Cajon, CA 92020

DSA #04-120235

FILE #37-H4

RCA Job No. 1-30-56

### NOTICE TO BIDDERS

This Addendum releases the Approved Drawings and Specifications approved by DSA on June 22nd, 2021.

Acknowledge receipt of Addendum No. 1 in the space provided on the Bid Form. Failure to do so may subject bidder to disqualification.

### GENERAL

- Item No. 1.1      Reference Attached DSA Approved Plans and Specifications:  
1.1.1      DSA Approved Plans and Specifications to be released as Bid Set.

### ATTACHMENTS

DSA Approved Plans and Specifications

END OF ADDENDUM 1

\_\_\_\_\_  
David Ruhnau, Principal  
#C-20662







PROJECT MANUAL

BATTERY REPLACEMENT  
AT VALHALLA HIGH SCHOOL

GROSSMONT UNION HIGH SCHOOL DISTRICT

El Cajon, CA

CONSTRUCTION DOCUMENTS

VOLUME 1 OF 1      Divisions 00 - 27

DSA Application #04-120235      File #37-H4

1.30.43

June 2021





**SECTION 00 01 01  
PROJECT TITLE PAGE**

**FOR**

**BATTERY REPLACEMENT**

**PROJECT NUMBER: 1-30-56**

**GROSSMONT UNION HIGH SCHOOL DISTRICT**

**1100 MURRAY DRIVE, EL CAJON, CA 92020**

**WWW.GUHSD.NET**

**PROJECT LOCATION**

**VALHALLA HIGH SCHOOL**

**1725 HILLSDALE ROAD**

**EL CAJON , CALIFORNIA 92019**

**PREPARED BY:**

**ARCHITECT**

**RUHNAU CLARKE ARCHITECTS**

5751 Palmer Way, Suite C, Carlsbad CA 92010

760.438.5899

[www.ruhnaucclarke.com](http://www.ruhnaucclarke.com)

Grossmont Union High School District Valhalla High School <b>Battery Replacement</b> RCA Project No. 1-30-56		Project Title Page 00 01 01 - 1
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NOTICE: This Project Manual, is an unpublished instrument of service of the authors. It is prepared for use only on this Project and in conjunction with the authors' interpretations, observations, decisions and administration, as described in the Conditions of the Contract. Desired results without these services cannot be assured. Use in whole or in part, without the authors' services and expressed written consent may violate Act 17 U.S.C. par. 301 (1991).

Grossmont Union High School District Valhalla High School <b>Battery Replacement</b> RCA Project No. 1-30-56		Project Title Page 00 01 01 - 2
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**SECTION 00 01 02  
PROJECT INFORMATION**

**PART 1 GENERAL**

**1.01 PROJECT IDENTIFICATION**

- A. Project Name: Battery Replacement, located at:  
Project Number: 1-30-56.  
Valhalla High School.  
1725 Hillsdale Road.  
El Cajon, California 92019.
- B. The Owner, hereinafter referred to as District: Grossmont Union High School District  
**Grossmont Union High School District**  
1100 Murray Drive, El Cajon, CA 92020  
www.guhsd.net  
619.644.8000

**1.02 NOTICE TO PROSPECTIVE BIDDERS**

- A. These documents constitute an Invitation to Bid to and request for qualifications from General Contractors for the construction of the project described below.

**1.03 PROJECT DESCRIPTION**

- A. Summary Project Description: Battery replacement and related equipment.
- B. Contract Scope: renovation.
- C. Contract Terms: Lump sum (fixed price, stipulated sum).

**1.04 PROJECT CONSULTANTS**

- A. The Architect, hereinafter referred to as Architect: **Ruhnau Clarke Architects**  
5751 Palmer Way, Suite C, Carlsbad CA 92010  
www.ruhnauclarke.com  
760.438.5899

**1.05 PROCUREMENT DOCUMENTS**

- A. Availability of Documents: Complete sets of procurement documents may be obtained:
1. From District at the Project Manager's address listed above.

Grossmont Union High School District Valhalla High School <b>Battery Replacement</b> RCA Project No. 1-30-56		Project Information 00 01 02 - 1
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**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

Grossmont Union High School District Valhalla High School <b>Battery Replacement</b> RCA Project No. 1-30-56		Project Information 00 01 02 - 2
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IDENTIFICATION STAMP  
DIV. OF THE STATE ARCHITECT

APP: 04-120235 INC:  
REVIEWED FOR  
SS ☒ FLS ☒ ACS ☐  
DATE: 06/22/2021

SECTION 00 01 07

SEALS PAGE

ARCHITECT OF RECORD (AOR)

**RUHNAU CLARKE ARCHITECTS**  
5751 Palmer Way, Suite C, Carlsbad CA 92010  
David Ruhnau, Architect of Record

C-20662



STRUCTURAL ENGINEER OF RECORD (SEOR)

**KNA CONSULTING ENGINEERS, INC.**  
9931 Muirlands Blvd., Irvine, CA 92618  
Larry Kaprielian

S-2795



MECHANICAL ENGINEER OF RECORD (MEOR)

**MA ENGINEERS**  
5160 Carroll Canyon Road, Suite 200, San Diego CA 92121  
Roy C. Campbell

M-025911



ELECTRICAL ENGINEER OF RECORD (EEOR)

**JOHNSON CONSULTING ENGINEERS, INC.**  
12875 Brookprinter Place, #300, Poway CA 92064  
Monica Goese-Hansen

E-14781



END OF SEALS PAGE

Grossmont Union High School District Valhalla High School <b>Battery Replacement</b> RCA Project No. 1-30-56		Seals Page 00 01 07 - 2
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- 00 01 02 - Project Information
- 00 01 07 - Seals Page
- 00 01 10 - Table of Contents
- 00 40 25 - Request for Information
- 00 43 25 - Substitution Request Form - During Procurement
- 00 63 25 - Substitution Request Form - During Construction

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**END OF SECTION**

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RCA Project No. 1-30-56		



**SECTION 00 40 25  
REQUEST FOR INFORMATION**

**RFI NUMBER:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

**PROJECT NAME: BATTERY REPLACEMENT**

**PROJECT NO.: 1-30-56**

**TO: RUHNAU CLARKE ARCHITECTS**

. Construction Manager

Attention: \_\_\_\_\_

Contractor: \_\_\_\_\_

Address: \_\_\_\_\_

Request By: \_\_\_\_\_

Date: \_\_\_\_\_

**BRIEF SUMMARY OF RFI:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Drawing No. \_\_\_\_\_ Detail No. \_\_\_\_\_

Specification Section \_\_\_\_\_ Title \_\_\_\_\_

. Page \_\_\_\_\_ Paragraph \_\_\_\_\_

**DETAILS OF THIS RFI:** \_\_\_\_\_

\_\_\_\_\_  
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\_\_\_\_\_  
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\_\_\_\_\_  
\_\_\_\_\_

Attachments: \_\_\_\_\_

\_\_\_\_\_

**RESPONSE WILL BE INCLUDED IN AN ADDENDUM**

Grossmont Union High School District Valhalla High School <b>Battery Replacement</b> RCA Project No. 1-30-56		Request for Information 00 40 25 - 1
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**END OF RFI**

Grossmont Union High School District Valhalla High School <b>Battery Replacement</b> RCA Project No. 1-30-56		Request for Information 00 40 25 - 2
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**SECTION 00 43 25**  
**SUBSTITUTION REQUEST FORM - DURING PROCUREMENT**

**SUBSTITUTION REQUEST NO.** \_\_\_\_\_

**DATE:** \_\_\_\_\_

**PROJECT NAME: BATTERY REPLACEMENT**

**PROJECT NUMBER: 1-30-56**

**TO: RUHNAU CLARKE ARCHITECTS**  
Construction Manager

From: \_\_\_\_\_

We hereby submit for your consideration the following product comparisons of the specified product and the proposed substitution. The undersigned fully understands that failure to answer any item below may be cause for rejection of request for substitution.

Request for substitution shall only be made during bidding (not later than 7 days prior to bid opening for inclusion by Addendum) except under conditions beyond control of Contractor.

**SPECIFIED PRODUCT:** \_\_\_\_\_

Project Manual Section Title \_\_\_\_\_ Number \_\_\_\_ Page \_\_\_\_ Paragraph \_\_\_\_.

Drawing No. \_\_\_\_\_ Detail No. \_\_\_\_\_

Proposed Substitution: \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Tel: \_\_\_\_\_

A. Is the point-by-point comparative data attached? — REQUIRED BY A/E

B. Reason request for substitution is being submitted: \_\_\_\_\_

**DIFFERENCES BETWEEN PROPOSED SUBSTITUTION AND SPECIFIED PRODUCT**

C. Does proposed substitution affect in any way the Structural Safety, Access Compliance, or Fire & Life Safety portions of the project? No\_\_ Yes\_\_

Explain \_\_\_\_\_

D. Does proposed substitution affect dimensions, gages, weights, etc. on Drawing? No\_\_ Yes\_\_

Explain \_\_\_\_\_

Grossmont Union High School District Valhalla High School <b>Battery Replacement</b> RCA Project No. 1-30-56		Substitution Request Form - During Procurement 00 43 25 - 1
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- E. Does proposed substitution require changes in Drawings or design and installation changes?  
 No\_\_\_ Yes\_\_\_ \_\_\_\_\_  
 (If yes, cost of these changes is the responsibility of the Contractor.)
- F. Does proposed substitution affect product cost, delivery time, or construction schedule?  
 No\_\_\_ Yes\_\_\_ Explain \_\_\_\_\_
- G. Does proposed substitution comply with specified ICC Number, UL Rating, ASTM Numbers?  
 No\_\_\_ Yes\_\_\_ Explain \_\_\_\_\_
- H. Does proposed substitution affect other trades and systems such as wiring, piping, ductwork, structure, etc.? No \_\_\_ Yes \_\_\_ (Explain which and how) \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
- I. Does proposed substitution product guarantee differ from that of the specified product?  
 No\_\_\_ Yes\_\_\_ Explain \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Attach a listing of 3 similar projects (one in service for at least 3 years) using the proposed substitution.

Substantiating Data: Attach product data/brochures and Vendor qualifications for both specified and substitute product. Provide samples for both specified and substitute products, if applicable.

Certification: Undersigned has examined Construction Documents, is familiar with specified product, understands indicated application of product, and understands design intent of the Architect caused by the requested substitution.

Submitted by: \_\_\_\_\_

\_\_\_\_\_. (Type Name)      Signature      Date

Signature must be made by person having legal authority to bind his firm to the above terms.

**END OF SECTION**

Grossmont Union High School District Valhalla High School <b>Battery Replacement</b> RCA Project No. 1-30-56		Substitution Request Form - During Procurement 00 43 25 - 2
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**SECTION 00 63 25**  
**SUBSTITUTION REQUEST FORM - DURING CONSTRUCTION**

**SUBSTITUTION REQUEST NO.** \_\_\_\_\_

**DATE:** \_\_\_\_\_

**PROJECT NAME: BATTERY REPLACEMENT**

**PROJECT NUMBER: 1-30-56**

**TO: RUHNAU CLARKE ARCHITECTS**  
Construction Manager

From: \_\_\_\_\_

We hereby submit for your consideration the following product comparisons of the specified product and the proposed substitution. The undersigned fully understands that failure to answer any item below may be cause for rejection of request for substitution.

This request for substitution form shall only be used after the end of the bidding period except under conditions beyond control of Contractor.

Specified Product: \_\_\_\_\_

Project Manual Section Title \_\_\_\_\_ Number \_\_\_\_ Page \_\_\_\_ Paragraph \_\_\_\_.

Drawing No. \_\_\_\_\_ Detail No. \_\_\_\_\_

Proposed Substitution: \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Tel: \_\_\_\_\_

A. Reason request for substitution is being submitted: \_\_\_\_\_

\_\_\_\_\_

B. Does proposed substitution affect in any way the Structural Safety, Access Compliance, or Fire & Life Safety portions of the project? No\_\_ Yes\_\_

Explain \_\_\_\_\_

\_\_\_\_\_

C. Does proposed substitution affect dimensions, gages, weights, etc. on Drawing? No\_\_ Yes\_\_

Explain \_\_\_\_\_

\_\_\_\_\_

D. Does proposed substitution require changes in Drawings or design and installation changes?

No\_\_ Yes\_\_ \_\_\_\_\_

(If yes, cost of Architect and Engineer document changes are the responsibility of the Contractor.)

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- E. Does proposed substitution affect product cost, delivery time, or construction schedule?  
No\_\_\_ Yes\_\_\_ Explain \_\_\_\_\_
- F. Does proposed substitution comply with specified ICC Number, UL Rating, ASTM Numbers?  
No\_\_\_ Yes\_\_\_ Explain \_\_\_\_\_
- G. Does proposed substitution affect other trades and systems such as wiring, piping, ductwork, structure, etc.? No \_\_\_ Yes \_\_\_ (Explain which and how) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

If yes, has impact on their work been included in price of proposed substitution? No\_\_\_ Yes\_\_\_.

- H. Does proposed substitution product guarantee differ from that of the specified product?  
No\_\_\_ Yes\_\_\_ Explain \_\_\_\_\_

\_\_\_\_\_

If the substitution request is accepted, it will result in:

No cost impact \_\_\_\_\_ Improve Schedule \_\_\_\_\_ Credit of \$ \_\_\_\_\_

Attach a listing of 3 projects (one in service for at least 3 years) using the proposed substitution.

Substantiating Data: Attach product data/brochures and Vendor qualifications for both specified and substitute product. Provide samples for both specified and substitute products, if applicable.

Certification: Undersigned has examined Construction Documents, is familiar with specified product, understands indicated application of product, and understands design intent of the Architect caused by the requested substitution.

Submitted by: \_\_\_\_\_

\_\_\_\_\_. (Type Name)      Signature      Date

Signature must be made by person having legal authority to bind his firm to the above terms.

Architect's Comments:

\_\_\_\_\_ Accepted, \_\_\_\_\_ accepted as noted, \_\_\_\_\_ not accepted, \_\_\_\_\_ received too late.

Reviewed by:

\_\_\_\_\_  
Architect      Date

\_\_\_\_\_  
DSA      Date

\_\_\_\_\_  
District      Date

**END OF SECTION**

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## SECTION 01 10 00 SUMMARY

### PART 1 GENERAL

#### 1.01 PROJECT

- A. Project Name: Battery Replacement
- B. District's Name: Grossmont Union High School District.
- C. Architect's Name: Ruhnau Clarke Architects.
- D. The Project consists of the canopy panels outside of the existing kitchen located at Valhalla High School.

#### 1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Owner-Contractor Agreement.

#### 1.03 CONTRACT DOCUMENTS

- A. Contract Requirements:
  - 1. Conditions of the Contract and other Contract documents have been included in the Project Manual, as indicated in the Table of Contents.
    - a. Such documents are not Specifications.
- B. Contract Drawings: The Drawings provided with and identified in the Project Manual are the Drawings referenced in the Agreement.
  - 1. The location, extent and configuration of the required construction and improvements are shown and noted on Drawings.
    - a. The Drawings are referenced in the Agreement.
    - b. An index of Drawings is included in the set of Drawings.
  - 2. Drawings are arranged into series according to design discipline. Such organization and all references to trades, subcontractor, specialty contractor or supplier shall not control the Contractor in dividing the Work among subcontractors or in establishing the extent of the Work to be performed by any trade.
  - 3. Where the terms "as shown", "as indicated", "as noted", "as detailed", "as scheduled", or terms of like meaning, are used in the Drawings or Specifications, it shall be understood that reference is being made to the Drawings referenced in the Agreement.
  - 4. Where reference to the word "plans" is made anywhere in Drawings, Specifications and related Contract Documents, it shall be understood to mean the Drawings referenced in the Agreement.
- C. Contract Specifications: The Specifications provided in the Project Manual are the Specifications referenced in the Agreement.
  - 1. Specifications are organized by Divisions and Sections in accordance with the recommended practices of the Construction Specifications Institute.

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- a. Such organization shall not control the Contractor in dividing the Work among subcontractors or in establishing the extent of Work to be performed by any trade.
- 2. Specifications are included in the Project Manual, which may also include other Bidding and Contract Documents.
  - a. Contents of the Project Manual are listed in Document 00 01 10 - Table of Contents, in the Project Manual.

#### 1.04 DESCRIPTION OF ALTERATIONS WORK

- A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 41 00.
  - 1. The intent of these drawings and specifications are the work of the alteration, rehabilitation, or reconstruction of this facility shall be submitted and approved by DSA before proceeding with the repair work. CAC Section 4-317.
- B. Scope of alterations work is indicated on drawings.

#### 1.05 WORK BY OWNER

- A. Concurrent Work Under Separate Contracts:
  - 1. Work Under Separate Contracts: District will award separate contracts for products and installation for interior improvements and other work as may be indicated on Drawings as NIC (Not in Contract).
  - 2. Relationship to Work Under the Contract:
    - a. Work under the Contract shall include all provisions necessary to make such concurrent work under separate contracts complete in every respect and fully functional, including field finishing.
    - b. Provide necessary backing, supports, piping, conduit, conductors and other such provisions from point of service to point of connection, as shown on Drawings and specified herein.
  - 3. Related Contract Documents:
    - a. District will make available, in a timely manner, drawings and specifications of work under separate contracts for coordination and further description of that work.
    - b. Such drawings and other data required for the coordination of the work of separate contracts with the Work of this Contract may be included with the Contract Documents.
    - c. If so, they are provided for convenience only and are not to be considered Contract Documents produced by Architect or Architect's consultants.
  - 4. Permits, Notices and Fees:
    - a. Permits, Notices and Fees: Notices required by and approvals required of authorities having jurisdiction for work under separate contracts and related fees will be solely the responsibility of District.

#### 1.06 OWNER OCCUPANCY

- A. District intends to continue to occupy adjacent portions of the existing building during the entire construction period.

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- B. District intends to occupy the Project upon Substantial Completion.
- C. Cooperate with District to minimize conflict and to facilitate District's operations.
- D. Schedule the Work to accommodate District occupancy.

#### **1.07 CONTRACTOR USE OF SITE AND PREMISES**

- A. Arrange use of site and premises to allow:
  - 1. District occupancy.
  - 2. Work by Others.
  - 3. Work by District.
  - 4. Use of site and premises by the public.
- B. Provide access to and from site as required by law and by District:
  - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
  - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
  - 3. Construction Limit:
    - a. Limit construction activities to areas indicated on Drawings as Project Area or, if not indicated, to areas within the parcel as described in the legal description on the Drawings.
    - b. Refer also to Section 01 50 00 - Temporary Construction Facilities and Controls for additional requirements.
- C. Existing building spaces may not be used for storage.
- D. Time Restrictions:
  - 1. Limit conduct of especially noisy malodorous and dusty exterior work to the hours of 8 AM to 6 PM.
- E. Utility Outages and Shutdown:
  - 1. Limit disruption of utility services to hours the site is unoccupied.
  - 2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to District and authorities having jurisdiction.
  - 3. Prevent accidental disruption of utility services to other facilities.

#### **1.08 CONSTRUCTION WASTE MANAGEMENT**

- A. Construction and waste management, complying with Section 01 74 19 - Construction Waste Management and Disposal, is a requirement for this project.
- B. The Contractor, Prime Contractors, and subcontractors all have obligations in meeting the requirements of this specification.

**END OF SECTION**

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**SECTION 01 20 00  
PRICE AND PAYMENT PROCEDURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Correlation of Contractor submittals based on changes.
- E. Procedures for preparation and submittal of application for final payment.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 78 00 - Closeout Submittals: Project record documents.

**1.03 SCHEDULE OF VALUES**

- A. Use Schedule of Values Form:
  - 1. Form provided by District.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in duplicate within 15 days after date established in Notice to Proceed.
- E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.
- F. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
- G. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.
- H. Revise schedule to list approved Change Orders, with each Application For Payment.
  - 1. List each authorized Change Order as an extension on the continuation sheet, listing the Change Order number and dollar value as for an original portion of Work.

**1.04 APPLICATIONS FOR PROGRESS PAYMENTS**

- A. Payment Period: Submit at intervals stipulated in the Agreement.
  - 1. Substantiating information will normally be required only for those portions of Work whose completion state cannot be readily determined by observation of the completed Work.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

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- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. For each item, provide a column for listing each of the following:
  - 1. Item Number.
  - 2. Description of work.
  - 3. Scheduled Values.
  - 4. Previous Applications.
  - 5. Work in Place and Stored Materials under this Application.
  - 6. Authorized Change Orders.
  - 7. Total Completed and Stored to Date of Application.
  - 8. Balance to Finish.
  - 9. Retainage.
- F. Execute certification by signature of authorized officer.
- G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
  - 1. No Change Orders shall be included with Application for Payment until approved in writing by District and Architect. Also approved by DSA when appropriate.
- I. Submit one electronic and three hard-copies of each Application for Payment.
- J. Include the following with the application:
  - 1. Transmittal letter as specified for submittals in Section 01 30 00.
  - 2. Construction progress schedule, revised and current as specified in Section 01 30 00.
  - 3. Current construction photographs specified in Section 01 30 00.
  - 4. Partial release of liens from major subcontractors and vendors.
    - a. Provide with each Application for Payment lien releases from all subcontractors, workers and materials suppliers employed for the Project covering their portion of Work to date for which payment application is made. Lien release forms will be provided by District and shall be completed in accordance with directions provided.
  - 5. Project record documents as specified in Section 01 78 00, for review by District which will be returned to the Contractor.
  - 6. Affidavits attesting to off-site stored products.
- K. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

#### 1.05 ADDENDA

- A. Addenda are changes issued prior to the signing of the Contract for Construction. These Addenda shall be signed by the Architect and approved by the (Project City).

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- B. These documents may or may not have approved by the (Project City) prior to the close of Bid.
  - 1. If not approved by DSA prior to close of the bidding period, the contract price shall include the Addenda.
  - 2. No work shall proceed regarding any Addendum until approved by DSA.
  - 3. Revisions to Addenda, when approved by DSA, shall be incorporated by an additional addendum or Change Order as indicated below and as provided for in the Contract for Construction and General Conditions.

#### 1.06 MODIFICATION PROCEDURES

- A. Construction Changes, General:
  - 1. The following describe administrative procedures to be followed in compliance with provisions of the Conditions of the Contract for Architect's Supplemental Instructions, Construction Change Directives, Construction Change Documents, and Contract Change Orders.
  - 2. The Architect will prepare and issue: Architect's Supplemental Instructions, a Construction Change Directive or a Request for Proposal to be presented to the Contractor for action.
- B. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to Contract Documents.
- C. Contract Change Order Forms: Form as directed by District.
- D. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
  - 1. Architect's Supplemental Instructions:
    - a. Minor changes in the Work, not involving an adjustment in either the Contract Sum or Contract Time, as authorized by the Conditions of the Contract, will be presented by the Architect using the Architect's Bulletin form.
    - b. Should the Architect's Supplemental Instructions result in disputed costs and time adjustments, such dispute shall be resolved in accordance with the provisions of the Conditions of the Contract.
- E. DSA Construction Change Document approval for substitutions and changes to structural, accessibility, or fire-life-safety portions of approved Drawings and Specifications is required from DSA prior to fabrication and installation. DSA IR A-6; CAC Section 4-215, & 4-233(c).
  - 1. The approved Construction Change Document shall be signed by:
    - a. Architect of Record.
    - b. When applicable:
      - 1) Structural Engineer of Record.
      - 2) Delegated Professional Engineer.
    - c. Division of the State Architect for final approval.
- F. For other required changes, not involving structural, accessibility, or fire-life-safety portions of approved Drawings and Specifications, Architect will issue a document signed by District

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instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.

1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
  2. Promptly execute the change.
  3. Construction Change Directives: In accordance with provisions of the Conditions of the Contract, the District may direct the Contractor to proceed with a change in the Work prior to formal preparation, review and agreement of a Contract Change Order, in order to not delay construction.
    - a. The Architect will prepare and issue a change document containing a Construction Change Directive which, when signed by the District and the Architect, shall instruct the Contractor to proceed with a change in the Work, for subsequent inclusion in a Contract Change Order.
    - b. Should the Construction Change Directive result in disputed costs and time adjustments, such dispute shall be resolved in accordance with the provisions of the Conditions of the Contract.
    - c. Construction Change Directives shall follow procedures specified below for Contract Change Orders except that Contractor shall immediately proceed with the change upon receipt of the signed Change Directive.
- G. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 14 days.
1. Such Request for Proposal may include an estimate of additions or deductions in Contract Time and Contract Sum for executing the change and may include stipulations regarding overtime work and the period of time the requested response from the Contractor shall be considered valid.
- H. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on work by separate or other contractors. Document any requested substitutions in accordance with Section 01 6000.
1. After review of the request and with the District's approval, the Architect will prepare a change document containing a Request for Proposal, as described above.
  2. Issuance of such a request by the Architect shall not indicate authorization of the Contractor to proceed with the proposed change.
  3. Changes will be approved only by an approved Construction Change Directive and Contract Change Order.
- I. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.

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2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
  3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
  4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.
- J. Substantiation of Costs: Provide full information required for evaluation.
1. On request, provide the following data:
    - a. Quantities of products, labor, and equipment.
    - b. Taxes, insurance, and bonds.
    - c. Overhead and profit.
    - d. Justification for any change in Contract Time.
    - e. Credit for deletions from Contract, similarly documented.
  2. Support each claim for additional costs with additional information:
    - a. Origin and date of claim.
    - b. Dates and times work was performed, and by whom.
    - c. Time records and wage rates paid.
    - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
  3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
    - a. Cost and Time Resolution: If amounts for changes in Contract Sum and Contract Time cannot be agreed upon by District and Contractor, amounts shall be resolved in accordance with provisions of the Conditions of the Contract for resolution of disputes and the following:
      - 1) Contractor shall keep accurate records of time, both labor and calendar days, and cost of materials and equipment.
      - 2) Contractor shall prepare and submit an itemized account and supporting data after completion of changed Work, within the time limits indicated in the Conditions of the Contract.
      - 3) Contractor shall provide full information as required and requested, for District and Architect to evaluate and substantiate proposed costs and time for the change in the Work.
      - 4) When District and Contractor determine mutually acceptable amounts for changes in Contract Sum and Contract Time, a Contract Change Order shall be executed for these amounts.
      - 5) District shall have the right to audit Contractor's invoices and bid quotations to substantiate costs for Contract Change Orders.

- K. Construction Changes Based on Stipulated Sum or Time: Based on the Contractor's response to a Request for Proposal or Construction Change Directive, the District and Architect will

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review the response.

1. The District and Contractor shall negotiate a mutually acceptable adjustment in Contract Sum and Contract Time, as appropriate, prior to performance of the changed Work.
  2. A Contract Change Order for the stipulated amounts shall be prepared based on the stipulated sum and change in time.
- L. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
1. When agreement is reached on changes, if any, in the Contract Time and the Contract Sum, the Contractor shall prepare a Contract Change Order using a form as directed by the District, with supplementary documents as necessary to describe the change and the associated costs and schedule impacts.
  2. Construction Change Document approval is required from DSA prior to fabrication and installation.
  3. Submit Contract Change Orders to District through the Architect.
  4. Contractor shall prepare and submit five original sets of documents for each Change Order. District, Architect and DSA shall sign the Change Order indicating acceptance and approval of the change.
    - a. Structural Engineer shall also sign the Change Order, when applicable.
  5. All Change Orders must be approved by DSA prior to fabrication and installation.
  6. Upon approval of the Change Order, Contractor shall promptly execute the change in the Work.
- M. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- N. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
1. Contractor shall submit revised schedules at the next Application for Payment following approval and acceptance of the Contract Change Order.
- O. Promptly enter changes in Project Record Documents.

#### **1.07 APPLICATION FOR FINAL PAYMENT**

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
  1. All closeout procedures specified in Section 01 70 00.

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**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

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**SECTION 01 25 00  
SUBSTITUTION PROCEDURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Procedural requirements for proposed substitutions.

**1.02 RELATED REQUIREMENTS**

- A. Division 00 - Procurement and Contracting Requirements: Restrictions on timing of substitution requests.
- B. Section 00 43 25 - Substitution Request Form - During Procurement: Required form for substitution requests made prior to award of contract (During procurement).
- C. Section 00 63 25 - Substitution Request Form - During Construction: Required form for substitution requests made after award of contract (During construction).
- D. Section 01 30 00 - Administrative Requirements: Submittal procedures, coordination.
- E. Section 01 60 00 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.
- F. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of indoor substitute products.

**1.03 DEFINITIONS**

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
  - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
    - a. Unavailability.
    - b. Regulatory changes.
  - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
    - a. Substitution requests offering advantages solely to the Contractor will not be considered.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 GENERAL REQUIREMENTS**

- A. Requests by Contractor to deviate from specified requirements for products, materials, equipment, and methods, or to provide products other than those specified, shall be considered requests for substitutions except under the following conditions:

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1. Substitutions are requested during the bidding period, and accepted prior to execution of the Contract. Acceptance shall be in the form of written Addendum to the Bidding documents or revision to the Drawings or Specifications for use as Construction Contract Documents.
  2. Changes in products, materials, equipment, and methods of construction are directed by the District or Architect.
  3. Contractor options for provision of products and construction methods are specifically stated in the Contract Documents.
  4. Change in products, materials, equipment, and methods of construction is required for compliance with Codes, ordinances, regulations, orders and standards of authorities having jurisdiction.
- B. Substitution Provisions: Refer to substitution provisions of the Conditions of the Contract, in addition to the requirements specified herein. Provisions for consideration and acceptance of substitutions shall be as follows:
1. Documentation:
    - a. Substitutions will not be considered if they are indicated or implied on shop drawing, product data or sample submittals.
    - b. All requests for substitution shall be made by separate written request from Contractor.
  2. Cost and Time Considerations: Substitutions will not be considered unless a net reduction in Contract Sum or Contract Time results to the District's benefit, including redesign costs, life cycle costs, changes in related Work and overall performance of building systems.
  3. Design Revision:
    - a. Substitutions will not be considered if acceptance will require substantial revision of the Contract Documents or will substantially change the intent of the design, in the opinion of the Architect.
    - b. The intent of the design shall include functional performance and aesthetic qualities.
  4. Data: It shall be the responsibility of the Contractor to provide adequate data demonstrating the merits of the proposed substitution, including cost data and information regarding changes in related Work.
  5. Determination by Architect:
    - a. Architect will determine the acceptability of proposed substitutions and will notify Contractor, in writing within a reasonable time, of acceptance or rejection.
    - b. The determination by the Architect regarding functional performance and aesthetic quality shall be final.
  6. Non-Acceptance: If a proposed substitution is not accepted, provide the specified product.
    - a. If, in the opinion of the Architect, the substitution request is incomplete or has insufficient data to enable a full and thorough review of the intended substitution, the substitution may be summarily refused and determined to be unacceptable.

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7. Substitution Limitation: Only one request for substitution will be considered for each product.
- C. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
  1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
    - a. Include a signed certification that the Contractor has:
      - 1) Reviewed the proposed substitution and has determined that the substitution is equivalent or superior in every respect to product requirements indicated or product specified in the Contract Documents.
      - 2) Certify the proposed substitution is suited for and can perform the purpose or application of the specified product indicated or specified in the Contract Documents.
  2. Agrees to provide the same warranty for the substitution as for the specified product.
  3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
  4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to District.
  5. Waives claims for additional costs or time extension that may subsequently become apparent.
    - a. Include a signed waiver by the Contractor for changes in the Contract Time or Contract Sum because of the following:
      - 1) Substitution failed to perform adequately.
      - 2) Substitution required changes in on other elements of the Work.
      - 3) Substitution caused problems in interfacing with other elements of the Work.
      - 4) Substitution was determined to be unacceptable by authorities having jurisdiction.
  6. Agrees to reimburse District and Architect for review or redesign services associated with re-approval by authorities.
- D. A Substitution Request for specified installer constitutes a representation that the submitter:
  1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.
- E. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
  1. Note explicitly any non-compliant characteristics.
- F. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
  1. Forms indicated and included in the Project Manual are adequate for this purpose, and must be used.
  2. No specific form is required. Contractor's Substitution Request documentation must include the following:

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- a. Project Information:
  - 1) Official project name and number, and any additional required identifiers established in Contract Documents.
  - 2) District's, Architect's, and Contractor's names.
- b. Substitution Request Information:
  - 1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
  - 2) Indication of whether the substitution is for cause or convenience.
  - 3) Issue date.
  - 4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
  - 5) Description of Substitution.
  - 6) Reason why the specified item cannot be provided.
  - 7) Differences between proposed substitution and specified item.
  - 8) Description of how proposed substitution affects other parts of work.
- c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
  - 1) Physical characteristics.
  - 2) In-service performance.
  - 3) Expected durability.
  - 4) Visual effect.
  - 5) Sustainable design features.
  - 6) Warranties.
  - 7) Other salient features and requirements.
  - 8) Include, as appropriate or requested, the following types of documentation:
    - (a) Product Data:
    - (b) Samples.
    - (c) Certificates, test, reports or similar qualification data.
    - (d) Drawings, when required to show impact on adjacent construction elements.
  - 9) Include a detailed description, in written or graphic form as appropriate, indicating all changes or modifications needed to other elements of the Work and to construction to be performed by the District and by others under separate Contract with District, that will be necessary if the proposed substitution is accepted.
- d. Impact of Substitution:
  - 1) Savings to District for accepting substitution.
    - (a) Include detailed cost data, including a proposal for the net change, if any, in the Contract Sum.

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- 2) Change to Contract Time due to accepting substitution.
  - (a) Indicate the substitution's effect on the Construction Schedule. Indicate the effect of the proposed substitution on overall Contract Time and, as applicable, on completion of portions of the Work for use by District or for work under separate contract by District.
- G. Limit each request to a single proposed substitution item.
  1. Submit an electronic document, combining the request form with supporting data into single document.

### 3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Submittal Time Restrictions:
- B. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.
- C. Pursuant to Section 3400 of the Public Contract Code, requests for substitution will be considered only if received up to 7 days prior to the bid date. Subsequent requests will be considered only in the case of product unavailability, through no fault of the Contractor , or for reasons of cost reducing value analysis requested by the District .
- D. Submittal Form (before award of contract):
  1. Submit substitution requests by completing the form in Section 00 43 25; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

### 3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Submittal Form (after award of contract):
  1. Submit substitution requests by completing the form in Section 00 63 25; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- B. After Contract award, requests will be considered for cause only; in the case of product unavailability, through no fault of the Contractor , or for reasons of cost reducing value analysis requested by the District.
  1. Substitutions will be considered when a product, through no fault of the Contractor, becomes unavailable or unsuitable due to regulatory change.
  2. Product Availability Waiver:
    - a. Substitutions will be considered after 35 day time limit only when a product becomes unavailable due to no fault of Contractor.
    - b. Failure to place orders for specified products sufficiently in advance of required date for incorporation into the Work will not be considered as a valid reason for which Contractor may request a substitution or deviation from requirements of the Drawings and Specifications.
  3. Waiver: At the discretion of the District, limitations on substitutions may be waived.
- C. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

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- D. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
  - 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the District through cost savings, time savings, greater energy conservation, or in other specific ways.
  - 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
  - 3. Bear the costs engendered by proposed substitution of:
    - a. District's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
    - b. Other construction by District.
    - c. Other unanticipated project considerations.
- E. Substitutions will not be considered under one or more of the following circumstances:
  - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
  - 2. Without a separate written request.
  - 3. When acceptance will require revisions to Contract Documents.

#### **3.04 CONTRACT DOCUMENT REVISIONS:**

- A. Should a Contractor-proposed substitution or alternative sequence or method of construction require revision of the Contract Drawings or Specifications;
  - 1. Including revisions for the purposes of determining feasibility, scope or cost, or revisions for the purpose of obtaining review and approval by authorities having jurisdiction.
  - 2. Revisions will be made by Architect or other consultant of District who is the responsible design professional, as approved in advance by District.
- B. Services of Architect or other consultant of the District, including time spent in researching and reporting on proposed substitutions or alternative sequence and method of construction, shall be paid by Contractor when such activities are considered additional services to the design services contracts of the Architect or other responsible design professional with the District.
- C. Costs of services by Architect or other responsible design professional of the District shall be paid on a time and materials basis, based on current hourly fee schedules, with reproduction, long distance telephone and shipping costs reimbursable at cost plus usual and customary mark-up for handling and billing.
- D. Such fees shall be paid whether or not the proposed substitution or alternative sequence or method of construction is ultimately accepted by District and a Change Order is executed.
- E. Such fees shall be paid from Contractor's portion of savings, if a net reduction in Contract Sum results. If fees exceed Contractor's portion of net reduction, Contractor shall pay all remaining fees unless otherwise agreed in advance by the District.
- F. Such fees owed shall be deducted from the amount owed Contractor on the Application for Payment next made following completion of revised Contract Drawings and Specifications or completion of research and other services. District will then pay Architect or other consultant of the

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District.

- G. Certain substitutions require approval from DSA.

### **3.05 RESOLUTION**

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.
  - 1. Architect's decision following review of proposed substitution will be noted on the submitted form.

### **3.06 ACCEPTANCE**

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

### **3.07 CLOSEOUT ACTIVITIES**

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

### **3.08 ATTACHMENTS**

- A. A facsimile of the Substitution Request Form (During Construction) required to be used on the Project is included after this section.

**END OF SECTION**

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**SECTION 01 30 00**  
**ADMINISTRATIVE REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General administrative requirements.
- B. Electronic document submittal service.
- C. Preconstruction meeting.
- D. Site mobilization meeting.
- E. Progress meetings.
- F. Construction progress schedule.
- G. Contractor's daily reports.
- H. Progress photographs.
- I. Submittals for review, information, and project closeout.
- J. Number of copies of submittals.
- K. Requests for Interpretation or Information (RFI) procedures.
- L. Submittal procedures.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 60 00 - Product Requirements: General product requirements.
- B. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.
- C. Technical Product Sections: Procedures for specific submittals specified in those Sections to be made at Contract closeout.

**1.03 DEFINITIONS**

- A. Action Submittals: Written and graphic information that requires responsive action by Construction Manager and Architect or other responsible design professional.
- B. Informational Submittals: Written information that does not require responsive action by Construction Manager and Architect or other responsible design professional.
- C. Unsolicited Submittals: Action or informational submittals not required by the Contract Documents or not requested by the reviewer. Unsolicited submittals may be returned with notation "not reviewed."
- D. Product Data: Standard published information ("catalog cuts") and specially prepared data for the Work of the Contract, including standard illustrations, schedules, brochures, diagrams, performance charts, instructions and other information to illustrate a portion of the Work.
- E. Request for Interpretation or Information (RFI): A document submitted by the Contractor requesting clarification of a portion of the Contract Documents, hereinafter referred to as an RFI.

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- F. Samples: Physical examples that demonstrate the materials, finishes, features, workmanship and other characteristics of a portion of the Work. Accepted samples shall serve as quality basis for evaluating the Work.
- G. Shop Drawings, Product Data and Samples: Instruments prepared and submitted by Contractor, for Contractor's benefit, to communicate to Architect the Contractor's understanding of the design intent, for review and comment by Architect on the conformance of the submitted information to the general intent of the design. Shop drawings, product data and samples are not Contract Documents.
- H. Shop Drawings: Drawings, diagrams, schedules and illustrations, with related notes, specially prepared for the Work of the Contract, to illustrate a portion of the Work.
- I. Other Submittals: Technical data, test reports, calculations, surveys, certifications, special warranties and guarantees, operation and maintenance data, extra stock and other submitted information and products shall not be considered as Contract Documents but shall be information from Contractor to Architect to illustrate a portion of the Work for confirmation of understanding of design intent.

#### 1.04 PROJECT COORDINATOR

- A. Project Coordinator: Construction Manager.
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for material delivery access, traffic, and parking facilities.
  - 1. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 10 00 - Summary.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- G. Make the following types of submittals to Architect through the Project Coordinator:
  - 1. Requests for Interpretation or Information.
  - 2. Requests for substitution.
  - 3. Shop drawings, product data, and samples.
  - 4. Test and inspection reports.
  - 5. Design data.
  - 6. Manufacturer's instructions and field reports.
  - 7. Applications for payment and change order requests.
  - 8. Progress schedules.
  - 9. Coordination drawings.

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10. Correction Punch List and Final Correction Punch List for Substantial Completion.
11. Closeout submittals.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION**

### **3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE**

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
  1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation or Information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
  2. Contractor and Architect are required to use this service.
  3. It is Contractor's responsibility to submit documents in allowable format.
  4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
  5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, [www.adobe.com](http://www.adobe.com), or Bluebeam PDF Revu, [www.bluebeam.com](http://www.bluebeam.com)), unless such software capability is provided by the service provider.
  6. Unless specifically requested, paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
  7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.
- C. Submittal Service: The selected service is:
  1. Bluebeam Software Inc.; Bluebeam Revu Studio: [www.bluebeam.com](http://www.bluebeam.com).
  2. Other Service acceptable to both District and Architect.
    - a. Direct email with PDF copies.
- D. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for District.

### **3.02 PRECONSTRUCTION MEETING**

- A. District will schedule a meeting after Notice of Award.
- B. Attendance Required:

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1. District.
  2. Architect.
  3. Contractor.
- C. Agenda:
1. Execution of District-Contractor Agreement.
  2. Submission of executed bonds and insurance certificates.
  3. Distribution of Contract Documents.
  4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
  5. Submission of initial Submittal schedule.
  6. Designation of personnel representing the parties to Contract and <1|A/E|>.
  7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  8. Scheduling.
  9. Scheduling activities of a Geotechnical Engineer.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, District, participants, and those affected by decisions made.

### 3.03 SITE MOBILIZATION MEETING

- A. Schedule meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
1. Contractor.
  2. District.
  3. Architect.
  4. Contractor's superintendent.
  5. Major subcontractors.
  6. Inspector of Record.
- C. Agenda:
1. Distribute and discuss list of subcontractors and suppliers.
  2. Project Communication Procedures: Review requirements and administrative requirements for written and oral communications.
    - a. Review requirements and administrative procedures Contractor may wish to institute for identification and reporting purposes.
  3. Change Procedures: Review requirements and administrative procedures for Change Orders, Construction Change Directives, Architect's supplemental instructions and Contractor's Requests for Interpretation or Information.
  4. Use of premises by District and Contractor.
    - a. Site access restrictions, if any, and requirements to avoid disruption of operations at adjoining facilities or operations.

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- b. Construction Facilities and Temporary Utilities: Designate storage and staging areas, construction office areas; review temporary utility provisions; present District's requirements for use of premises.
- 5. District's requirements.
- 6. Construction facilities and controls provided by District.
- 7. Temporary utilities provided by District.
- 8. Survey and building layout.
- 9. Security and housekeeping procedures.
- 10. Schedules.
  - a. Distribute and discuss initial construction schedule and critical work sequencing of major elements of Work;
  - b. Include coordination of District Furnished / Contractor Installed (OFCl) products;
- 11. Application for payment procedures.
- 12. Procedures for testing.
- 13. Procedures for maintaining record documents.
- 14. Requirements for start-up of equipment.
- 15. Inspection and acceptance of equipment put into service during construction period.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, District, participants, and those affected by decisions made.

### 3.04 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum bi-weekly intervals.
- B. Meeting Time and Location: As mutually agreed by District, Architect, and Contractor, at on-site location.
- C. Special Meetings: As necessary, Construction Manager may convene special meetings to discuss specific construction issues in detail and to plan specific activities.
  - 1. See Section 01 70 00 - Execution and Closeout Requirements.
- D. Attendance Required:
  - 1. Contractor.
  - 2. District.
  - 3. Architect.
  - 4. Contractor's superintendent.
  - 5. Major subcontractors.
- E. Agenda:
  - 1. Review minutes of previous meetings.
  - 2. Review of work progress.
  - 3. Field observations, problems, and decisions.
  - 4. Identification of problems that impede, or will impede, planned progress.

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5. Review of submittals schedule and status of submittals.
  6. Review of RFIs log and status of responses.
  7. Review of off-site fabrication and delivery schedules.
  8. Maintenance of progress schedule.
  9. Corrective measures to regain projected schedules.
    - a. Develop corrective measures and procedures, including but not necessarily limited to additional personnel loading to regain planned schedule.
  10. Planned progress during succeeding work period.
  11. Coordination of projected progress.
  12. Maintenance of quality and work standards.
  13. Effect of proposed changes on progress schedule and coordination.
  14. Other business relating to work.
- F. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, District, participants, and those affected by decisions made.

### **3.05 CONSTRUCTION PROGRESS SCHEDULE**

- A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.
- B. Contractor's Review: All schedules shall be reviewed and approved by Contractor prior to submission for Architect's and DSA's review.
- C. Reviews by Architect and DSA will be to ascertain the general status of construction and shall not be interpreted to establish or approve the means, methods, techniques and sequences of construction.
- D. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- E. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
  1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- F. Within 10 days after joint review, submit complete schedule.
- G. Submit updated schedule with each Application for Payment.

### **3.06 DAILY CONSTRUCTION REPORTS**

- A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.
- B. In addition to transmitting electronically a copy to District and Architect, submit two printed copies at weekly intervals.
  1. Submit in format acceptable to District.
  2. Submit using required form, a sample of which is appended to this section.
- C. Prepare a daily construction report recording the following information concerning events at Project site and project progress:

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1. Date.
2. High and low temperatures, and general weather conditions.
3. List of subcontractors at Project site.
4. List of separate contractors at Project site.
5. Approximate count of personnel at Project site.
  - a. Include a breakdown for supervisors, laborers, journeymen, equipment operators, and helpers.
6. Major equipment at Project site.
7. Material deliveries.
8. Safety, environmental, or industrial relations incidents.
9. Meetings and significant decisions.
10. Unusual events (submit a separate special report).
11. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
15. Change Orders received and implemented.
16. Testing and/or inspections performed.
17. List of verbal instruction given by District and/or Architect.
18. Signature of Contractor's authorized representative.

### 3.07 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.
- C. Photography Type: Digital; electronic files.
- D. Provide photographs of construction throughout progress of work produced by an experienced photographer, acceptable to Architect.
- E. Take photographs as evidence of existing project conditions as follows:
  1. Interior views: each elevation, floor and ceilings prior to demolition.
- F. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
  1. Delivery Medium: Via email.
  2. File Naming: Include project identification, date and time of view, and view identification.

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3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

### 3.08 REQUESTS FOR INTERPRETATION OR INFORMATION (RFI)

- A. Definition: A request seeking one of the following:
  1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in the Contract Documents.
  2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
- C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
  1. Prepare a separate RFI for each specific item.
    - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
    - b. Do not forward requests which solely require internal coordination between subcontractors.
  2. Prepare in a format and with content acceptable to District.
  3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
  1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
    - a. Submit RFIs from subcontractors and material suppliers through, be reviewed by and be attached to an RFI prepared, signed and submitted by Contractor.
      - 1) RFIs from subcontractors and material suppliers are to be:
        - (a) Reviewed by Contractor.
        - (b) Corrected and rewritten to clarify as required by Contractor.
        - (c) Placed on the proper form, then signed, and submitted by Contractor.
        - (d) RFIs submitted directly by subcontractors or material suppliers will be returned unanswered to the Contractor.
      - 2) RFIs submitted directly by subcontractors or material suppliers will be returned unanswered to the Contractor.
    - b. Review all subcontractor- and supplier-initiated RFIs and take actions to resolve issues of coordination, sequencing and layout of the Work.

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- 1) RFIs submitted to request clarification of issues related to means, methods, techniques and sequences of construction or for establishing trade jurisdictions and scopes of subcontracts will be returned without response.
    - (a) Such issues are solely the Contractor's responsibility.
  - 2) Contractor is responsible for delays resulting from the necessity to resubmit an RFI due to insufficient or incorrect information presented in the RFI.
2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
- a. Approval of submittals (use procedures specified elsewhere in this section).
  - b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
  - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
  - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
- a. The District reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.
- E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
  2. District's, Architect's, and Contractor's names.
  3. Discrete and consecutive RFI number, and descriptive subject/title.
  4. Issue date, and requested reply date.
  5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
  6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
    - a. Inability to determine from the Contract Documents the exact material, process, or system to be installed;
    - b. Or when the elements of construction are required to occupy the same space (interference);
    - c. Or when an item of Work is described differently at more than one place in the Contract Documents.

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7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
  - a. In all cases, furnish all information required for the Architect to analyze and/or understand the circumstances causing the RFI and prepare a clarification or direction as to proceed for RFIs issued to request clarification of issues related to:
    - 1) Means, methods, techniques and sequences of construction, for example
    - 2) Pipe and duct routing, clearances;
    - 3) Specific locations of Work shown diagrammatically;
    - 4) Apparent interferences and similar items.
    - 5) If information included with this type RFI by the Contractor is insufficient, the RFI will be returned unanswered.
- F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
  1. Indicate current status of every RFI. Update log promptly and on a regular basis.
  2. Note dates of when each request is made, and when a response is received.
  3. Highlight items requiring priority or expedited response.
  4. Highlight items for which a timely response has not been received to date.
  5. Identify and include improper or frivolous RFIs.
- H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
  1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
- I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to District.
  1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
  2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
  3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
  4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified

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above.

### 3.09 SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format.
  - 1. Submit at the same time as the preliminary schedule.
    - a. Submit initial Submittals Schedule within 14 days of date of Notice of Award of construction.
    - b. After review and return by Architect, resubmit Submittals Schedule within 10 days and thereafter submit updated Submittals Schedules at each Construction Progress Meeting.
    - c. Submit one copy each to Owner and Architect.
  - 2. Coordinate with Contractor's construction schedule and schedule of values.
  - 3. Format schedule to allow tracking of status of submittals throughout duration of construction.
    - a. Prepare schedules in Gantt format using software at Contractor's option, providing clear indication of sequencing and scheduling of Work, for determination of "critical path" of construction progress.
      - 1) Submittals shall be connected to the related construction element by a graphically indicated critical path on the same page.
      - 2) Present schedules using opaque reproductions on substantial paper, with sheet size a multiple of 8-1/2 by 11 inches and large enough to clearly read characters.
  - 4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
  - 5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.

### 3.10 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
  - 1. Product data.
  - 2. Shop drawings.
  - 3. Samples for selection.
  - 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

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### 3.11 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
  - 1. Design data.
  - 2. Certificates.
  - 3. Test reports.
  - 4. Inspection reports.
  - 5. Manufacturer's instructions.
  - 6. Manufacturer's field reports.
  - 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for District.

### 3.12 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
  - 1. Project record documents.
  - 2. Operation and maintenance data.
    - a. Include operation and maintenance data submittals in Submittals Schedule specified above.
    - b. Provide space for review action stamps and, if required by governing authorities having jurisdiction, license seal of design Professional, if applicable.
  - 3. Warranties.
  - 4. Bonds.
  - 5. Other types as indicated.
- D. Submit for District's benefit during and after project completion.

### 3.13 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format with renderable text; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Small Size Sheets, Not Larger Than 11 by 17 inch: Submit one copy; the Contractor shall make his own copies from original returned by the Architect after making his own file copy.
- C. Extra Copies at Project Closeout: See Section 01 78 00.
- D. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
  - 1. After review, produce duplicates.
  - 2. Retained samples will not be returned to Contractor unless specifically so stated.
  - 3. Quantity:

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- a. Submit minimum of four (4) samples of each of color, texture and pattern.
- b. Submit one item only of actual assembly or product.
- c. Unless otherwise noted, full-size and complete samples will be returned and may be incorporated into field mock-ups and the Work.

### 3.14 SUBMITTAL PROCEDURES

#### A. General Requirements:

- 1. Use a separate transmittal for each item.
- 2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
- 3. Transmit using approved form.
- 4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
- 5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
  - a. For example:
    - 1) 09 21 16-1 - First submittal for Section 09 21 16 - Gypsum Board Assemblies.
    - 2) 09 21 16-2 - Second submittal for Section 09 21 16 - Gypsum Board Assemblies.
  - b. Use same number for resubmittals as original submittal, followed by a letter indicating sequential resubmittal. For example:
    - 1) 09 21 16-2A - Resubmission of second submittal for Section 09 21 16 - Gypsum Board Assemblies.
    - 2) 09 21 16-2B - Second resubmission of second submittal for Section 09 21 16 - Gypsum Board Assemblies.
- 6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
  - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
  - b. Field measurements have been determined and verified.
  - c. Conformance with requirements of Contract Drawings and Specifications is confirmed.
  - d. Catalog numbers and similar data are correct.
  - e. Work being performed by various subcontractors and trades is coordinated.
  - f. Field construction criteria have been verified, including confirmation that information submitted has been coordinated with the work being performed by others for District and actual site conditions.
  - g. All deviations from requirements of Drawings and Specifications have been identified and noted.

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7. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
    - a. Send submittals in electronic format via email to Architect.
    - b. Upload submittals in electronic form to Electronic Document Submittal Service website.
  8. Schedule submittals to expedite the Project, and coordinate submission of related items.
    - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
    - b. For sequential reviews involving Architect's consultants, District, or another affected party, allow an additional 7 days.
  9. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
    - a. Changes in the Work shall not be authorized by submittals review actions.
    - b. No review action, implicit or explicit, shall be interpreted to authorized changes in the Work.
    - c. Changes shall only be authorized by separate written Contract Change Order or Construction Change Directive, in accordance with the Conditions of the Contract and Section 01 20 00 - Price and Payment Procedures.
  10. Provide space for Contractor and Architect review stamps.
  11. When revised for resubmission, identify all changes made since previous submission.
  12. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
  13. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
  14. Submittals not requested will be recognized, but will be returned without comment,
- B. Product Data Procedures:
1. Submit only information required by individual specification sections.
  2. Collect required information into a single submittal.
  3. Submit concurrently with related shop drawing submittal.
  4. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
  2. Use of reproductions of Contract Documents in digital data form to create shop drawings is only permitted as defined in Division 01 and individual product sections.
  3. Coordination: Show all field dimensions and relationships to adjacent or critical features of Work.
  4. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:

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1. Transmit related items together as single package.
2. Samples will be reviewed for aesthetic, color, or finish selection.
3. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
4. Color Selection Samples: Architect will review and select colors for Project only after all colors are received, so that colors may be properly coordinated.
5. Copies: Submit actual samples. Photographic or printed reproductions will not be accepted.
6. Review of Field Samples: Review by Architect of field samples will be made for the following example products, as applicable, if not otherwise required and if requested by Contractor.
  - a. Concrete wall finishes and detailing (edges, corners and reveals).
  - b. Concrete paving colors and textures.
  - c. Gypsum board textures and finishes.
  - d. Field-applied paint colors and finishes.

### 3.15 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
  1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.
- D. Architect's and consultants' actions on items submitted for review:
  1. Authorizing purchasing, fabrication, delivery, and installation:
    - a. "Approved", or language with same legal meaning.
    - b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
      - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
    - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
      - 1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
      - 2) Non-responsive resubmittals may be rejected.
  2. Not Authorizing fabrication, delivery, and installation:
    - a. "Revise and Resubmit".
      - 1) Resubmit revised item, with review notations acknowledged and incorporated.
      - 2) Non-responsive resubmittals may be rejected.

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- b. "Rejected".
    - 1) Submit item complying with requirements of Contract Documents.
- E. Architect's and consultants' actions on items submitted for information:
  - 1. Items for which no action was taken:
    - a. "Received" - to notify the Contractor that the submittal has been received for record only.
  - 2. Items for which action was taken:
    - a. "Reviewed" - no further action is required from Contractor.

**END OF SECTION**

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**SECTION 01 30 00.01  
REQUEST FOR INTERPRETATION**

**RFI NUMBER:** \_\_\_\_\_ **DATE:** \_\_\_\_\_

**PROJECT NAME: BATTERY REPLACEMENT PROJECT NO.: 1-30-56**

**TO: RUHNAU CLARKE ARCHITECTS**

. Construction Manager

Attention: \_\_\_\_\_

Contractor: \_\_\_\_\_

Address: \_\_\_\_\_

**BRIEF SUMMARY OF RFI:** \_\_\_\_\_

Drawing No. \_\_\_\_\_ Detail No. \_\_\_\_\_

Specification Section \_\_\_\_\_ Title \_\_\_\_\_

. Page \_\_\_\_\_ Paragraph \_\_\_\_\_

**DETAILS OF THIS RFI:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**SUGGESTED SOLUTION:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Response required by: \_\_\_\_\_ (min. 3 full days) Submitted By: \_\_\_\_\_

\_\_\_\_\_

. Organization: \_\_\_\_\_

**RESPONSE:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Attachments: \_\_\_\_\_

Response By: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_

Organization: \_\_\_\_\_

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Copies: ☐ File ☐ District ☐ Structural ☐ Mechanical ☐ Plumbing ☐ Electrical  
☐ Civil ☐ Landscape ☐ other consultants

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**END OF RFI**

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## SUBMITTAL / SHOP DRAWING TRANSMITTAL

To:	Ruhnau Clarke Architects	Contractor's Submittal No.	
Attn:	<b>Construction Dept.</b>		
Contractor:		Project Name:	Battery Replacement at Valhalla High School
Street:		RCA's Project No.	1-30-56
City, State:		Subcontractor:	

CONTRACTOR TO FILL OUT THE FOLLOWING COVERING ONE COMPLETE SECTION OF THE SPECIFICATIONS ONLY:

Specification Section #:	Section Title:
--------------------------	----------------

<input type="checkbox"/>	Initial Submittal	Scheduled Date of Submittal	
<input type="checkbox"/>	1st Resubmittal	Scheduled Date of Submittal Return	
<input type="checkbox"/>	___ Resubmittal	Date Sent	
<input type="checkbox"/>	Submittal was a previously approved substitution.	Number of Copies	
	Approved Substitution Request Transmittal Form is enclosed.	Number of Samples	

CONTRACTOR COMPLETE EITHER (A) OR (B) FOLLOWING, <u>CHECK ONE</u> :	CONSTRUCTION MANAGERS CERTIFICATION
(A)  WE HAVE VERIFIED THAT THE MATERIAL OR EQUIPMENT CONTAINED IN THIS SUBMITTAL MEETS ALL THE REQUIREMENTS SPECIFIED OR SHOWN (NO EXCEPTIONS).  <input type="checkbox"/>	THIS IS TO CERTIFY THAT THE CONSTRUCTION MANAGER IS REASONABLY CERTAIN THAT THE MATERIAL SPECIFIED IN THIS SUBMITTAL MEETS THE REQUIREMENTS OF THE CONTRACT DOCUMENTS, AND THE SUBMITTAL IS COMPLETE PER THE CONTRACT DOCUMENTS.  SIGNATURE: _____ _____
(B)  WE HAVE VERIFIED THAT THE MATERIAL OR EQUIPMENT CONTAINED IN THIS SUBMITTAL MEETS ALL THE REQUIREMENTS SPECIFIED OR SHOWN, EXCEPT FOR THE FOLLOWING DEVIATIONS (LIST DEVIATIONS ON AN ATTACHED SHEET OR INDICATE DEVIATIONS CLEARLY ON SHOP DRAWINGS OR SUBMITTALS).  <input type="checkbox"/>	<b>CONTRACTORS CERTIFICATION</b>  THIS IS TO CERTIFY THAT THE CONTRACTOR IS REASONABLY CERTAIN THAT THE MATERIAL SPECIFIED IN THIS SUBMITTAL MEETS THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.  SIGNATURE: _____ _____

ARCHITECT'S USE ONLY BELOW THIS LINE.

Action:

☐ No Exception Taken      ☐ Make Corrections Noted      ☐ Rejected/Resubmit      ☐ Revise and Resubmit

Comments:

Date Received By RRC:

Date Sent to Consultant:

Structural \_\_\_\_\_

Mechanical \_\_\_\_\_

Electrical \_\_\_\_\_

Other \_\_\_\_\_

Date Received From:

Consultant \_\_\_\_\_

No. of Copies Received \_\_\_\_\_

Final Distribution: Contractor \_\_\_\_\_ Inspector \_\_\_\_\_ District/P.M. \_\_\_\_\_ Architect \_\_\_\_\_

Final Distribution Date: \_\_\_\_\_



**SECTION 01 35 53  
SECURITY PROCEDURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Security measures including formal security program, entry control, personnel identification, and miscellaneous restrictions.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 10 00 - Summary: use of premises and occupancy.
- B. Section 01 50 00 - Temporary Facilities and Controls: Temporary lighting.

**1.03 SECURITY PROGRAM**

- A. Protect Work , existing premises and District's operations from theft, vandalism, and unauthorized entry.
- B. Initiate program in coordination with District's existing security system at project mobilization.
- C. Maintain program throughout construction period until District acceptance precludes the need for Contractor security.

**1.04 ENTRY CONTROL**

- A. Restrict entrance of persons and vehicles into Project site and existing facilities.
- B. Allow entrance only to authorized persons with proper identification.
- C. Maintain log of workers and visitors, make available to District on request.
- D. District will control entrance of persons and vehicles related to District's operations.
- E. Contractor shall control entrance of persons and vehicles related to District's operations.
- F. Coordinate access of District's personnel to site in coordination with District's security forces.

**1.05 PERSONNEL IDENTIFICATION**

- A. Shall be worn by Contractor's superintendent and all sub contractors
- B. Provide identification badge to each person authorized to enter premises.
- C. Badge To Include: Personal photograph, name, assigned number , expiration date and employer.
- D. Maintain a list of accredited persons, submit copy to District on request.
- E. Require return of badges at expiration of their employment on the Work.

**1.06 RESTRICTIONS**

- A. Do not allow cameras on site or photographs taken except by written approval of District.

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**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

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**SECTION 01 40 00  
QUALITY REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Contractor Quality assurance submittals.
- B. Quality assurance.
- C. Testing and inspection agencies and services.
- D. Control of installation.
- E. Tolerances.
- F. Manufacturers' field services.
- G. Defect Assessment.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- B. Section 01 41 00 - Regulatory Requirements: Compliance with applicable codes, ordinances and standards.
- C. Section 01 60 00 - Product Requirements: Requirements for material and product quality.
  - 1. Product options, substitutions, transportation and handling requirements, storage and protection requirements, and system completeness requirements.

**1.03 REFERENCE STANDARDS**

- A. IAS AC89 - Accreditation Criteria for Testing Laboratories.

**1.04 DEFINITIONS**

- A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
  - 1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of inspector.
    - d. Date and time of sampling or inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.

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- g. Type of test/inspection.
  - h. Date of test/inspection.
  - i. Results of test/inspection.
  - j. Compliance with Contract Documents.
  - k. When requested by Architect, provide interpretation of results.
2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for District's information.
- C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
- 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
  - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the District's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- E. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for District.
- 1. Submit report in duplicate within 30 days of observation to Architect for information.
  - 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
- F. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for District.
- 1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
  - 2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or District.

#### 1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
- 1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
  - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
  - 3. Qualification Statement: Provide documentation showing testing laboratory is approved by Division of the State Architect.

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4. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.
- B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in California.
- C. Contractor's Quality Control (CQC) Plan:
  1. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:
    - a. Management Structure: Identify personnel responsible for quality. Include a chart showing lines of authority.
      - 1) Include qualifications (in resume form), duties, responsibilities of each person assigned to CQC function.
    - b. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
      - 1) Management and control of documents and records relating to quality.
      - 2) Communications.
      - 3) Coordination procedures.
      - 4) Resource management.
      - 5) Process control.
      - 6) Inspection and testing procedures and scheduling.
      - 7) Control of noncomplying work.
      - 8) Tracking deficiencies from identification, through acceptable corrective action, and verification.
      - 9) Control of testing and measuring equipment.
      - 10) Project materials certification.
      - 11) Managerial continuity and flexibility.
    - c. District will not make a separate payment for providing and maintaining a Quality Control Plan. Include associated costs in Bid price.
    - d. Acceptance of the plan is required prior to start of construction activities not including mobilization work. District's acceptance of the plan will be conditional and predicated on continuing satisfactory adherence to the plan. District reserves the right to require Contractor to make changes to the plan and operations, including removal of personnel, as necessary, to obtain specified quality of work results.
- D. Quality-Control Personnel Qualifications. Engage a person with requisite training and experience to implement and manage quality assurance (QA) and quality control (QC) for the project.

#### 1.07 REGULATORY REQUIREMENTS FOR TESTING AND INSPECTION

- A. Inspections, testing and approvals as required by authorities having jurisdiction. Refer to Section 01 41 00 - Regulatory Requirements.

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- B. Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Unless more stringent requirements are indicated or specified, comply with manufacturer's instructions and recommendations, reference standards and building code research report requirements in preparing, fabricating, erecting, installing, applying, connecting and finishing Work.
- C. Deviations from Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Document and explain all deviations from reference standards and building code research report requirements and manufacturer's product installation instructions and recommendations, including acknowledgement by the manufacturer that such deviations are acceptable and appropriate for the Project.

#### **1.08 TESTING AND INSPECTION AGENCIES AND SERVICES**

- A. District will employ and pay for services of an independent testing agency approved by DSA to perform other specified testing.
- B. As indicated in individual specification sections, District or Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

### **PART 2 PRODUCTS - NOT USED**

### **PART 3 EXECUTION**

#### **3.01 CONTRACTOR'S QUALITY ASSURANCE**

- A. Quality Requirements: Work shall be accomplished in accordance with quality requirements of the Drawings and Specifications, including, by reference, all Codes, laws, rules, regulations and standards. When no quality basis is prescribed, the quality shall be in accordance with the best accepted practices of the construction industry for the locale of the Project, for projects of this type.
- B. Quality Control Personnel: Contractor shall employ and assign knowledgeable and skilled personnel as necessary to perform quality control functions to ensure that the Work is provided as required.

#### **3.02 CONTROL OF INSTALLATION**

- A. Quality of Products: Unless otherwise indicated or specified, all products shall be new, free of defects and fit for the intended use.
- B. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- C. Comply with manufacturers' instructions, including each step in sequence.
- D. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- E. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

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- F. Have work performed by persons qualified to produce required and specified quality.
- G. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- H. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.
- I. Quality of Installation: All Work shall be produced plumb, level, square and true, or true to indicated angle, and with proper alignment and relationship between the various elements.
- J. Protection of Existing and Completed Work: Take all measures necessary to preserve and protect existing and completed Work free from damage, deterioration, soiling and staining, until Acceptance by the District.
- K. Verification of Quality: Work shall be subject to verification of quality by District, or Architect in accordance with provisions of the General Conditions of the Contract.
  - 1. Contractor shall cooperate by making Work available for inspection by District, Architect or their designated representatives.
  - 2. Such verification may include mill, plant, shop, or field inspection as required.
  - 3. Provide access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated.
  - 4. Provide all information and assistance as required, including that by and from subcontractors, installers, fabricators, materials suppliers and manufacturers, for verification of quality by District, or Architect.
  - 5. Contract modifications, if any, resulting from such verification activities shall be governed by applicable provisions in the General Conditions.

### 3.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

### 3.04 TESTING AND INSPECTION

- A. See individual specification sections for testing required.
- B. Testing Agency Duties:
  - 1. Test samples of mixes submitted by Contractor.
  - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
  - 3. Perform specified sampling and testing of products in accordance with specified standards.
  - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  - 5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.

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6. Perform additional tests and inspections required by Architect.
  7. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  2. Agency may not approve or accept any portion of the Work.
  3. Agency may not assume any duties of Contractor.
  4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
  2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
  3. Provide incidental labor and facilities:
    - a. To provide access to Work to be tested/inspected.
    - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    - c. To facilitate tests/inspections.
    - d. To provide storage and curing of test samples.
  4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
  5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
  6. Arrange with District's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

### 3.05 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect 30 days in advance of required observations.
  1. Observer subject to approval of Architect.
  2. Observer subject to approval of District.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

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### 3.06 FIELD QUALITY CONTROL SUBMITTALS

- A. Administration: Make all submittals to the Architect, unless otherwise directed.
- B. Submittal Identification: Identify each submittal by Specification Section number followed by a number indicating sequential submittal for that Section. Coordinate submittal numbers with submittals specified in Section 01 30 00 - Administrative Requirements.

1. Resubmittals shall use same number as original submittal, followed by a letter indicating sequential resubmittal.

03 30 00 - 1	First submittal for Section 03 30 00 - Cast in Place Concrete.
03 30 00 - 2	Second submittal for Section 03 30 00 - Cast in Place Concrete.
03 30 00 - 2A	Resubmittal of second submittal for Section 03 30 00 - Cast in Place Concrete.
03 30 00 - 2B	Second resubmittal of second submittal for Section 03 30 00 - Cast in Place Concrete.

- C. Project Identification: Title each submittal with Project name, submittal date and Architect's Project number.
- D. Copies: Provide PDF copies electronically transmitted or submit 6 copies, minimum, of reports of quality control reports on dry-process xerographic copies only.
- E. Contractor's Review:
1. Submittals shall be made in accordance with requirements specified herein and in individual Sections.
2. Indicate clearly on each submittal the specified or referenced values for each quality control activity and the values obtained.
3. Note clearly and sign each submittal certifying that reported quality control activity "Conforms" or "Does Not Conform".
- F. Changes and Deviations:
1. Identify all deviations from requirements of Drawings and Specifications.
2. Changes in the Work shall not be authorized by submittals review actions.
3. No review action, implicit or explicit, shall be interpreted to authorized changes in the Work.
4. Changes shall only be authorized by separate written Change Order or Construction Change Directive, in accordance with the General Conditions and 01 20 00 - Price and Payment Procedures.
- G. Record Submittals: When record submittals are specified, submit three copies or sets only. Record submittals will not be reviewed but will be retained for historical and maintenance purposes.
- H. Unsolicited Submittals: Unsolicited submittals will be returned unreviewed.

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### 3.07 ARCHITECT'S REVIEW

- A. General:
  - 1. Submitted Report review by Architect and Architect's consultants shall be only for general conformance with the design concept and requirements based on the information presented.
  - 2. Neither Architect nor Architect's consultants shall verify submitted quality control data.
- B. Contract Requirements:
  - 1. Review by Architect and Architect's consultants shall not relieve the Contractor from compliance with requirements of the Drawings and Specifications.
  - 2. Changes shall only be authorized by separate written Change Order or Construction Change Directive, in accordance with the General Conditions and 01 20 00 - Price and Payment Procedures.
- C. Observations by Architect and Architect's Consultants: Periodic and occasional observations of Work in progress will be made by Architect and Architect's consultants as deemed necessary to review progress of Work and general conformance with design intent.

### 3.08 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements, at no change in Contract Sum or Contract Time.
- B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.
- C. Architect's Acceptance and Rejection of Work: Architect reserves the right to reject all Work not in conformance to the requirements of the Drawings and Specifications.
- D. Acceptance of Non-Conforming Work: Acceptance of non-conforming Work, without specific written acknowledgement and approval of the District, shall not relieve the Contractor of the obligation to correct such Work.
  - 1. Acceptance of structurally related non-conforming work shall be submitted to DSA for review and approval.
- E. Contract Adjustment for Non-conforming Work:
  - 1. Should Architect or District determine that it is not feasible or in District's interest to require non-conforming Work to be repaired or replaced, an equitable reduction in Contract Sum shall be made by agreement between District and Contractor.
  - 2. If equitable amount cannot be agreed upon, a Construction Change Directive will be issued and the amount in dispute resolved in accordance with applicable provisions of the General Conditions.
- F. Non-Responsibility for Non-Conforming Work: Architect and Architect's consultants disclaim any and all responsibility for Work produced not in conformance with the Drawings and Specifications.

### END OF SECTION

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**SECTION 01 41 00  
REGULATORY REQUIREMENTS**

**PART 1 GENERAL**

**1.01 AUTHORITY AND PRECEDENCE OF CODES, ORDINANCES AND STANDARDS**

- A. Authority: All codes, ordinances and standards referenced in the Drawings and Specifications shall have the full force and effect as though printed in their entirety in the Specifications.
- B. Precedence:
  - 1. Where specified requirements differ from the requirements of applicable codes, ordinances and standards, the more stringent requirements take precedence.
  - 2. Where the Drawings or Specifications require or describe products or execution of better quality, higher standard or greater size than required by applicable codes, ordinances and standards, the Drawings and Specifications take precedence so long as such increase is legal.
  - 3. Where no requirements are identified in the Drawings or Specifications, comply with all requirements of applicable codes, ordinances and standards of authorities having jurisdiction.
- C. Applicable Codes, Laws and Ordinances: Refer also to Section 01 10 00 - Summary, regarding permits and licenses.
  - 1. Performance of the Work is to be governed by all applicable laws, ordinances, rules and regulations of Federal, State and local governmental agencies and jurisdictions having authority over the Project, including accessibility requirements.
  - 2. Performance of the Work shall be accomplished in conformance with all rules and regulations of public utilities, utility districts and other agencies serving the development.
  - 3. Where such laws, ordinances, rules and regulations require more care or greater time to accomplish Work, or require better quality, higher standards or greater size of products, Work shall be accomplished in conformance to such requirements with no change to the Contract Time and Contract Sum, except where changes in laws, ordinances, rules and regulations occur subsequent to the execution date of the Agreement.
- D. Applicable Building Codes: References on the Drawings or in the Specifications to "code" or "building code" not otherwise identified shall mean the codes specified below, together with all additions, amendments, changes, and interpretations adopted by code authorities of the jurisdiction having authority over the Project.
- E. Performance of the Work shall meet or exceed the minimum regulatory requirements applicable to this project as summarized in this section, as adopted by Division of the State Architect:
  - 1. Part 1, Title 24 CCR - 2019 California Building Standards Administrative Code.
  - 2. Part 2, Title 24 CCR - 2019 California Building Code (CBC); Volumes 1 and 2.
    - a. Based on ICC (IBC) - ICC International Building Code, 2018.

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3. Part 3, Title 24 CCR - 2019 California Electrical Code (CEC, NFPA 70-NEC 2017).
4. Part 4, Title 24 CCR - 2019 California Mechanical Code (CMC).
  - a. Based on IAPMO (UMC) - Uniform Mechanical Code, 2018.
5. Part 5, Title 24 CCR - 2019 California Plumbing Code (CPC).
  - a. Based on IAPMO (UPC) - Uniform Plumbing Code, 2018.
6. Part 6, Title 24 CCR - 2019 California Energy Code.
7. Part 9, Title 24 CCR - 2019 California Fire Code (CFC).
  - a. Based on ICC (IFC) - International Fire Code; 2018.
8. Part 11, Title 24 CCR - 2019 California Green Building Standards Code (CALGreen).
9. Part 12, Title 24 CCR - 2019 California Referenced Standards Code.

## **1.02 SUMMARY OF REFERENCE STANDARDS**

- A. Regulatory requirements applicable to this project are the following:
- B. California Referenced Standards Code, 2016: Chapter 12-7-4 Fire Resistive Standards, for fire rated doors.
- C. 28 CFR 35 - Nondiscrimination on the Basis of Disability in State and Local Government Services; Final Rule; Department of Justice.
- D. 28 CFR 36 - Nondiscrimination by Public Accommodations and in Commercial Facilities; Final Rule; Department of Justice.
- E. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.
- F. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- G. 29 CFR 1910 - Occupational Safety and Health Standards.

## **1.03 RELATED REQUIREMENTS**

- A. Section 01 40 00 - Quality Requirements.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION - NOT USED**

**END OF SECTION**

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**SECTION 01 45 33**  
**CODE-REQUIRED SPECIAL INSPECTIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Division of the State Architect (DSA) Procedures for construction oversight and inspections required during the course of construction.
- B. Code-required special inspections.
  - 1. Division of the State Architect (DSA) approved testing laboratory services and inspections required during the course of construction.
- C. Testing services incidental to special inspections.
- D. Submittals.
- E. Manufacturers' field services.
- F. Fabricators' field services.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- B. Section 01 40 00 - Quality Requirements.
- C. Section 01 42 19 - Reference Standards.
- D. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

**1.03 DEFINITIONS**

- A. Code or Building Code: California Building Code and, more specifically, Chapter 17A - Structural Tests and Special Inspections, of same.
- B. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located. AHJ for this Project is Division of the State Architect.
- C. Special Inspection:
  - 1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the CBC that also require special expertise to ensure compliance with the approved contract documents and the referenced standards.
  - 2. Special inspections are separate from and independent of tests and inspections conducted by District or Contractor for the purposes of quality assurance and contract administration.

**1.04 REFERENCE STANDARDS**

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
- B. AISC 341 - Seismic Provisions for Structural Steel Buildings.
- C. AISC 360 - Specification for Structural Steel Buildings.

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- D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- F. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- G. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.
- H. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems.
- I. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.
- J. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- K. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel.
- L. SDI (QA/QC) - Standard for Quality Control and Quality Assurance for Installation of Steel Deck.

#### 1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency is required to:
  - 1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
  - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
  - 3. Submit certification that Special Inspection Agency is acceptable to AHJ.
- C. Testing Agency Qualifications: Prior to the start of work, the Testing Agency is required to:
  - 1. Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
  - 2. Testing and inspections will be performed by an independent testing laboratory selected and employed by the District and approved by the (Project City) (DSA).
    - a. Qualification of a testing agency or laboratory will be under the jurisdiction of the DSA Structural Safety Section (SSS). Procedural and acceptance criteria are set forth in the California Administrative Code (CBC) Chapter 4.
- D. Manufacturer's Qualification Statement: Manufacturer is required to submit documentation of manufacturing capability and quality control procedures. Include documentation of AHJ approval.
- E. Fabricator's Qualification Statement: Fabricator is required to submit documentation of fabrication facilities and methods as well as quality control procedures.
- F. Distribution List: The Testing Laboratory will make the following distribution of test and inspection reports:
  - 1 District
  - 2 Architect

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- 1 Structural Engineer
  - 1 Contractor
  - 1 District's Inspector
  - 1 DSA
- G. Each and every test or inspection report shall bear the File Number and Application Number assigned to this project by the DSA.
- H. DSA Form 291: From the engineering manager of the laboratory of record.
- I. Special Inspection Reports: After each special inspection, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one each to the distribution list.
- 1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of Special Inspector.
    - d. Date and time of special inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.
    - g. Type of special inspection.
    - h. Date of special inspection.
    - i. Results of special inspection.
    - j. Compliance with Contract Documents.
  - 2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.
  - 3. Comply with DSA IR 17-12, revised 04/23/20.
- J. Fabricator Special Inspection Reports: After each special inspection of fabricated items at the Fabricator's facility, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one each to the distribution list.
- 1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of Special Inspector.
    - d. Date and time of special inspection.
    - e. Identification of fabricated item and specification section.
    - f. Location in the Project.
    - g. Results of special inspection.
    - h. Verification of fabrication and quality control procedures.
    - i. Compliance with Contract Documents.
    - j. Compliance with referenced standard(s).

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K. Test Reports: After each test or inspection, promptly submit at least two copies of report; one to Architect and one each to the distribution list.

1. Include:
  - a. Date issued.
  - b. Project title and number.
  - c. Name of inspector.
  - d. Date and time of sampling or inspection.
  - e. Identification of product and specifications section.
  - f. Location in the Project.
  - g. Type of test or inspection.
  - h. Date of test or inspection.
  - i. Results of test or inspection.
  - j. Compliance with Contract Documents.
  - k. Test reports shall be signed by a Civil Engineer licensed in the State of California.
2. Test reports shall include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory.
  - a. Samples taken but not tested shall also be reported.
  - b. Records of special sampling operations as required shall also be reported.
  - c. Reports shall show that the material or materials were sampled and tested in accordance with the requirements of the CBC, and with the approved specifications.
  - d. They shall also state definitely whether or not the material or materials tested comply with requirements.
  - e. Test reports shall be issued within 14 days of finding being known, to all parties listed above.
3. At the completion of the project, Testing Laboratory shall certify in writing and on all required DSA forms, that all work specified or required to be tested and inspected conforms to drawings, specifications and applicable building codes.
4. Verification of Test Reports:
  - a. The Testing Laboratory of record shall submit to the (Project City) (DSA) a verified report covering all tests which are required to be made by that agency during the progress of the project.
    - 1) Such report shall be furnished each time that work on the project is suspended, covering the tests up to that time, and at the completion of the project.
    - 2) Specific testing requirements as listed on the Structural Test and Inspections (T&I) Form DSA-103 for this project. These tests may include the following forms:
      - (a) DSA-201: Soils Compaction.
      - (b) DSA-202: Sieve Analysis.
      - (c) DSA-203: Tension/Bend.
      - (d) DSA-204: Compression.

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- (e) DSA-205: Concrete Masonry Unit.
  - (f) DSA-206: Anchor Load.
  - (g) DSA-207: Masonry Core Shear/Compression.
  - (h) DSA-210: Ultrasonic (NDT).
  - (i) DSA-250: Special Inspection(s).
  - (j) DSA-291: Laboratory Verified Report.
  - (k) DSA-292: Special Inspection(s) Verified Report(s).
  - (l) DSA-293: Geotechnical Verified Report.
- 3) Other Division of the State Architect (DSA) Certification Documents (Reports) as may be required.
- b. DSA Form 292 - Special Inspection Verified Report shall be from all special inspectors contracting directly and individually with the school board.
- L. Certificates: When specified in individual special inspection requirements, Special Inspector shall submit certification by the manufacturer, fabricator, and installation subcontractor to Architect and AHJ, in quantities specified for Product Data.
  - 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
  - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect and AHJ.
- M. Manufacturer's Field Reports: Submit reports to Architect.
  - 1. Submit report in duplicate within 7 days of observation to Architect for information.
  - 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in Contract Documents.
- N. Fabricator's Field Reports: Submit reports to Architect and AHJ.
  - 1. Submit report in duplicate within 30 days of observation to Architect for information.
  - 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in Contract Documents.

#### 1.06 SPECIAL INSPECTION AGENCY

- A. District will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code.
- B. The Special Inspection Agency may employ and pay for services of an independent testing agency to perform testing and sampling associated with special inspections and required by the building code.
- C. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

#### 1.07 TESTING AND INSPECTION AGENCIES

- A. District is to employ services of an independent inspection and testing agency to perform observation, testing and sampling associated with special inspections including those not required by the building code. CAC

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1. Project Inspector and testing lab are employed by the District and approved by:
  - a. A/E of Record.
  - b. Structural Engineer (when applicable).
  - c. DSA.
- B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

#### **1.08 QUALITY ASSURANCE**

- A. Special Inspection Agency Qualifications:
  1. Independent firm specializing in performing testing and inspections of the type specified in this section.
- B. Testing Agency Qualifications:
  1. Independent firm specializing in performing testing and inspections of the type specified in this section.
  2. Testing Agency must possess DSA LEA Program acceptance.
- C. Testing and inspection services which are performed shall be in accordance with requirements of the CBC, and as specified herein. Testing and inspection services shall verify that work meets the requirements of the Construction Documents.
- D. In general, tests and inspections for structural materials shall include all items enumerated on the Structural Tests and Inspections list for this project as prepared and distributed by the Architect.
- E. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document.

#### **1.09 INSPECTION BY THE DISTRICT**

- A. The District shall have the right to reject materials and workmanship which are defective, or to require their correction.
  1. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the premises without charge to the District.
  2. If the Contractor does not correct such rejected work within a reasonable time, the District may correct such rejected work and charge the expense to the Contractor.
- B. Should it be considered necessary or advisable by the District at any time before final acceptance of the entire work to make an examination of work already completed by removing or tearing out the completed work; the Contractor shall on request promptly furnish necessary facilities, labor and materials.
  1. If such work is found to be defective in any respect due to fault of the Contractor or his subcontractor, he shall defray all expenses of such examinations and of satisfactory reconstruction. .
  2. If, however, such work is found to meet the requirements of the Contract, the additional cost of labor and material necessarily involved in the examination and replacement shall be allowed the Contractor.

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#### 1.10 DISTRICT'S INSPECTOR

- A. A Project Inspector (IOR) employed by the District and approved by Architect, Structural Engineer and DSA in accordance with the requirements of the California Building Code will be assigned to the work.
  - 1. Project Inspector duties are specifically defined in CCR Title 24 Part 1, Sec. 4-211(b), 4-219, 4-333(b), 4-336 and 4-342.
- B. The District's Inspector shall at all times have access for the purpose of inspection to all parts of the work and to the shops where the work is in preparation, and the Contractor shall at all times maintain proper facilities and provide safe access for such inspection.
- C. The work of construction in all stages of progress shall be subject to the personal continuous observation of the District's Inspector.
  - 1. The Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the work and the character of the materials.
  - 2. Inspection of the work shall not relieve the Contractor from any obligation to fulfill this Contract.
  - 3. Inspector of Record is required to work a normal 40 hour week on this project only. Any overtime required will be at the expense of the Contractor and sub-contractor requiring the inspection.

#### 1.11 PAYMENTS

- A. Costs of initial testing and inspection, except as specifically modified herein, or specified otherwise in technical sections, will be paid for by the District, providing such testing and inspection indicates compliance with Contract Documents. Initial tests and inspections are defined as the first tests and inspections as herein specified.
- B. In the event a test or inspection indicates failure of a material or procedure to meet requirements of Contract Documents, costs for retesting and reinspection will be paid by the District and backcharged to the Contractor.
- C. Additional tests and inspections not herein specified but requested by District or Architect, will be paid for by District, unless results of such tests and inspections are found to be not in compliance with Contract Documents, in which case the District will pay all costs for initial testing as well as retesting and reinspection and backcharge the Contractor.
- D. Costs for additional tests or inspections required because of change in materials being provided or change of source or supply will be paid by District and backcharged to the Contractor.
- E. Costs for tests or inspections which are required to correct deficiencies will be paid by the District and backcharged to the Contractor.
- F. Cost of testing which is required solely for the convenience of Contractor in his scheduling and performance of work will be paid by the District and backcharged to the Contractor.
- G. Overtime costs for testing and inspections performed outside the regular work day hours, including weekends and holidays, will be paid for by the District and backcharged to the Contractor. Such costs include overtime costs for the District's Inspector.

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- H. Testing Laboratory shall separate and identify on the invoices, the costs covering all testing and inspections which are to be backcharged to the Contractor as specified above.
- I. Testing Laboratory shall furnish to District a cost estimate breakdown covering initial tests and inspections required by Contract Documents. Estimate shall include number of tests, man-hours required for tests, field and plant inspections, travel time, and costs.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION**

### **3.01 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL**

- A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
  - 1. Continuous Special Inspection: Special Inspection Agency is required to be present in the area where the work is being performed and observe the work at all times the work is in progress.
  - 2. Periodic Special Inspection: Special Inspection Agency is required to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.
- B. Tests and inspections for the following will be required in accordance with the current CBC, unless otherwise specified.

### **3.02 SPECIAL INSPECTIONS FOR STEEL CONSTRUCTION (CHAPTER 17A AND 22A)**

- A. Structural Steel: Comply with quality assurance inspection requirements of CBC.
- B. Cold-Formed Steel Deck: Comply with quality assurance inspection requirements of SDI (QA/QC).
- C. Welding:
  - 1. Testing Laboratory will review welding procedure specifications as prepared by the fabricator.
  - 2. Structural Steel:
    - a. Inspect welding per CBC 1705A.2.5.
      - 1) Comply with DSA IR 17-3: Structural Welding Inspection: 2019 CBC; Revised 09/24/19.
    - b. Complete and Partial Joint Penetration Groove Welds: Verify compliance with AWS D1.1/D1.1M and AWS D1.8/D1.8M; continuous.
  - 3. Reinforcing Steel: Verify items listed below comply with AWS D1.4/D1.4M and ACI 318, Section 26.6.
    - a. Provide continuous inspection of welding of reinforcing steel per CBC 1705A.3.1; Table 1705A.3, Item 2; 1903A.8.
  - 4. Ultrasonic Testing: All full penetration multi-pass groove welds shall be subject to ultrasonic testing.
    - a. Defective welds shall be repaired and retested with ultrasonic equipment.

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- b. Initially, all multi-pass groove field welds shall be tested at the rate of 100 percent of each individual welder.
  - 1) If rejectable defects occur in less than 5 percent of the welds tested, the frequency of testing may be reduced to 25 percent.
  - 2) If the rate of rejectable defects increases to 5 percent or more, 100 percent testing shall be reestablished until the rate is reduced to less than 5 percent.
  - 3) The percentage of rejects shall be calculated for each welder independently.
- c. When ultrasonic indications arising from the weld root can be interpreted as either a weld defect or the backing strip itself, the backing strip shall be removed at the expense of the Contractor, and if no root defect is visible, the weld shall be retested.
  - 1) If no defect is indicated on this retest, and no significant amount of the base and weld metal have been removed, no further repair or welding is necessary.
  - 2) If a defect is indicated, it shall be repaired at the Contractor's expense.
- 5. Technician to calibrate ultrasonic instrumentation to evaluate the quality of the welds in accordance with AWS D1.1/D1.1M latest Edition.
- 6. Should defects appear in welds tested, repairs shall be similarly inspected at the Contractor's expense and at the direction of the Architect until satisfactory performance is assured.
- 7. Other methods of inspection, for example, X-ray, gamma ray, magnetic particle, or dye penetrant, may be used on welds if felt necessary by the Architect.
- D. Corrections:
  - 1. Correct deficiencies in structural steel work which inspections and test reports indicate to be not in compliance with the specified requirements.
  - 2. Perform additional tests required to reconfirm noncompliance of the original work and to show compliance of corrected work. Costs for all additional tests will be paid for by the District and backcharged to the Contractor.

### 3.03 SPECIAL INSPECTIONS FOR FIRE RESISTANT PENETRATIONS AND JOINTS

- A. Verify penetration firestops in accordance with ASTM E2174.
- B. Verify fire resistant joints in accordance with ASTM E2393.
- C. Inspection: Comply with CBC 1705A.17.

### 3.04 SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE

- A. Inspection: Comply with CBC 1705A.12.
- B. Testing: Comply with CBC 1705A.13.
- C. Structural Steel: Comply with the quality assurance plan requirements of AISC 341.
- D. Storage Racks and Access Floors: Anchorage; periodic.
- E. Architectural Components: Erection and fastening of components below; periodic.
  - 1. Exterior cladding; per ICC ESR Report when applicable.
  - 2. Interior and exterior veneer.
  - 3. Interior and exterior non-loadbearing walls and partitions.

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- F. Mechanical and Electrical Components:
  - 1. Anchorage of electric equipment required for emergency or standby power systems; periodic.
  - 2. Installation and anchorage of other electrical equipment; periodic.
  - 3. Vibration isolation systems where the approved Contract Documents require a nominal clearance of 1/4 inch or less between support frame and seismic restraint; periodic.
  - 4. Installation of mechanical and electrical equipment, including duct work, piping systems and their structural supports, where automatic fire sprinkler systems are installed.
    - a. Verify clearances have been provide as required by Section 13.2.3 of ASCE 7.
    - b. Verify nominal clearance of 3 inches has been provided between fire protection sprinkler drops and sprigs and: structural members not used collectively or independently to support the sprinklers; equipment attached to the building structure; and other systems' piping.
- G. Designated Seismic System Verification: Verify label, anchorage or mounting complies with certificate of compliance provided by manufacturer or fabricator.
- H. Structural Testing for Seismic Resistance:
  - 1. Concrete reinforcement: Comply with ACI 318, Section 20.2.2.5 and 21.1.52.
    - a. Materials Obtain mill certificates demonstrating compliance with ASTM A615/A615M; periodic.
    - b. Welding: Perform chemical tests complying with ACI 318, Section 26.6.4 to determine weldability; periodic.
  - 2. Structural Steel: Comply with the quality assurance requirements of AISC 341.
  - 3. Non-Structural Components:
    - a. General Design Requirements: Obtain manufacturer certification of compliance with requirements of ASCE 7, Section 13.2.1; periodic.
    - b. Designated Seismic Force-Resisting Non-Structural System Components: Obtain manufacturer certification of compliance with ASCE 7, Section 13.2.2; periodic.
- I. Structural Observations for Seismic Resistance: Visually observe structural system for general compliance with the approved Contract Documents; periodic.

### 3.05 STRUCTURAL OBSERVATIONS FOR STRUCTURES

- A. Provide Observations: For structure where one or more of the following conditions exist:
  - 1. Such observation is required by the registered design professional responsible for the structural design.
  - 2. Such observation is specifically required by AHJ.

### 3.06 SPECIAL ARCHITECTURAL INSPECTIONS

- A. Signs and/or identification devices:
  - 1. Prior to issuance of a final Certificate of Occupancy, Enforcing Agency shall verify installation of signs for information content, appearance, location and Braille per CBC 11B-703.1.1.2.

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- a. Inspection shall include, but not limited to:
  - 1) Braille dots and cells are properly spaced and the size proportion and type raised characters are in compliance with these regulations.
  - 2) Tactile exit signage per CBC 1013.4 and 11B-216.4.1 Exit doors.
  - 3) Tactile floor designation signs in stairways per CBC 1023.9 Stairway identification signs.
  - 4) Tactile special egress control device signs per CBC 1010.1.9.7 Delayed Egress Locks, item 5.1.
  - 5) Elevator car control identification per CBC 11B-407.4.6-8 Elevator car controls.
  - 6) Sanitary facilities signage per CBC 11B-216.8 Toilet rooms and bathing rooms; and 11B-703.7.2.6 Toilet and bathing facilities geometric symbols.
- B. Inspection by Health Department:
  1. CONSTRUCTION INSPECTIONS: Contact the Health Department Plan Checker for a Preliminary Inspection when construction is approximately 80% complete, with plumbing, rough ventilation, and rough equipment installed. Request for inspection should be made at least five (5) working days in advance.
  2. A FINAL INSPECTION MUST be made upon completion of ALL work including finished details. APPROVAL to operate shall not be granted, or remodeled areas approved to operate, until the facility has passed the FINAL INSPECTION, and "APPLICATION TO OPERATE" has been completed and PERMIT FEES have been paid.

### 3.07 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

- A. Special Inspection Agency shall:
  1. Verify samples submitted by Contractor comply with the referenced standards and the approved Contract Documents.
  2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
  3. Perform specified sampling and testing of products in accordance with specified reference standards.
  4. Ascertain compliance of materials and products with requirements of Contract Documents.
  5. Promptly notify Architect, SEOR, IOR, DSA, District and Contractor of observed irregularities or non-conformance of work or products.
  6. Perform additional tests and inspections required by Architect.
  7. Submit reports of all tests or inspections specified.
- B. Limits on Special Inspection Agency Authority:
  1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  2. Agency may not approve or accept any portion of the work.
  3. Agency may not assume any duties of Contractor.
  4. Agency has no authority to stop the work.

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- C. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- D. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

### 3.08 TESTING AGENCY DUTIES AND RESPONSIBILITIES

- A. Testing Agency Duties:
  - 1. Test samples submitted by Contractor.
  - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
  - 3. Perform specified sampling and testing of products in accordance with specified standards.
  - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  - 5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
  - 6. Perform additional tests and inspections required by Architect.
  - 7. Attend preconstruction meetings and progress meetings.
  - 8. Submit reports of all tests or inspections specified.
- B. Limits on Testing or Inspection Agency Authority:
  - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  - 2. Agency may not approve or accept any portion of the work.
  - 3. Agency may not assume any duties of Contractor.
  - 4. Agency has no authority to stop the work.
- C. Immediately upon determination of a test failure, the Laboratory shall telephone the results to the Architect. On the same day, Laboratory shall send test results by email to the Architect and to all relevant responsible parties of the project team, and District's Inspector
- D. On instructions by Architect, perform re-testing required because of non-compliance with specified requirements, using the same agency.
- E. Contractor will pay for re-testing required because of non-compliance with specified requirements.
- F. At the completion of the project, Testing Laboratory shall certify in writing and on all required DSA forms, that all work specified or required to be tested and inspected conforms to drawings, specifications and applicable building codes.
  - 1. See DSA Procedure PR 13-01.
- G. Duties of the Laboratory of Record related to the use of form DSA 152 are as follows:
  - 1. Meet with the Project Inspector, design professionals, and contractor as needed to mutually communicate and understand the testing and inspection program and the methods of communication appropriate for the project.
  - 2. Obtain a copy of the DSA approved construction documents from the design professional in general responsible charge prior to the commencement of construction

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3. Obtain a copy of the DSA approved Statement of Structural Tests and Special Inspections (form DSA 103) from the design professional in general responsible charge prior to the commencement of construction.
4. Report all project related activities to the Project Inspector. The Project Inspector is responsible for monitoring the work of the Laboratory of Record and Special Inspectors to ensure the testing and special inspection program is satisfactorily completed
5. Provide material testing as identified in the DSA approved construction documents.
6. Submit test reports to the Project Inspector on the day the tests were performed for any tests performed on-site
7. Submit material test reports in a timely manner such that construction is not delayed and not to exceed 14 days from the date the material tests were performed. Test reports are to be submitted to DSA, the Architect, structural engineer, Project Inspector and school district.
  - a. As a convenience, and if agreed upon by involved parties, the test reports may be submitted electronically as identified in Section 4 of this procedure.
8. Immediately submit reports of material tests not conforming to the requirements of the DSA approved construction documents. These reports shall be submitted to the DSA, Architect, structural engineer, Project Inspector and school district.
9. The Engineering Manager shall submit an interim Laboratory of Record Verified Report (form DSA 291) and the Geotechnical Engineer shall submit an interim Geotechnical Verified Report (form DSA 293) to DSA, the project inspector, school district and the Design Professional in General Responsible Charge.
  - a. The reports are required to be submitted upon any of the following events occurring:
    - 1) Within 14 days of the completion of the material testing/special inspection program.
    - 2) Work on the project is suspended for a period of more than one month.
    - 3) The services of the laboratory of record are terminated for any reason prior to completion of the project.
    - 4) The DSA requests a Verified Report. (See interim verified reports below. This is a "DSA request.")
10. The Engineering Manager shall submit an interim verified report (form DSA 291) and the Geotechnical Engineer shall submit form DSA 293 to DSA and a copy to the project inspector for each of the applicable sections of the form DSA 152, prior to the project inspector signing off that section of the project inspection card, if that section required material testing. The sections are:
  - a. Initial Site Work
  - b. Foundation Prep
  - c. Vertical Framing
  - d. Horizontal Framing
  - e. Appurtenances

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- f. Finish Site Work
  - g. Other Work
  - h. Final
- H. Duties of Special Inspectors, employed by the Laboratory of Record, related to the use of form DSA 152 are as follows:
1. Meet with the Project Inspector, design professionals, and contractor as needed to mutually communicate and understand the testing and inspection program and the methods of communication appropriate for the project.
  2. Report all project related activities to the Project Inspector. The Project Inspector is responsible for monitoring the work of the Laboratory of Record and Special Inspectors to ensure the testing and special inspection program is satisfactorily completed.
  3. Perform work under the supervision of the Engineering Manager for the Laboratory of Record
  4. Perform inspections in conformance with the DSA approved construction documents, applicable codes and code reference standards
  5. Prepare detailed daily inspection reports outlining the work inspected and provide the Project Inspector a copy of the reports on the same day the inspections were performed.
  6. Prepare detailed daily inspection reports outlining the work inspected and provide the Project Inspector a copy of the reports on the same day the inspections were performed.
  7. Immediately submit reports of materials or work not conforming to the requirements of the DSA approved construction documents. These reports shall be submitted to the DSA, Architect, structural engineer, Project Inspector and school district.
  8. Submit daily special inspection reports in a timely manner such that construction is not delayed and not to exceed 14 days from the date the special inspections were performed. The reports are to be submitted to the Architect, structural engineer, Project Inspector and school district.
  9. Submit Verified Report forms DSA 292 to the DSA, Project Inspector, district and design professional in responsible charge.
  10. The reports are required to be submitted upon any of the following events occurring:
  11. Within 14 days of the completion of the special inspection work.
  12. Work on the project is suspended for a period of more than one month.
  13. The services of the special inspector are terminated for any reason prior to completion of the project.
  14. The DSA requests a Verified Report. (See interim verified reports below. This is a "DSA request")
  15. Submit an interim Verified Report (form DSA 292) to the DSA and a copy to the Project Inspector for each of the applicable sections of the form DSA 152, prior to the Project Inspector signing off that section of the project inspection card, if that section required special inspections. The sections are:
    - a. Initial Site Work
    - b. Foundation

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- c. Vertical Framing
  - d. Horizontal Framing
  - e. Appurtenances
  - f. Non-Building Site Structures
  - g. Finish Site Work
  - h. Other Work
  - i. Final
16. The Verified Reports shall be sent electronically to the DSA.
- I. Duties of Special Inspectors, not employed by the Laboratory of Record, related to the use of form DSA 152 are as follows:
- 1. Meet with the project inspector, Laboratory of Record, the design professionals, and the contractors as needed to mutually communicate and understand the testing and inspection program, and the methods of communication appropriate for the project.
  - 2. Report all project related activities to the project inspector. The project inspector is responsible for monitoring the work of the Laboratory of Record and special inspectors to ensure the testing and special inspection program is satisfactorily completed.
  - 3. Perform work under the direction of the design professional in general responsible charge, as defined in Section 4-335(f)1B of the California Administrative Code (Title 24, Part 1).
  - 4. Perform inspections in conformance with the DSA approved construction documents, applicable codes and code reference standards.
  - 5. Prepare detailed daily inspection reports outlining the work inspected and provide the project inspector a copy of the reports on the same day the inspections were performed.
  - 6. Immediately submit reports of materials or work not conforming to the requirements of the DSA approved construction documents. These reports shall be submitted to DSA, the Architect, structural engineer, project inspector and the school district.
  - 7. Submit daily special inspection reports in a timely manner such that construction is not delayed and not to exceed 14 days from the date the special inspections were performed. The reports are to be submitted to DSA, the Architect, structural engineer, project inspector and the school district.
  - 8. Submit Special Inspection Verified Report forms DSA 292 to DSA, the project inspector, the school district and the Design Professional in General Responsible Charge.
    - a. The reports are required to be submitted upon any of the following events occurring:
      - 1) Within 14 days of the completion of the special inspection work.
      - 2) Work on the project is suspended for a period of more than one month.
      - 3) The services of the special inspector are terminated for any reason prior to completion of the project.
      - 4) DSA requests a verified report. (See interim verified reports below. This is a "DSA request.")

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9. Submit an interim Special Inspection Verified Report (form DSA 292) to DSA and a copy to the project inspector for each of the applicable sections of the form DSA 152, prior to the project inspector signing off that section of the project inspection card, if that section required special inspections.
  - a. The sections are:
    - 1) Initial Site Work
    - 2) Foundation Prep
    - 3) Vertical Framing
    - 4) Horizontal Framing
    - 5) Appurtenances
    - 6) Finish Site Work
    - 7) Other Work
    - 8) Final

### 3.09 CONTRACTOR DUTIES AND RESPONSIBILITIES

#### A. DSA Requirements:

1. Each Multi-Prime Contractor or Subcontractor shall comply with DSA Construction Oversight Procedure PR 13-01. California Code of Regulations (CCR), Title 24, Part 1, CCR, Chapter 4, Article 1 (Sections 4-211 through 4-220) and Group1, Articles 5 and 6 (Sections 4-331 through 4-344) which provide regulations governing the construction process for projects under the jurisdiction of the Division of the State Architect (DSA).
  - a. Assist the Project Inspector (IOR) and complete and fill out the following forms during the course of construction.
    - 1) Form-102-IC: Construction Start Notice/ Inspection Card Request: Verify Project Inspector has an active form issued by DSA.
    - 2) Form-151: Project Inspector Notifications: Contractor to notify IOR and assist.
    - 3) Form-152: Project Inspection Card: See below.
    - 4) Form-154: Notice of Deviations/ Resolution of Deviations: Contractor to verify all deviations are reviewed, corrected, and accepted by the design professional, and filed with DSA through the Project Inspector (IOR).
      - (a) When the Project Inspector identifies deviations from the DSA approved construction documents the inspector must verbally notify the contractor. If the deviations are not corrected within a reasonable time frame, the inspector is required to promptly issue a written notice of deviation to the contractor, with a copy sent to the design professional in general responsible charge and the DSA.
      - (b) When the noticed deviations are corrected, the inspector is required to promptly issue a written notice of resolution to the contractor, with a copy sent to the design professional in general responsible charge and the DSA.
      - (c) Deviations include both construction deviations and material deficiencies.
      - (d) The written notice of deviations shall be made using form DSA 154.

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- (e) The notice of resolution of deviations shall be made using the original form DSA 154 that reported the deviations.
  - 5) Form-156: Commencement/Completion of Work Notification
  - 6) Form-6.C: Verified Report – Contractor: From each contractor having a contract with the school board.
2. Duties of Contractor related to the use of form DSA 152 are as follows:
- a. The Contractor shall carefully study the DSA approved documents and shall plan a schedule of operations well ahead of time.
  - b. If at any time it is discovered that work is being done which is not in accordance with the DSA approved construction documents, the Contractor shall correct the work immediately.
  - c. Verify that forms DSA 152 are issued for the project prior to the commencement of construction.
  - d. Meet with the design team, the Laboratory of Record and the Project Inspector to mutually communicate and understand the testing and inspection program and the methods of communication appropriate for the project.
  - e. Notify the Project Inspector, in writing, of the commencement of construction of each and every aspect of the work at least 48 hours in advance by submitting form DSA 156 (or other agreed upon written documents) to the Project Inspector.
  - f. Notify the Project Inspector of the completion of construction of each and every aspect of the work by submitting form DSA 156 (or other agreed upon written documents) to the Project Inspector.
  - g. Consider the relationship of the signed off blocks and sections of the form DSA 152 and the commencement of subsequent work. Until the Project Inspector has signed off applicable blocks and sections of the form DSA 152, the Contractor may be prohibited from proceeding with subsequent construction activities that cover up the unapproved work. Any subsequent construction activities, that cover up the unapproved work, will be subject to a “Stop Work Order” from the DSA or the district and are subject to removal and remediation if found to be in non-compliance with the DSA approved construction documents.
  - h. Submit the final verified report. All prime contractors are required to submit final Contractor Verified Reports (form DSA 6-C) to DSA and the project inspector.
    - 1) The reports are required to be submitted upon any of the following events occurring:
      - (a) The project is substantially complete. DSA considers the project to be complete when the construction is sufficiently complete in accordance with the DSA approved construction documents so that the owner can occupy or utilize the project.
      - (b) Work on the project is suspended for a period of more than one month.
      - (c) The services of the contractor are terminated for any reason prior to the completion of the project.
      - (d) DSA requests a verified report.

B. Contractor Responsibilities, General:

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1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
2. Availability of Samples
  - a. Contractor shall make materials required for testing available to Laboratory and assist in acquiring these materials as directed by the District's Inspector. The samples shall be taken under the immediate direction and supervision of the Testing Laboratory or District's Inspector.
  - b. If work which is required to be tested or inspected is covered up without prior notice or approval, such work may be uncovered at the discretion of Architect at no additional cost to the District. Refer to paragraph "Payments" herein.
  - c. Unless otherwise specified, Contractor shall notify Testing Laboratory a minimum of 10 working days in advance of all required tests, and a minimum of 2 working days in advance of all required inspections. All extra expenses resulting from a failure to notify the Laboratory will be paid by the District and backcharged to the Contractor.
  - d. Contractor shall give sufficient advance notice to Testing Laboratory in the event of cancellation or time extension of a scheduled test or inspection. Charges due to insufficient advance, notice of cancellations, or time extension will be paid for by the District and backcharged to the Contractor.
3. Cooperate with agency and laboratory personnel; provide access to approved documents at project site, to the work, to manufacturers' facilities, and to fabricators' facilities.
4. Provide incidental labor and facilities:
  - a. To provide access to work to be tested or inspected.
  - b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
  - c. To facilitate tests or inspections.
  - d. To provide storage and curing of test samples.
5. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.
6. Arrange with District's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
7. The Contractor shall notify the District's Inspector a minimum of 5 working days in advance of the manufacture of material to be supplied by him under the Contract Documents, which must be by terms of the Contract be tested, in order that the District may arrange for the testing of such material at the source of supply.
8. Material shipped by the Contractor from the source of supply before having satisfactorily passed such testing and inspection or before the receipt of notice from said Inspector that such testing and inspection will not be required, shall not be incorporated in the Project.
9. The District will select and pay testing laboratory costs for all tests and inspections, but may be reimbursed by the Contractor for such costs under the Contract conditions. Any direct payments by the Contractor to the testing laboratory on this project is prohibited.

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- C. Contractor shall submit a written statement of responsibility to comply with CBC section 1704A.4.
  - 1. Each contractor responsible for the construction of a main wind- or seismic-force-resisting system, designated seismic system or a wind- or seismic-resisting component listed in the statement of special inspections shall submit a written statement of responsibility to the building official and the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:
    - a. Acknowledgment of awareness of the special requirements contained in the statement of special inspections;
    - b. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official;
    - c. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports; and
    - d. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
- D. Contractor Responsibilities, Seismic Force-Resisting System, Designated Seismic System, and Seismic Force-Resisting Component: Submit written statement of responsibility for each item listed in the Statement of Special Inspections to AHJ and District prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.
- E. Contractor Responsibilities, Wind Force-Resisting System and Wind Force-Resisting Component: Submit written statement of responsibility for each item listed in the Statement of Special Inspections to AHJ and District prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.
- F. Unless otherwise directed, materials not conforming to the requirements of Contract Documents shall be promptly removed from the Project site.

### 3.10 MANUFACTURERS' AND FABRICATORS' FIELD SERVICES

- A. When specified in individual specification sections, require material suppliers, assembly fabricators, or product manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, to test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect 30 days in advance of required observations.
  - 1. Observer subject to approval of Architect.
  - 2. Observer subject to approval of District.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

### END OF SECTION

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**SECTION 01 50 00**  
**TEMPORARY FACILITIES AND CONTROLS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Temporary utilities.
- B. Temporary sanitary facilities.
- C. Security requirements.
- D. Vehicular access and parking.
- E. Waste removal facilities and services.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 35 53 - Security Procedures

**1.03 TEMPORARY UTILITIES**

- A. District will provide the following:
  - 1. Electrical power and metering, consisting of connection to existing facilities.
  - 2. Water supply, consisting of connection to existing facilities.
- B. Existing facilities may be used.
- C. Use trigger-operated nozzles for water hoses, to avoid waste of water.

**1.04 TEMPORARY SANITARY FACILITIES**

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
  - 1. Provide temporary toilet facilities if maximum number of personnel on project is greater than 10.
  - 2. Submit proposed location of temporary toilet(s) to DSA for approval.
    - a. Place on-site portable toilets away from building air intakes and entryway.
- B. Maintain daily in clean and sanitary condition.

**1.05 SECURITY**

- A. Provide security and facilities to protect Work, existing facilities, and District's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with District's security program.

**1.06 CAFETERIA AND FOOD**

- A. Construction personnel shall police their own areas. All cups, cans, paper, wrappers, and discarded food must be placed in trash receptacles at end of each break.
- B. Contractor(s) shall submit to DSA proposed location of any break areas and eating areas for approval.

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### **1.07 SMOKING AND TOBACCO**

- A. Smoking and vaping is not permitted on property.
- B. No chewing tobacco or spitting of tobacco is permitted.

### **1.08 VEHICULAR ACCESS AND PARKING**

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and District.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

### **1.09 WASTE REMOVAL**

- A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- C. Provide containers with lids. Remove trash from site periodically.
- D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

### **1.10 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS**

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing facilities used during construction to original condition.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION - NOT USED**

**END OF SECTION**

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**SECTION 01 60 00  
PRODUCT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General product requirements.
  - 1. System Completeness.
  - 2. Installation of Products.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations.
- E. Maintenance materials, including extra materials, spare parts, tools, and software.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- B. Section 01 40 00 - Quality Requirements: Product quality monitoring.
- C. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- D. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

**1.03 REFERENCE STANDARDS**

- A. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers.
- B. NFPA 70 - National Electrical Code.
  - 1. Use California Electrical Code.

**1.04 SUBMITTALS**

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
  - 1. Submit within 15 days after date of Agreement.
  - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

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- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
  - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

## 1.05 QUALITY ASSURANCE

- A. CAL (CDPH SM) v1.1: California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.1–2010, for the emissions testing and requirements of products and materials.

## PART 2 PRODUCTS

### 2.01 GENERAL REQUIREMENTS

- A. Drawings and Specifications:
  - 1. If a conflict exists between the Drawings and the Specifications (Project Manual), then the Contractor shall submit a Request for Interpretation from the Architect.
    - a. As noted in the General Conditions, the more stringent requirements shall govern, including cost of materials and/or installation.
  - 2. If a specific product is indicated on the Drawings for use, then that product shall be used without exception in the location identified.
  - 3. If the Contractor proposes the use of another product other than the item indicated, whether or not listed in these specifications, the Contractor shall submit the product using the complete substitution process. See the the Article titled "SUBSTITUTIONS".
  - 4. DSA ((Project City)) approval is also required prior to the use or installation of any substitution, on any product or location of product (requiring a revision to the Drawings or Specifications), included in these construction documents.
    - a. Installation of a non-approved product may result in the Contractor removing and replacing the non-approved product at the Contractor's own expense.
- B. General: Items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock, and include materials, equipment, assemblies, fabrications and systems.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model designations indicated in the manufacturer's published product data.
  - 2. Materials: Products that are shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed or installed to form a part of the Work.
  - 3. Equipment: A product with operating parts, whether motorized or manually operated, that requires connections such as wiring or piping.
- C. Specific Product Requirements: Refer to requirements of Section 01 40 00 - Quality Requirements and individual product Specifications Sections in Divisions 2 through 33 for specific requirements for products.
- D. Minimum Requirements: Specified requirements for products are minimum requirements. Refer to general requirements for quality of the Work specified in Section 01 40 00 - Quality

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Requirements and elsewhere herein.

E. Standard Products:

1. Where specific products are not specified, provide standard products of types and kinds that are suitable for the intended purposes and that are usually and customarily used on similar projects under similar conditions.
2. Products shall be as selected by Contractor and subject to review and acceptance by the District and Architect.

F. Product Completeness:

1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
2. Comply with additional requirements specified herein in Article titled "SYSTEM COMPLETENESS".

G. Code Compliance:

1. All products, other than commodity products prescribed by Code, shall have a current ICC Evaluation Service Research Report (ICC ESR), CABO National Evaluation Report (NER), or other testing agencies as accepted by the Division of the State Architect.
2. Refer to additional requirements specified in Section 01 41 00 - Regulatory Requirements.

## 2.02 SYSTEM COMPLETENESS

- A. The Contract Drawings and Specifications are not intended to be comprehensive directions on how to produce the Work. Rather, the Drawings and Specifications are instruments of service prepared to describe the design intent for the completed Work.
- B. It is intended that all equipment, systems and assemblies be complete and fully functional even though not fully described. Provide all products and operations necessary to achieve the design intent described in the Contract Documents.
- C. Refer to related general requirements specified in Section 01 41 00 - Regulatory Requirements regarding compliance with minimum requirements of applicable codes, ordinances and standards.
- D. Omissions and Misdescriptions: Contractor shall report to Architect immediately when elements essential to proper execution of the Work are discovered to be missing or misdescribed in the Drawings and Specifications or if the design intent is unclear.
  1. Should an essential element be discovered as missing or misdescribed prior to receipt of Bids, an Addendum will be issued so that all costs may be accounted for in the Contract Sum.
  2. Should an obvious omission or misdescription of a necessary element be discovered and reported after execution of the Agreement, Contractor shall provide the element as though fully and correctly described, and a no-cost Change Order shall be executed.
  3. Refer to related General Conditions or general requirements specified in Section 01 30 00 - Administrative Requirements and 01 31 14 - Facility Services Coordination regarding construction interfacing and coordination.

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## 2.03 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
  - 1. Provide products that fully comply with the Contract Documents, are undamaged and unused at installation.
  - 2. Comply with additional requirements specified herein in Article titled "PRODUCT OPTIONS".
- B. See Section 01 40 00 - Quality Requirements, for additional source quality control requirements.
- C. Use of products having any of the following characteristics is not permitted:
  - 1. Made outside the United States, its territories, Canada, or Mexico.
  - 2. Containing lead, cadmium, or asbestos.
- D. Where other criteria are met, Contractor shall give preference to products that:
  - 1. If used on interior, have lower emissions, as defined in Section 01 61 16.
  - 2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.
  - 3. Are extracted, harvested, and/or manufactured closer to the location of the project.
  - 4. Have longer documented life span under normal use.
  - 5. Result in less construction waste. See Section 01 74 19
- E. Provide interchangeable components of the same manufacture for components being replaced.
  - 1. To the fullest extent possible, provide products of the same kind from a single source. Products required to be supplied in quantity shall be the same product and interchangeable throughout the Work.
  - 2. When options are specified for the selection of any of two or more products, provide product selected to be compatible with products previously selected.
- F. Product Nameplates and Instructions:
  - 1. Except for required Code-compliance labels and operating and safety instructions, locate nameplates on inconspicuous, accessible surfaces. Do not attach manufacturer's identifying nameplates or trademarks on surfaces exposed to view in occupied spaces or to the exterior.
  - 2. Provide a permanent nameplate on each item of service-connected or power-operated equipment. Nameplates shall contain identifying information and essential operating data such as the following example:
    - a. Name of manufacturer
    - b. Name of product
    - c. Model and serial number
    - d. Capacity
    - e. Operating and Power Characteristics
    - f. Labels of Tested Compliance with Codes and Standards

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3. Refer to additional requirements which may be specified in various sections, as included in this Project Manual.
4. For each item of service-connected or power-operated equipment, provide operating and safety instructions, permanently affixed and of durable construction, with legible machine lettering. Comply with all applicable requirements of authorities having jurisdiction and listing agencies.
- G. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to CEC/NFPA 70, include lugs for terminal box.
- H. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

## 2.04 PRODUCT OPTIONS

- A. Unless the specifications state that no substitution is permitted, whenever the Contract Documents indicate any specific article, device, equipment, product, material, fixture, patented process, form, method, or type of construction or any specific name, make, trade name, or catalog number, with or without the words "or equal," such specification shall be deemed to be used for the purpose of facilitating description of the material, process, or article desired and shall be deemed to be followed by the words "or equal."
  1. See Section 01 25 00 - Substitution Procedures.
- B. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
  1. Reference Standards:
    - a. Where Specifications require compliance with a standard, provided product shall fully comply with the standard specified.
    - b. Refer to general requirements specified in Section 01 42 19 - Reference Standards regarding compliance with referenced standards, standard specifications, codes, practices and requirements for products.
  2. Product Description:
    - a. Where Specifications describe a product, listing characteristics required, with or without use of a brand name, provide a product that has the specified attributes and otherwise complies with specified requirements.
  3. Performance Requirements:
    - a. Where Specifications require compliance with performance requirements, provide product(s) that comply and are recommended by the manufacturer for the intended application.
    - b. Verification of manufacturer's recommendations may be by product literature or by certification of performance from manufacturer.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
- D. Products Specified by Identification of Manufacturer and Product Name or Number:

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1. "Specified Manufacturer": Provide the specified product(s) of the specified manufacturer.
  - a. If only one manufacturer is specified, without "acceptable manufacturers" being identified, provide only the specified product(s) of the specified manufacturer.
  - b. If District standard is indicated make all efforts to provide that product.
  - c. If the phrase "or equal" or "approved equal" is stated or reference is made to the "or equal provision," products of other manufacturers may be provided if such products are equivalent to the specified product(s) of the specified manufacturer.
    - 1) Equivalence shall be demonstrated by submission of information in compliance with requirements of Section 01 25 00 - Substitution Procedures.
2. "Acceptable Manufacturers":
  - a. Product(s) of the named manufacturers, if equivalent to the specified product(s) of the specified manufacturer, will be acceptable in accordance with the requirements of Section 01 25 00 - Substitution Procedures.
    - 1) Exception: Considerations regarding changes in Contract Time and Contract Sum will be waived if no increase in Contract Time or Contract Sum results from use of such equivalent products.
3. Unnamed manufacturers: Product(s) of unnamed manufacturers will be acceptable when disclosed during the bidding period and only as follows:
  - a. Unless specifically stated that substitutions will not be accepted or considered, the phrase "or equal" shall be assumed to be included in the description of specified product(s).
  - b. Equivalent products of unnamed manufacturers will be accepted in accordance with the "or equal" provision specified herein, below.
  - c. If provided, products of unnamed manufacturers shall be subject to the requirements of Section 01 25 00 - Substitution Procedures.
4. Quality basis:
  - a. Specified product(s) of the specified manufacturer shall serve as the basis by which products by named acceptable manufacturers and products of unnamed manufacturers will be evaluated.
  - b. Where characteristics of the specified product are described, where performance characteristics are identified or where reference is made to industry standards, such characteristics are specified to identify the most significant attributes of the specified product(s) which will be used to evaluate products of other manufacturers.
- E. Products Specified by Combination of Methods: Where products are specified by a combination of attributes, including manufacturer's name, product brand name, product catalog or identification number, industry reference standard, or description of product characteristics, provide products conforming to all specified attributes.
- F. "Or Equal" Provision: Where the phrase "or equal" or the phrase "or approved equal" is included, equivalent product(s) of unnamed manufacturer(s) may be provided as specified above in subparagraph titled "Unnamed manufacturers" and Section 01 25 00 - Substitution Procedures with the following conditions:

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1. The requirements of Section 01 25 00 - Substitution Procedures applies to products provided under the "or equal" provision.
    - a. Exception: If the proposed product(s) are determined to be equivalent to the specified product(s) of the specified manufacturer, the requirement specified for substitutions to result in a net reduction in Contract Time or Contract Sum will be waived.
  2. Use of product(s) under the "or equal" provision shall not result in any delay in completion of the Work, including completion of portions of the Work for use by District or for work under separate contract by District.
  3. Use of product(s) under the "or equal" provision shall not result in any costs to the District, including design fees and permit and plan check fees.
  4. Use of product(s) under the "or equal" provision shall not require substantial change in the intent of the design, in the opinion of the Architect.
    - a. The intent of the design shall include functional performance and aesthetic qualities.
  5. The determination of equivalence will be made by the Architect and District, and such determination shall be final.
- G. Visual Matching:
1. Where Specifications require matching a sample, the decision by the Architect on whether a proposed product matches shall be final.
  2. Where no product visually matches but the product complies with other requirements, comply with provisions for substitutions for selection of a matching product in another category.
- H. Visual Selection of Products:
1. Where requirements include the phrase "as selected from manufacturer's standard colors, patterns and textures", or a similar phrase, selections of products will be made by indicated party or, if not indicated, by the Architect. The will select color, pattern and texture from the product line of submitted manufacturer, if all other specified provisions are met.
  2. The Architect will select color, pattern and texture from the product line of submitted manufacturer, if all other specified provisions are met.

## 2.05 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

## PART 3 EXECUTION

### 3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 25 00 - Substitution Procedures.

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### 3.02 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
  - 1. Schedule delivery to minimize long-term storage and prevent overcrowding construction spaces.
  - 2. Coordinate with installation to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport products by methods to avoid product damage.
- F. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- G. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- H. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- I. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

### 3.03 STORAGE AND PROTECTION

- A. Provide protection of stored materials and products against theft, casualty, or deterioration.
- B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.
  - 1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.
- C. Inspection Provisions: Arrange storage to provide access for inspection and measurement of quantity or counting of units.
- D. Structural Considerations: Store heavy materials away from the structure in a manner that will not endanger supporting construction.
- E. Store and protect products in accordance with manufacturers' instructions.
- F. Store with seals and labels intact and legible.
- G. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.
- H. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- I. For exterior storage of fabricated products, place on sloped supports above ground.

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1. Place products on raised blocks, pallets or other supports, above ground and in a manner to not create ponding or misdirection of runoff.
- J. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- K. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
  1. Periodically inspect to ensure products are undamaged, and are maintained under required conditions.
  2. Remove and replace products damaged by improper storage or protection with new products at no change in Contract Sum or Contract Time.
  3. Weather-Resistant Storage:
    - a. Store moisture-sensitive products above ground, under cover in a weathertight enclosure or covered with an impervious sheet covering. Provide adequate ventilation to avoid condensation.
    - b. Maintain storage within temperature and humidity ranges required by manufacturer's instructions.
    - c. Store loose granular materials on solid surfaces in a well-drained area. Prevent mixing with foreign matter.
- L. Comply with manufacturer's warranty conditions, if any.
- M. Do not store products directly on the ground.
- N. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- O. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- P. Prevent contact with material that may cause corrosion, discoloration, or staining.
- Q. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- R. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

### 3.04 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products, except where more stringent requirements are specified, are necessary due to Project conditions or are required by authorities having jurisdiction.
- B. Anchor each product securely in place, accurately located and aligned with other Work.
- C. Clean exposed surfaces and provide protection to ensure freedom from damage and deterioration at time of Substantial Completion review. Refer to additional requirements specified in General Conditions, Section 01 50 00 - Temporary Construction Facilities and Controls and 01 70 00 - Execution and Closeout Requirements.

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### 3.05 PROTECTION OF COMPLETED WORK

- A. Provide barriers, substantial coverings and notices to protect installed Work from traffic and subsequent construction operations.
- B. Remove protective measures when no longer required and prior to Substantial Completion review of the Work.
- C. Comply with additional requirements specified in Section 01 50 00 - Temporary Construction Facilities and Controls.

**END OF SECTION**

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**SECTION 01 61 16**  
**VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Requirements for Indoor-Emissions-Restricted products.
- B. Requirements for VOC-Content-Restricted products.
- C. Requirement for installer certification that they did not use any non-compliant products.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- B. Section 01 40 00 - Quality Requirements: Procedures for testing and certifications.
- C. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

**1.03 DEFINITIONS**

- A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
  - 1. Interior paints and coatings applied on site.
  - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
  - 3. Products making up wall and ceiling assemblies.
  - 4. Thermal and acoustical insulation.
  - 5. Exterior applied products (for Healthcare and Schools projects only).
  - 6. Other products when specifically stated in the specifications.
- B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
  - 1. Interior paints and coatings.
  - 2. Interior adhesives and sealants, including flooring adhesives.
  - 3. Wet-applied roofing and waterproofing.
  - 4. Other products when specifically stated in the specifications.
- C. Interior of Building: Anywhere inside the exterior weather barrier.
- D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:

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1. Metals that are plated, anodized, or powder-coated.

#### 1.04 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
- C. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.
- D. GreenSeal GS-36 - Adhesives for Commercial Use.
- E. SCAQMD 1113 - Architectural Coatings.
- F. SCAQMD 1168 - Adhesive and Sealant Applications.

#### 1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.
- C. Installer Certifications Regarding Prohibited Content: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of installer's products, or 2) that such products used comply with these requirements.
  1. Use the form following this section for installer certifications.
- D. Verification of compliance with VOC limits as specified in the CalGreen Code Section 5.504 shall be provided at the request of the Building Inspector.
  1. Product certification and specifications.
  2. Chain of custody certifications.
  3. Product, labeled and invoiced as meeting the Composite Wood Products regulation.
  4. Exterior grade products marked as meeting the PS-1 or PS-2 standards of the Engineered Wood Association, the Australian AS/NZS 2269 or European 636 3S standards
  5. Other methods approved by the building official.

#### 1.06 QUALITY ASSURANCE

- A. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
  1. Evidence of Compliance: Acceptable types of evidence are:
    - a. Report of laboratory testing performed in accordance with requirements.
    - b. Published product data showing compliance with requirements.
    - c. Certification by manufacturer that product complies with requirements.
- B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

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## **PART 2 PRODUCTS**

### **2.01 REGULATORY REQUIREMENTS**

- A. All VOC restricted products shall be compliant with local jurisdiction, South Coast Air Quality Management District, Air Pollution Control District, County of San Diego, and California Green Standards Code, Rules and Regulations in effect at the time of installation. Products specified in this project shall be used as a basis of design. Updated products that are compliant with the rules in force at the time of installation shall be submitted as substitutions when they become available.
  - 1. If a product is found to be non-compliant with the VOC rules at the scheduled time of installation, notify the Architect a minimum of 90 days prior to installation. Contractor shall submit a suggested compliant product that is equal to the performance and cost of the specified product using the substitution procedure.

### **2.02 MATERIALS**

- A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.
- B. VOC-Content-Restricted Products: VOC content not greater than required by the following:
  - 1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
  - 2. Aerosol Adhesives: GreenSeal GS-36.
  - 3. Joint Sealants: SCAQMD 1168 Rule.
  - 4. Paints and Coatings: Each color; most stringent of the following:
    - a. 40 CFR 59, Subpart D.
    - b. SCAQMD 1113 Rule.
    - c. CARB (SCM).
    - d. CalGreen Building Standards Section 5.504, Table 504.4.3 "VOC Content Limits for Architectural Coatings".
    - e. Clear Wood Finishes, Floor Coatings, Stains, Primers and Shellacs: Do not exceed the VOC content limits established in SCAQMD 1113 rule.
- C. Other Product Categories: Comply with limitations specified elsewhere.

## **PART 3 EXECUTION**

### **3.01 FIELD QUALITY CONTROL**

- A. District reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to District.
- B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

### **END OF SECTION**

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**SECTION 01 61 16.01**  
**ACCESSORY MATERIAL VOC CONTENT CERTIFICATION FORM**

**1.01 FORM**

A. Identification:

1. Project Name: Battery Replacement
2. Project No.: 1-30-56
3. Architect: Ruhnau Clarke Architects

B. Use of This Form:

1. Because installers are allowed and directed to choose accessory materials suitable for the applicable installation, there is a possibility that such accessory materials might contain VOC content in excess of that permitted, especially where such materials have not been explicitly specified.
  - a. Each installer of work on this project is required to certify that his/their use of these particular materials complies with the contract documents and to provide documentation showing that the products used do not contain the prohibited content.
2. Contractor is required to obtain and submit this form from each installer of work on this project.
3. For each product category listed, check the correct paragraph.
4. If any of these accessory materials has been used, attach to this form product data and MSDS sheet for each such product.

C. VOC content restrictions are specified in Section 01 61 16.

1. Volatile organic compounds (VOCs) are defined by the U.S. EPA, California Air Resources Board (CARB), South Coast Air Quality Management District (SCAQMD), along with other state and local regulations applicable to this project.

**2.01 PRODUCT CERTIFICATION**

A. I certify that the installation work of my firm on this project:

1. [HAS] [HAS NOT] required the use of any ADHESIVES.
2. [HAS] [HAS NOT] required the use of any JOINT SEALANTS.
3. [HAS] [HAS NOT] required the use of any PAINTS OR COATINGS.
4. [HAS] [HAS NOT] required the use of any COMPOSITE WOOD or AGRIFIBER PRODUCTS.

B. Product data and MSDS sheets are attached.

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**3.01 CERTIFIED BY: (INSTALLER/MANUFACTURER/SUPPLIER FIRM)**

- A. Firm Name: \_\_\_\_\_
- B. Print Name: \_\_\_\_\_
- C. Signature: \_\_\_\_\_
- D. Title: \_\_\_\_\_ (officer of company)
- E. Date: \_\_\_\_\_

**END OF SECTION**

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**SECTION 01 70 00**  
**EXECUTION AND CLOSEOUT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Cleaning and protection.
- F. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- G. General requirements for maintenance service.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures.
- C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.
- E. Section 01 50 00 - Temporary Facilities and Controls: Temporary interior partitions.
- F. Section 01 74 19 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- G. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- H. Section 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.
- I. Individual Product Specification Sections:
  - 1. Advance notification to other sections of openings required in work of those sections.
  - 2. Limitations on cutting structural members.

**1.03 REFERENCE STANDARDS**

- A. CFC Ch. 33 - Fire Safety During Construction and Demolition.
- B. CFC Ch. 35 - California Fire Code - Chapter 35 - Welding and Other Hot Work.
- C. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

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- B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
  - 1. Structural integrity of any element of Project.
  - 2. Integrity of weather exposed or moisture resistant element.
  - 3. Efficiency, maintenance, or safety of any operational element.
  - 4. Visual qualities of sight exposed elements.
  - 5. Work of District or separate Contractor.
  - 6. Include in request:
    - a. Identification of Project.
    - b. Location and description of affected work. Include shop drawings as necessary to identify locations and communicate descriptions.
    - c. Necessity for cutting or alteration.
    - d. Description of proposed work and products to be used.
    - e. Effect on work of District or separate Contractor.
    - f. Effect on existing construction of District and, if applicable, work for Project being provided by District under separate contract.
    - g. Written permission of affected separate Contractor.
    - h. Date and time work will be executed.
  - 7. Include written evidence that those performing work under separate contract for District have been notified and acknowledge that cutting and patching work will be occurring. Include written permission for intended cutting and patching, included scheduled times.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities.

## 1.05 PROJECT CONDITIONS

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- B. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
- C. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- D. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- E. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

## PART 2 PRODUCTS

### 2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

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- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that existing conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

### **3.02 PREPARATION**

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

### **3.03 PREINSTALLATION MEETINGS**

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
  - 1. Review conditions of examination, preparation and installation procedures.
  - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, District, participants, and those affected by decisions made.

### **3.04 GENERAL INSTALLATION REQUIREMENTS**

- A. Dimensions for Accessibility:
  - 1. Conventions: See CBC Figure 11B-104. Dimensions that are not stated as "maximum" or "minimum" are absolute.

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2. Tolerances shall be per CBC 11B-104.1.1 "Construction and manufacturing tolerances. All dimensions are subject to conventional industry tolerances except where the requirement is stated as a range with specific minimum and maximum end points."
- B. In addition to compliance with regulatory requirements, conduct construction operations in compliance with ASTM F477 and NFPA 241, including applicable recommendations in Appendix A.
- C. When welding or doing other hot work, comply with CFC Ch. 35.
- D. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- E. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- F. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- G. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- H. Make neat transitions between different surfaces, maintaining texture and appearance.

### 3.05 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
  1. Verify that construction and utility arrangements are as indicated.
  2. Report discrepancies to Architect before disturbing existing installation.
  3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
  1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 .
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
  1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
  2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- D. Remove existing work as indicated and as required to accomplish new work.
  1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
  2. Remove items indicated on drawings.
  3. Relocate items indicated on drawings.
  4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
  5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

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- E. Services (Including but not limited to Plumbing, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
  - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
  - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
  - 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
    - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
    - b. Provide temporary connections as required to maintain existing systems in service.
  - 4. Verify that abandoned services serve only abandoned facilities.
  - 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- F. Protect existing work to remain.
  - 1. Prevent movement of structure; provide shoring and bracing if necessary.
  - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  - 3. Repair adjacent construction and finishes damaged during removal work.
- G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
  - 1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
  - 2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
  - 3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
  - 4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.
- H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- I. Refinish existing surfaces as indicated:
  - 1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.

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- 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- J. Clean existing systems and equipment.
- K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- L. Do not begin new construction in alterations areas before demolition is complete.
- M. Comply with all other applicable requirements of this section.

### 3.06 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
  - 1. Complete the work.
  - 2. Fit products together to integrate with other work.
  - 3. Provide openings for penetration of mechanical, electrical, and other services.
  - 4. Match work that has been cut to adjacent work.
  - 5. Repair areas adjacent to cuts to required condition.
  - 6. Repair new work damaged by subsequent work.
  - 7. Remove samples of installed work for testing when requested.
  - 8. Remove and replace defective and non-complying work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
  - 1. Coordinate installation or application of products for integrated Work.
  - 2. Uncover completed Work as necessary to install or apply products out of sequence.
  - 3. Remove and replace defective or non-conforming Work.
- E. After uncovering existing Work, inspect conditions affecting proper accomplishment of Work.
- F. Temporary Supports: Provide supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- G. Beginning of cutting or patching shall be interpreted to mean that existing conditions were found by Contractor to be acceptable.
- H. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- I. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
  - 1. Use a diamond grit abrasive saw or similar cutter for smooth edges. Do not overcut corners.
- J. Restore work with new products in accordance with requirements of Contract Documents.
- K. Fit work neat and tight allowing for expansion and contraction.

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- L. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- M. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material , to full thickness of the penetrated element.
- N. Patching:
  - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
  - 2. Match color, texture, and appearance.
  - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
- O. Finishing: Refinish surfaces to match adjacent and similar finishes as used for the Project.
  - 1. For continuous surfaces, refinish to nearest intersection or natural break.
  - 2. For an assembly, refinish entire unit.

### **3.07 PROGRESS CLEANING**

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

### **3.08 PROTECTION OF INSTALLED WORK**

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

### **3.09 PROJECT CLOSEOUT CONFERENCE**

- A. Schedule and conduct a project closeout conference, at a time convenient to District and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.

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1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of District, Commissioning Authority (CxA), Architect, and relevant consultants; Contractor and project superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
  - a. Preparation of record documents.
  - b. Commissioning.
  - c. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
  - d. Submittal of written warranties.
  - e. Coordination of separate contracts.
  - f. District's partial occupancy requirements.
  - g. Installation of District's furniture, fixtures, and equipment.
  - h. Responsibility for removing temporary facilities and controls.
4. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, District, participants, and those affected by decisions made.

### **3.10 ADJUSTING**

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

### **3.11 FINAL CLEANING**

- A. Cleaning and Disposal Requirements, General: Conduct cleaning and disposal operations in compliance with all applicable codes, ordinances and regulations, including environmental protection laws, rules and practices.
- B. Execute final cleaning prior to final project assessment.
  1. Clean areas to be occupied by District prior to final completion before District occupancy.
- C. Substantial Completion Review Cleaning, General: Execute a thorough cleaning prior to Substantial Completion review by Architect and District. Employ experienced workers or professional cleaners for cleaning operations for Substantial Completion review.
- D. Use cleaning materials that are nonhazardous.
  1. Cleaning Agents and Materials: Use only those cleaning agents and materials which will not create hazards to health or property and which will not damage or degrade surfaces.
    - a. Use only those cleaning agents, materials and methods recommended by manufacturer of the material to be cleaned.
    - b. Use cleaning materials only on surfaces recommended by cleaning agent manufacturer.

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- c. Before use, review cleaning agents and materials with DSA for suitability and compatibility. Use no cleaning agents and materials without approval as noted above.
- 2. Cleaning Procedures: All cleaning processes, agents and materials shall be subject to Architect, District and/or DSA review and approval. Processes and degree of cleanliness shall be as directed by Architect, District and/or DSA.
- E. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- F. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- G. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- H. Clean filters of operating equipment.
- I. Clean site; sweep paved areas, rake clean landscaped surfaces.
- J. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

### 3.12 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
  - 1. Provide copies to Architect and District.
- B. Accompany Architect, Construction Manager, and District Representative on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's comprehensive list of items to be completed or corrected.
  - 1. As authorized by the District; Architect and Architect's and District's consultants, as appropriate, will attend a meeting at the Project site to review Contract closeout procedures and to review the list of items to be completed and corrected (punch list) to make the Work ready for acceptance by the District.
  - 2. This meeting shall be scheduled not earlier than 14 days prior to the date anticipated for the Substantial Completion review.
- C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- E. Clearing and Cleaning: Prior to the Substantial Completion review, Contractor shall conduct a thorough cleaning and clearing of the Project area, including removal of construction facilities and temporary controls.
- F. District will occupy all of the building as specified in Section 01 10 00.

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- G. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
1. Correction (Punch) List: Contractor shall prepare and distribute at the preliminary Contract closeout review meeting, a typewritten, comprehensive list of items to be completed and corrected (punch list) to make the Work ready for acceptance by the District.
    - a. The punch list shall include all items to be completed or corrected prior to the Contractor's application for final payment.
    - b. The punch list shall identify items by location (room number or name) and consecutive number. For example, 307-5 would identify item 5 in Room 307, Roof-4 would identify item 4 on Roof.
    - c. Contractor shall prepare separate lists according to categories used for Drawings. For example, provide lists for Architectural.
    - d. Verbal comments will be made to the Contractor by the DSA, the Architect and the Architect's and District's consultants, if in attendance, during the walk-through. These comments will indicate generally the additions and corrections to be made to the punch list. Such comments shall not be considered to be comprehensive; Contractor shall use the comments as guidance in preparing the punch list for the Substantial Completion review.
  2. Substantial Completion Meeting: On a date mutually agreed by the District, Architect, and Contractor, a meeting shall be conducted at the Project site to determine whether the Work is satisfactory and complete for filing a Notice of Completion (Substantial Completion).
    - a. Contractor shall provide three working days notice to Architect for requested date of Substantial Completion meeting.
    - b. The DSA, the Architect and the Architect's and District's consultants, as authorized by the District, will attend the Substantial Completion meeting.
    - c. In addition to conducting a walk-through of the facility and reviewing the punch list, the purpose of the meeting shall include submission of warranties, guarantees and bonds to the District, submission of operation and maintenance data (manuals), provision of specified extra materials to the District, and submission of other Contract closeout documents and materials as required and if not already submitted.
    - d. The DSA, the Architect and Architect's consultants, as appropriate, will conduct a walk-through of the facility with the Contractor and review the punch list.
    - e. Contractor shall correct the punch list and record additional items as may identified during the walk-through, including notations of corrective actions to be taken.
    - f. Contractor shall retype the punch list and distribute it within three working days to those attending the meeting.
    - g. If additional site visits by the DSA, the Architect and the Architect's and District's consultants are required to review completion and correction of the Work, the costs of additional visits shall be reimbursed to the District by the Contractor by deducting

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such costs from the Final Payment.

- H. Correct items of work listed in Final Correction Punch List and comply with requirements for access to District-occupied areas.
- I. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
  - 1. Architect's Certification of Substantial Completion:
    - a. When Architect determines that list of items to be completed and corrected (Punch List) is sufficiently complete for District to occupy Project for the use to which it is intended.
    - b. Architect will complete and issue to the District and Contractor a Certificate of Substantial Completion using:
      - 1) The American Institute of Architects Form G704 - Certificate of Substantial Completion
      - 2) or other form if directed by the District.
- J. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

### **3.13 FINAL PAYMENT**

- A. After completion of all items listed for completion and correction, after submission of all documents and products and after final cleaning, submit final Application for Payment, identifying total adjusted Contract Sum, previous payments and sum remaining due.
- B. Payment will not be made until the following are accomplished:
  - 1. All Project Record Documents have been transferred and accepted by District.
  - 2. All extra materials and maintenance stock have been transferred and received by District.
  - 3. All warranty documents and operation and maintenance data have been received and accepted by District.
  - 4. All liens have been released or bonded by Contractor.
  - 5. Contractor's surety has consented to Final Payment.
  - 6. All documentation required by DSA has been completed.

### **END OF SECTION**

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**SECTION 01 74 19**  
**CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

**PART 1 GENERAL**

**1.01 WASTE MANAGEMENT REQUIREMENTS**

- A. Comply with the requirements Section 5.408 of the California Green Building Standards Code.
  - 1. Recycle and/or salvage for reuse a minimum of 65 percent of the nonhazardous construction and demolition waste in accordance with Section 504.8.1.1, 5.408.1.2, or 5.408.1.3; or meet a local construction and demolition waste management ordinance, whichever is more stringent.
- B. District requires that this project generate the least amount of trash and waste possible.
- C. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- D. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- E. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
  - 1. Aluminum and plastic beverage containers.
  - 2. Corrugated cardboard.
  - 3. Wood pallets.
  - 4. Clean dimensional wood.
  - 5. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 10 00 - Site Clearing for use options.
    - a. Comply with California Green Code (CGC) 5.408.3; Excavated soil and land clearing debris: 100 percent of trees, stumps, rocks and associated vegetation and soils resulting primarily from land clearing shall be reused or recycled.
      - 1) Exception: Reuse, either on-or off-site, of vegetation or soil contaminated by disease or pest infestation.
  - 6. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
  - 7. Bricks: May be used on project if whole, or crushed and used as landscape cover, sub-base material, or fill.
  - 8. Concrete masonry units: May be used on project if whole, or crushed and used as sub-base material or fill.
  - 9. Asphalt paving: May be recycled into paving for project.
  - 10. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
  - 11. Glass.
  - 12. Gypsum drywall and plaster.

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13. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (<http://flooring.dupont.com>) and Interface ([www.interfaceinc.com](http://www.interfaceinc.com)) conduct reclamation programs.
14. Roofing.
15. Paint.
16. Plastic sheeting.
17. Rigid foam insulation.
18. Windows, doors, and door hardware.
19. Plumbing fixtures.
20. Mechanical and electrical equipment.
21. Fluorescent lamps (light bulbs).
22. Acoustical ceiling tile and panels.
23. Materials which could be hazardous and subject to special disposal regulations include but are not limited to the following: CalGreen Section 5.408.2
  - a. Lead-Based Paint
  - b. Asbestos: Found in older pipe insulation, asphalt floor tiles, linoleum, insulation, etc.
  - c. Polychlorinated Biphenyls (PCBs):
    - 1) Found in electrical oil filled equipment manufactured prior to 1978 such as transformers, switches and fluorescent lamp ballasts.
    - 2) Also found in adhesive, sealant, caulk, glazing putty, roofing material, pesticide vehicle, ink, paper, fabric dye, gaskets, and hydraulic fluid.
  - d. HVAC Refrigerants: Containing Fluorinated and Chlorinated compounds.
  - e. Drinking Fountain Refrigerants: Containing Fluorinated and Chlorinated compounds.
  - f. Fluorescent Light Tubes: Contain mercury.
  - g. EXIT signs and Smoke Detectors: May contain unregulated, radioactive tritium. · Required to be returned to manufacturer.
  - h. Contaminated Soils.
  - i. Pressure Treated Lumber.
- F. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
  1. Contractor's quantitative reports for construction waste materials as a condition of approval of progress payments.
- G. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements. CalGreen Section 5.408.1.1.
- H. The following sources may be useful in developing the Waste Management Plan:
  1. California Recycling Department, at [www.bsc.ca.gov/Home/CALGreen.aspx](http://www.bsc.ca.gov/Home/CALGreen.aspx).
  2. General information contacts regarding construction and demolition waste:

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- a. EPA Construction and demolition (C&D) debris website:  
[www.epa.gov/epawaste/conserve/imr/cdm/](http://www.epa.gov/epawaste/conserve/imr/cdm/).
  - b. Directory of Wood-Framed Building Deconstruction and Reused Building Materials Companies: [www.fpl.fs.fed.us/documnts/fplgtr/fpl\\_gtr150.pdf](http://www.fpl.fs.fed.us/documnts/fplgtr/fpl_gtr150.pdf).
  - c. Additional resources to be developed by Contractor with assistance from District and **Contractor, as requested.**
3. Recycling Haulers and Markets: The source list below contains local haulers and markets for recyclable materials. This list is provided for information only and is not necessarily comprehensive; other haulers and markets are acceptable.
- a. CAL-MAX: [www.calrecycle.ca.gov/calmax/](http://www.calrecycle.ca.gov/calmax/).
    - 1) A free service designed to help businesses find markets for non-hazardous materials they have traditionally discarded.
  - b. General Recycling/Reuse Centers: For information on qualified local solid waste haulers contact the California Department of Resources Recycling and Recovery - CalRecycle. The website lists wastes recycling facilities in counties throughout the State of California.
    - 1) <http://www.calrecycle.ca.gov/default.asp>
- I. Methods of trash/waste disposal that are not acceptable are:
- 1. Burning on the project site.
  - 2. Burying on the project site.
  - 3. Dumping or burying on other property, public or private.
  - 4. Other illegal dumping or burying.
  - 5. Incineration, either on- or off-site.
- J. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

## 1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. Section 01 50 00 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 01 60 00 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- D. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.
- E. Section 31 10 00 - Site Clearing: Handling and disposal of land clearing debris.

## 1.03 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

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- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
  - 1. Debris that is not hazardous as defined in CalGreen Section 5.408.2 and California Code of Regulations, Title 22, Section 66261.3 et seq.
  - 2. This term includes, but is not limited to, asphalt concrete, Portland cement concrete, brick, lumber, gypsum wallboard, cardboard and other associated packaging, roofing material, ceramic tile, carpeting, plastic pipe, and steel.
  - 3. The debris may be commingled with rock, soil, tree stumps, and other vegetative matter resulting from land clearing and landscaping for construction or land development projects.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Diversion: Avoidance of demolition and construction waste sent to landfill or incineration. Diversion does not include using materials for landfill, alternate daily cover on landfills, or materials used as fuel in waste-to-energy processes.
- E. Enforcement Agency (EA). Enforcement agency as defined in CA Public Resources Code 40130.
- F. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- G. Landfill, Inert waste or Inert Disposal Facility:
  - 1. A disposal facility that accepts only inert waste such as soil and rock, fully cured asphalt paving, uncontaminated concrete (including fiberglass or steel reinforcing rods embedded in the concrete), brick, glass, and ceramics, for land disposal.
- H. Landfill, Class III:
  - 1. A landfill that accepts non-hazardous resources such as household, commercial, and industrial waste, resulting from construction, remodeling, repair, and demolition operations.
  - 2. A Class III landfill must have a solid waste facilities permit from the California Integrated Waste Management Board (CIWMB) and is regulated by the Enforcement Agency (EA).
- I. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- J. Mixed Debris Recycling Facility: A processing facility that accepts loads of commingled construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing the non-recyclable residual materials.
- K. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- L. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- M. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

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- N. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- O. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- P. Recycling Center: A facility that receives only C&D material that has been separated for reuse prior to receipt, in which the residual (disposed) amount of waste in the material is less than 10% of the amount separated for reuse by weight.
- Q. Return: To give back reusable items or unused products to vendors for credit.
- R. Reuse: To reuse a construction waste material in some manner on the project site.
- S. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- T. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- U. Separated for Reuse:
  - 1. Materials, including commingled recyclables.
  - 2. Separated or kept separate from the solid waste stream for the purpose of:
    - a. Additional sorting or processing those materials for reuse or recycling.
      - 1) In order to return them to the economic mainstream in the form of raw material for new, reused, or reconstituted products.
    - b. Products shall meet the quality standards necessary to be used in the marketplace.
    - c. Includes materials that have been "source separated".
- V. Solid Waste:
  - 1. All putrescible and nonputrescible solid, semisolid, and liquid wastes, including:
    - a. Garbage, trash, refuse, paper, rubbish, ashes, industrial wastes, demolition and construction wastes.
    - b. Abandoned vehicles and parts thereof.
    - c. Discarded home and industrial appliances.
    - d. Dewatered, treated, or chemically fixed sewage sludge which is not hazardous waste.
    - e. Manure, vegetable or animal solid and semisolid wastes.
    - f. Other discarded solid and semisolid wastes.
  - 2. "Solid waste" does not include hazardous waste, radioactive waste, or medical waste as defined or regulated by State law.
- W. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
  - 1. Materials, including commingled recyclables, that have been separated or kept separate from the solid waste stream at the point of generation, for the purpose of additional sorting or processing of those materials for reuse or recycling in order to return them to the economic mainstream in the form of raw materials for new, reused, or reconstituted

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products which meet the quality standards necessary to be used in the marketplace.

- X. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- Y. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- Z. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.
- AA. Waste Hauler: A company that possesses a valid permit from the local waste management authority to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal in the locality.

#### 1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Submit Waste Management Plan within 30 calendar days after receipt of Notice to Proceed, or prior to any trash or waste removal, whichever occurs sooner; submit projection of all trash and waste that will require disposal and alternatives to landfilling.
  - 1. Submit four copies of CWMP for review.
    - a. Contractor's Construction Waste and Recycling Plan must be approved by the Architect and Construction Manager prior to the start of Work.
  - 2. Approval of the Contractor's CWMP shall not relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures.
- C. Waste Management Plan: Include the following information:
  - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
  - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
  - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
    - a. List each material proposed to be salvaged, reused, or recycled.
    - b. List the local market for each material.
  - 4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
  - 5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
  - 6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
  - 7. Recycling Incentives: Describe procedures required to obtain credits, rebates, or similar incentives.

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- D. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
    - a. Inert materials shall achieve a construction waste diversion rate of at least 95 percent.
      - 1) These materials include, but are not limited to, concrete, asphalt and rock.
      - 2) Earthwork is not included.
      - 3) Excavated soil shall not be included in any of the calculations used to ensure compliance with this specification section.
    - b. The overall diversion rate must be based on weight.
    - c. The diversion rate of individual materials can be measured in either weight or volume, but the rate shall be converted into the units selected for calculating the overall diversion rate.
      - 1) All individual material diversions must be converted to a consistent set of units when calculating the overall diversion rate for the all reports and submittals required for the Work.
    - d. Conversion rate numbers shall be based on standard conversion rate data for construction projects provided by the California Integrated Waste Management Board (CIWMB). This data is available at the following internet location, <http://www.calrecycle.ca.gov/LGCentral/Library/dsg/ICandD.htm>.
  2. Submit Report on a form acceptable to District.
  3. Landfill Disposal: Include the following information:
    - a. Identification of material.
    - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
    - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
    - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
  4. Recycled and Salvaged Materials: Include the following information for each:
    - a. Identification of material, including those retrieved by installer for use on other projects.
    - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
    - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
    - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
    - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.

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5. Material Reused on Project: Include the following information for each:
  - a. Identification of material and how it was used in the project.
  - b. Amount, in tons or cubic yards.
  - c. Include weight tickets as evidence of quantity.
6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

## **PART 2 PRODUCTS**

### **2.01 PRODUCT SUBSTITUTIONS**

- A. See Section 01 60 00 - Product Requirements for substitution submission procedures.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 60 00:
  1. Relative amount of waste produced, compared to specified product.
  2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
  3. Proposed disposal method for waste product.
  4. Markets for recycled waste product.

## **PART 3 EXECUTION**

### **3.01 WASTE MANAGEMENT PROCEDURES**

- A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

### **3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION**

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, District, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
  1. Prebid meeting.

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2. Preconstruction meeting.
  3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
1. As a minimum, provide:
    - a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
    - b. Separate dumpsters for each category of recyclable.
    - c. Recycling bins at worker lunch area.
  2. Provide containers as required.
  3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
  4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
  5. Locate enclosures out of the way of construction traffic.
  6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
  7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
  8. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

### 3.03 DISPOSAL OPERATIONS AND WASTE HAULING

- A. Remove waste materials from Project Site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
1. Except for items or materials to be salvaged, recycled, or otherwise reused.
  2. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate on site.
  3. Use a permitted waste hauler or Contractor's trucking services and personnel. To confirm valid permitted status of waste haulers, contact the local solid waste authority.
  4. Become familiar with the conditions for acceptance of new construction, excavation and demolition materials at recycling facilities, prior to delivering materials.

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5. Deliver to facilities that can legally accept new construction, excavation and demolition materials for purpose of re-use, recycling, composting, or disposal.
6. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
7. Do not burn or bury waste materials on or off site. Appropriate on-site topical application of ground gypsum or wood, or use of site paving as granulated fill is considered reuse, not waste.

#### **3.04 PLAN AND REPORT FORMS**

- A. See suggested forms on the following pages.

**END OF SECTION**

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## CONTRACTOR'S CONSTRUCTION WASTE AND RECYCLING PLAN

(Submit After Award of Contract and Prior to Start of Work)

Project Title:						
Contract or Work Order No.:						
Contractor's Name:						
Street Address:						
City:				State:		Zip:
Phone: (    )				Fax: (    )		
E-Mail Address:						
Prepared by: (Print Name)						
Date Submitted:						
Project Period:		From:			TO:	
Reuse, Recycling or Disposal Processes To Be Used						
Describe the types of recycling processes or disposal activities that will be used for material generated in the project. Indicate the type of process or activity by number, types of materials, and estimated quantities that will be recycled or disposed in the sections below:						
01 - Reuse of building materials or salvage items on site (i.e. crushed base or red clay brick)						
02 - Salvaging building materials or salvage items at an offsite salvage or re-use center (i.e. lighting, fixtures)						
03 - Recycling source separated materials on site (i.e. crushing asphalt/concrete for reuse or grinding for mulch)						
04 - Recycling source separated materials at an offsite recycling center (i.e. scrap metal or green materials)						
05 - Recycling commingled loads of C&D materials at an offsite mixed debris recycling center or transfer station						
06 - Recycling material as Alternative Daily Cover at landfills						
07 - Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).						
08 - Disposal at a landfill or transfer station.						
09 - Other (please describe) _____						
Types of Material To Be Generated						
Use these codes to indicate the types of material that will be generated on the project						
A = Asphalt		C = Concrete		M = Metals		I = Mixed Inert    G = Green Materials
D = Drywall		P/C=Paper/Cardboard		W/C = Wire/Cable		S= Soils (Non Hazardous)
M/C = Miscellaneous Construction Debris		R = Reuse/Salvage		W = Wood		O = Other (describe)
Facilities Used: Provide Name of Facility and Location (City)						
Total Truck Loads: Provide Number of Trucks Hauled from Site During Reporting Period						
Total Quantities: If scales are available at sites, report in tons. If not, quantify by cubic yards. For salvage/reuse items, quantify by estimated weight (or units).						
SECTION I - RE-USED/RECYCLED MATERIALS						
Include all recycling activities for source separated or mixed material recycling centers where recycling will occur.						
Type of Material	Type of Activity	Facility to be Used/Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) M	04	ABC Metals, Los Angeles	24	355		
a. Total Diversion						

# CONTRACTOR'S CONSTRUCTION WASTE AND RECYCLING PLAN

Continued

SECTION II - DISPOSED MATERIALS						
Include all disposal activities for landfills, transfer stations, or inert landfills where no recycling will occur.						
Type of Material	Type of Activity	Facility to be Used/Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) D	08	DEF Landfill, Los Angeles	2	35		
b. Total Disposal				0	0	0

SECTION III - TOTAL MATERIALS GENERATED			
This section calculates the total materials to be generated during the project period (Reuse/Recycle + Disposal = Generation)			
	Tons	Cubic YD	Other Wt.
a. Total Reused/Recycled	0	0	0
b. Total Disposed	0	0	0
c. Total Generated	0	0	0

SECTION IV - CONTRACTOR'S LANDFILL DIVERSION RATE CALCULATION			
Add totals from Section I + Section II			
	Tons	Cubic YD	Other Wt.
a. Materials Re-Used and Recycled	0		
b. Materials Disposed	0		
c. Total Materials Generated (a. + b. = c.)	0	0	0
d. Landfill Diversion Rate (Tonnage Only)*			

\* Use tons only to calculate recycling percentages: Tons Reused/Recycled/Tons Generated = % Recycled

Contractor's Comments (Provide any additional information pertinent to planned reuse, recycling, or disposal activities):

## Notes:

- |  |  |
|--|--|
| 1. Suggested Conversion Factors: From Cubic Yards to Tons<br>(Use when scales are not available) | c. Ferrous Metals: .22 (ex. 1000 CY Ferrous Metal = 220 tons)          |
| a. Asphalt: .61 (ex. 1000 CY Asphalt = 610 tons. Applies to broken chunks of asphalt)            | d. Non-Ferrous Metals: .10 (ex. 1000 CY Non-Ferrous Metals = 100 tons) |
| b. Concrete: .93 (ex. 1000 CY Concrete = 930 tons. Applies to broken chunks of concrete)         | e. Drywall Scrap: .20  |
|  | f. Wood Scrap: .16   |

# CONTRACTOR'S REUSE, RECYCLING, AND DISPOSAL REPORT

(Submit With Each Progress Payment)

Project Title:						
Contract or Work Order No.:						
Contractor's Name:						
Street Address:						
City:				State:		Zip:
Phone: (    )				Fax: (    )		
E-Mail Address:						
Prepared by: (Print Name)						
Date Submitted:						
Project Period:		From:		TO:		
Reuse, Recycling or Disposal Processes to Be Used						
Describe the types of recycling processes or disposal activities that will be used for material generated in the project. Indicate the type of process or activity by number, types of materials, and estimated quantities that will be recycled or disposed in the sections below:						
01 - Reuse of building materials or salvage items on site (i.e. crushed base or red clay brick)						
02 - Salvaging building materials or salvage items at an offsite salvage or re-use center (i.e. lighting, fixtures)						
03 - Recycling source separated materials on site (i.e. crushing asphalt/concrete for reuse or grinding for mulch)						
04 - Recycling source separated materials at an offsite recycling center (i.e. scrap metal or green materials)						
05 - Recycling commingled loads of C&D materials at an offsite mixed debris recycling center or transfer station						
06 - Recycling material as Alternative Daily Cover at landfills						
07 - Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).						
08 - Disposal at a landfill or transfer station.						
09 - Other (please describe) _____						
Types of Material To Be Generated						
Use these codes to indicate the types of material that will be generated on the project						
A = Asphalt		C = Concrete		M = Metals		I = Mixed Inert    G = Green Materials
D = Drywall		P/C=Paper/Cardboard		W/C = Wire/Cable		S= Soils (Non-Hazardous)
M/C = Miscellaneous Construction Debris		R = Reuse/Salvage		W = Wood		O = Other (describe)
Facilities Used: Provide Name of Facility and Location (City)						
Total Truck Loads: Provide Number of Trucks Hauled from Site During Reporting Period						
Total Quantities: If scales are available at sites, report in tons. If not, quantify by cubic yards. For salvage/reuse items, quantify by estimated weight (or units).						
SECTION I - RE-USED/RECYCLED MATERIALS						
Include all recycling activities for source separated or mixed material recycling centers where recycling will occur.						
Type of Material	Type of Activity	Facility to be Used/Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) M	04	ABC Metals, Los Angeles	24	355		
a. Total Diversion						



# CONTRACTOR'S REUSE, RECYCLING, AND DISPOSAL REPORT

Continued

SECTION II - DISPOSED MATERIALS						
Include all disposal activities for landfills, transfer stations, or inert landfills where no recycling will occur.						
Type of Material	Type of Activity	Facility to be Used/Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) D	08	DEF Landfill, Los Angeles	2	35		
b. Total Disposal						

SECTION III - TOTAL MATERIALS GENERATED			
This section calculates the total materials to be generated during the project period (Reuse/Recycle + Disposal = Generation)			
	Tons	Cubic YD	Other Wt.
a. Total Reused/Recycled			
b. Total Disposed			
c. Total Generated			

SECTION IV - CONTRACTOR'S LANDFILL DIVERSION RATE CALCULATION			
Add totals from Section I + Section II			
	Tons	Cubic YD	Other Wt.
a. Materials Re-Used and Recycled			
b. Materials Disposed			
c. Total Materials Generated (a. + b. = c.)			
d. Landfill Diversion Rate (Tonnage Only)*			

\* Use tons only to calculate recycling percentages: Tons Reused/Recycled/Tons Generated = % Recycled

Contractor's Comments (Provide any additional information pertinent to planned reuse, recycling, or disposal activities):

## Notes:

1. Suggested Conversion Factors: From Cubic Yards to Tons  
(Use when scales are not available)

- a. Asphalt: .61 (ex. 1000 CY Asphalt = 610 tons. Applies to broken chunks of asphalt)
- b. Concrete: .93 (ex. 1000 CY Concrete = 930 tons. Applies to broken chunks of concrete)

c. Ferrous Metals: .22 (ex. 1000 CY Ferrous Metal = 220 tons)

d. Non-Ferrous Metals: .10 (ex. 1000 CY Non-Ferrous Metals = 100 tons)

e. Drywall Scrap: .20

f. Wood Scrap: .16

**SECTION 01 78 00  
CLOSEOUT SUBMITTALS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Project record documents.
- B. Operation and maintenance data.
- C. Warranties and bonds.

**1.02 RELATED REQUIREMENTS**

- A. Owner issued Bidding Instructions and General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01 45 33 - Code-Required Special Inspections: Construction oversight procedures by DSA regarding the execution, approval, and closeout of this building project.
- D. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- E. Individual Product Sections: Specific requirements for operation and maintenance data.
- F. Individual Product Sections: Warranties required for specific products or Work.
  - 1. Special Project warranty requirements for specific products or elements of the Work; commitments and agreements for continuing services to District.

**1.03 DEFINITIONS**

- A. Warranty: Assurance to District by Contractor, installer, supplier, manufacturer or other party responsible as warrantor, for the quantity, quality, performance and other representations of a product, system service of the Work, in whole or in part, for the duration of the specified period of time.
- B. Guarantee: Assurance to District by Contractor or product manufacturer or other specified party, as guarantor, that the specified warranty will be fulfilled by the guarantor in the event of default by the warrantor.
- C. Standard Product Warranty: Preprinted, written warranty published by product manufacturer for particular products and specifically endorsed by the manufacturer to the District.
- D. Special Project Warranty: Written warranty required by or incorporated into Contract Documents, to extend time limits provided by standard warranty or to provide greater rights for District.
- E. Correction Period: As defined in the Conditions of the Contract, Correction Period shall be synonymous with "warranty period", "guarantee period" and similar terms used in the Contract Specifications.

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#### 1.04 SUBMITTALS

- A. Advance Submittals: For equipment and systems, or component parts of systems, put into service during construction and operated by District, submit documents within ten days of start of operation by District.
- B. Final Completion Submittals: Prior to application for final payment, Contractor shall submit 3 copies the following:
  - 1. Agency Document Submittals: Submit to District all documents required by authorities having jurisdiction, including serving utilities and other agencies. Submit original versions of all permit cards, with final sign-off by inspectors. Submit all certifications of inspections and tests.
    - a. Contractor shall also complete all required contractor forms and obtain DSA approval of these same forms. Comply with "Final Certification of Construction" per Title 24 Part 1 section 4-339.
      - 1) Form-6.C: Verified Report – Contractor: From each Contractor having a contract with the District.
  - 2. Final Specifications Submittals: Submit to District all documents and products required by Specifications to be submitted, including the following:
    - a. Project record drawings and specifications.
    - b. Operating and maintenance data.
    - c. Guarantees, warranties and bonds.
    - d. Keys and keying schedule.
    - e. Spare parts and extra stock.
    - f. Test reports and certificates of compliance.
  - 3. Certificates of Compliance and Test Report Submittals: Submit to District certificates and reports as specified and as required by authorities having jurisdiction, including the following:
    - a. Sterilization of water systems.
    - b. Sanitary sewer system tests.
    - c. Gas system tests.
    - d. Lighting, power and signal system tests.
    - e. Ventilation equipment and air balance tests.
    - f. Fire sprinkler system tests.
    - g. Fire detection system, smoke alarms and dampers.
    - h. Roofing inspections and tests.
  - 4. Lien and Bonding Company Releases: Submit to District, with copy to Architect, evidence of satisfaction of encumbrances on Project by completion and submission of The American Institute of Architects Forms:
    - a. G706 - Contractor's Affidavit of Payment of Debts and Claims;
    - b. G706A - Contractor's Affidavit of Release of Liens;
    - c. (if applicable) G707 - Consent of Surety;
    - d. or forms as as agreed to by the District.

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- e. Comply also with other requirements of District, as directed.
  - f. All signatures shall be notarized.
- 5. Subcontractor List: Submit to two copies to District and two copies to Architect of updated Subcontractor and Materials Supplier List.
- 6. Warranty Documents: Prepare and submit to District all warranties and bonds as specified in Contract General Conditions and this Section.
- C. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- D. Operation and Maintenance Data:
  - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
  - 2. For equipment, or component parts of equipment put into service during construction and operated by District, submit completed documents within ten days after acceptance.
  - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
  - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- E. Warranties and Bonds:
  - 1. For equipment or component parts of equipment put into service during construction with District's permission, submit documents within 10 days after acceptance.
  - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

#### 1.05 WARRANTIES AND GUARANTEES

- A. General:
  - 1. Provide all warranties and guarantees with District named as beneficiary.
  - 2. For equipment and products, or components thereof, bearing a manufacturer's warranty or guarantee that extends for a period of time beyond the Contractor's warranty and guarantee, so state in the warranty or guarantee.
- B. Provisions for Special Warranties: Refer to Conditions of the Contract for terms of the Contractor's special warranty of workmanship and materials.
- C. General Warranty and Guarantee Requirements:
  - 1. Warranty shall be an agreement to repair or replace, without cost and undue hardship to District, Work performed under the Contract which is found to be defective during the Correction Period (warranty or guarantee) period.
  - 2. Repairs and replacements due to improper maintenance or operation, or due to normal wear, usage and weathering are excluded from warranty requirements unless otherwise

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specified.

- D. Specific Warranty and Guarantee Requirements: Specific requirements are included in product Specifications Sections of Divisions 03 through 33, including content and limitations.
- E. Disclaimers and Limitations:
  - 1. Manufacturer's disclaimers and limitations on product warranties and guarantees shall not relieve Contractor of responsibility for warranty and guarantee requirements.
  - 2. This applies to the Work that incorporates such products, nor shall they relieve suppliers, manufacturers, and installers required to countersign special warranties with Contractor.
- F. Related Damages and Losses: When correcting warranted Work that has been found defective, remove and replace other Work that has been damaged as a result of such defect or that must be removed and replaced to provide access for correction of warranted Work.
- G. Reinstatement of Warranty:
  - 1. When Work covered by a warranty has been found defective and has been corrected by replacement or rebuilding, reinstate the warranty by written endorsement.
  - 2. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- H. Replacement Cost:
  - 1. Upon determination that Work covered by a warranty has been found to be defective, replace or reconstruct the Work to a condition acceptable to District, complying with applicable requirements of the Contract Documents.
  - 2. Contractor shall be responsible for all costs for replacing or reconstructing defective Work regardless of whether District has benefited from use of the Work through a portion of its anticipated useful service life.
- I. District's Recourse:
  - 1. Written warranties made to the District shall be in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under law, nor shall warranty periods be interpreted as limitations on time in which the District can enforce such other duties, obligations, rights, or remedies.
  - 2. Rejection of Warranties:
    - a. The District reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- J. Warranty as Condition of Acceptance:
  - 1. District reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment shall be required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

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## PART 2 PRODUCTS - NOT USED

## PART 3 EXECUTION

### 3.01 PROJECT RECORD DOCUMENTS

- A. Record Documents are to be maintained and submitted in searchable live electronic format (PDF).
  - 1. Develop in compliance with Section 01 30 00 - Administrative Requirements.
  - 2. Acceptable markup software:
    - a. Adobe Acrobat Professional.
    - b. Bluebeam Revu.
- B. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Contract Drawings.
  - 2. Project Manual with Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed shop drawings, product data, and samples.
  - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- C. Ensure entries are complete and accurate, enabling future reference by District.
- D. Store record documents separate from documents used for construction.
- E. Record information concurrent with construction progress.
- F. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
  - 1. Manufacturer's name and product model and number.
  - 2. Product substitutions or alternates utilized.
  - 3. Changes made by Addenda and modifications.
  - 4. Provide copies of all approved addenda, directives, corrections, and change orders affecting the associated project.
    - a. These copies shall be included with the "Bid Set" and/or "Record Set" listed above and formatted as detailed above.
- G. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
  - 1. Reproducible set of Contract Drawings will be provided to Contractor by District through Architect or DSA.
  - 2. Measured depths of foundations in relation to finish first floor datum.
  - 3. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

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4. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
5. Field changes of dimension and detail.
6. Details not on original Contract drawings.
  - a. Application of copies of details produced and provided by Architect during construction will be accepted.
- H. Submission: Submit Record Documents in searchable (live text and redlines mark-ups; not scanned) PDF format to Architect prior to final Application for Payment.
  1. Maintain one additional paper copy and one in PDF format (on CD) of the fire suppression and fire protection detection system drawings and specifications at the building premises.
    - a. One copy is to be kept on site for a period of three years to comply with CFC section 901.6.2.

### **3.02 OPERATION AND MAINTENANCE DATA**

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

### **3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES**

- A. For Each Product, Applied Material, and Finish:
  1. Product data, with catalog number, size, composition, and color and texture designations.
  2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

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### 3.04 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with District's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Project Warranty and Guarantee Forms:
  - 1. Example forms for special Project warranties and guarantees are included at the end of this Section.
  - 2. Prepare written documents utilizing the appropriate form, ready for execution by the Contractor, or the Contractor and subcontractor, supplier or manufacturer.
    - a. Submit a draft to District through Architect for approval prior to final execution.
  - 3. Refer to product Specifications Sections of Divisions 2 through 33 for specific content requirements, and particular requirements for submittal of special warranties.
  - 4. Prepare standard warranties and guarantees, excepting manufacturers' standard printed warranties and guarantees, on Contractor's, subcontractor's, material supplier's, or manufacturer's own letterhead, addressed to District.
  - 5. Warranty and guarantee letters shall be signed by all responsible parties and by Contractor in every case, with modifications only as approved in advance by District to suit the conditions pertaining to the warranty or guarantee.
- C. Manufacturer's Guarantee Form:
  - 1. Manufacturer's guarantee form may be used in lieu of special Project form included at the end of this Section.
  - 2. Manufacturer's guarantee form shall contain appropriate terms and identification, ready for execution by the required parties.
  - 3. If proposed terms and conditions restrict guarantee coverage or require actions by District beyond those specified, submit draft of guarantee to District through Architect for review and acceptance before performance of the Work.
  - 4. In other cases, submit draft of guarantee to District through Architect for approval prior to final execution of guarantee.
- D. Signatures: Signatures shall be by person authorized to sign warranties, guarantees and bonds on behalf of entity providing such warranty, guarantee or bond.
- E. Co-Signature: All installer's warranties and bonds shall be co-signed by Contractor. Manufacturer's guarantees will not require co-signature.
- F. Verify that documents are in proper form, contain full information, and are notarized.
- G. Co-execute submittals when required.
- H. Retain warranties and bonds until time specified for submittal.
- I. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- J. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

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1. If more than one volume of warranties, guarantees and bonds is produced, identify volume number on binder.
- K. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- L. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- M. Form of Warranty and Bond Submittals:
  1. Prior to final Application and Certificate for Payment, compile two copies of each required warranty, guarantee and bond, properly executed by Contractor, or jointly by Contractor, subcontractor, supplier, or manufacturer.
  2. Collect and assemble all written warranties and guarantees into binders and deliver binders to District for final review and acceptance.
  3. Include Table of Contents for binder, neatly typed, following order and Section numbers and titles as used in the Project Manual.
  4. Provide heavy paper dividers with celluloid or plastic covered tabs for each separate warranty.
    - a. Mark tabs to identify products or installation, and Section number and title.
  5. Include on separate typed sheet, if information is not contained in warranty or guarantee form, a description of the product or installation, and the name, address, telephone number and responsible person for applicable installer, supplier and manufacturer.
  6. When operating and maintenance data manuals are required for warranted construction, include additional copies of each required warranty and guarantee in each required manual.
    - a. Coordinate with requirements listed in the prior articles for operating and maintenance data manuals.

### 3.05 TIME OF WARRANTY AND BOND SUBMITTALS

- A. Submission of Preliminary Copies:
  1. Unless otherwise specified, obtain preliminary copies of warranties, guarantees and bonds within ten days of completion of applicable item or Work.
  2. Prepare and submit preliminary copies for review as specified herein.
- B. Submission of Final Copies:
  1. Submit fully executed copies of warranties, guarantees and bonds within ten days of date identified in Certificate of Completion but no later than three days prior to date of final Application for Payment.
- C. Date of Warranties and Bonds:
  1. Unless otherwise directed or specified, commencement date of warranty, guarantee and bond periods shall be the date established in the Certificate of Completion.
  2. Warranties for Work accepted in advance of date stated in Certificate of Completion:

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- a. When a designated system, equipment, component parts or other portion of the Work is completed and occupied or put to beneficial use by District:
  - 1) By separate agreement with Contractor, prior to completion date established in the Certificate of Completion, submit properly executed warranties to District within ten days of completion of that designated portion of the Work.
  - 2) List date of commencement of warranty, guarantee or bond period as the date established in the Certificate of Completion.
- 3. Warranties for Work not accepted as of date established in the Certificate of Completion:
  - a. Submit documents within ten days after acceptance, listing date of acceptance as beginning of warranty, guarantee or bond period.
- D. Duration of Warranties and Guarantees:
  - 1. Unless otherwise specified or prescribed by law, warranty and guarantee periods shall be not less than the Correction Period required by the Conditions of the Contract.
  - 2. In no case, the period is to be less than one year from the date established for completion of the Project in the Certificate of Completion.
  - 3. See product Specifications Sections of the Project Manual for extended warranty and guarantee beyond the minimum one year duration.

**END OF SECTION**

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**SECTION 01 78 00.01  
WARRANTY FORM LETTER**

**FOR CONTRACTOR'S / SUBCONTRACTOR'S / MANUFACTURER'S WARRANTY**

CONTRACTOR'S/SUBCONTRACTOR'S/SUPPLIER'S LETTERHEAD

**SPECIAL LIMITED PROJECT WARRANTY FOR \_\_\_\_\_ WORK.**

We, the undersigned, do hereby warrant that the portion of the Work described above which we have provided for Battery Replacement is in accordance with the Contract Documents and that all such Work as installed will fulfill or exceed all minimum warranty requirements. We agree to repair or replace Work installed by us, together with any adjacent Work which is displaced or damaged by so doing, that proves to be defective in workmanship, material, or function within a period of (years), commencing (date identified in Certificate of Completion, unless otherwise directed) and terminating (date).

The following terms and conditions apply to this warranty (obtain District 's approval before submission):

In the event of our failure to comply with the above-mentioned conditions within a reasonable time period determined by the District , after notification in writing, we, the undersigned, all collectively and separately, hereby authorize the District to have said defective Work repaired or replaced to be made good, and agree to pay to the District upon demand all moneys that the District may expend in making good said defective Work, including all collection costs and reasonable attorney fees.

**LOCAL REPRESENTATIVE: FOR WARRANTY MAINTENANCE, REPAIR, OR REPLACEMENT SERVICE, CONTACT:**

(Name) \_\_\_\_\_  
(Address) \_\_\_\_\_  
(City) \_\_\_\_\_ (State) \_\_\_\_\_ (ZIP) \_\_\_\_\_  
(Phone) \_\_\_\_\_ / \_\_\_\_\_  
(signed) \_\_\_\_\_  
(Date) \_\_\_\_\_ (Typed Name) \_\_\_\_\_  
(Title) \_\_\_\_\_ (Firm) \_\_\_\_\_

**CONTRACTOR:**

State License No: \_\_\_\_\_  
(signed) \_\_\_\_\_  
(Date) \_\_\_\_\_ (Typed Name) \_\_\_\_\_  
(Title) \_\_\_\_\_ (Firm) \_\_\_\_\_

**FORM LETTER**

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## FORM LETTER

### FOR CONTRACTOR'S / MANUFACTURER'S GUARANTEE

CONTRACTOR'S / MANUFACTURER'S LETTERHEAD

#### SPECIAL LIMITED PROJECT [☐ WARRANTY] [☐ GUARANTEE] FOR \_\_\_\_\_ WORK.

We, the undersigned, do hereby [☐ warrant] [☐ guarantee] that the portion of the Work described above which [☐ we have provided] [☐ was provided by (Installer or Subcontractor's Name)\_\_\_\_] for Battery Replacement in accordance with the Contract Documents and that all such Work as installed will fulfill or exceed all minimum warranty requirements. We agree to repair or replace Work installed by [☐ us,] [☐ (Installer or Subcontractor's Name)\_\_\_\_] together with any adjacent Work which is displaced or damaged by so doing, that proves to be defective in workmanship, material, or function within a period of (years), commencing (date indicated in Certificate of Completion, unless otherwise directed) and terminating (date).

The following terms and conditions apply to this [☐ warranty] [☐ guarantee] (obtain District's approval before submission):

In the event of our failure to comply with the above-mentioned conditions within a reasonable time period determined by the District, after notification in writing, we, the undersigned, all collectively and separately, hereby authorize the District to have said defective Work repaired or replaced to be made good, and agree to pay to the District upon demand all moneys that the District may expend in making good said defective Work, including all collection costs and reasonable attorney fees.

#### LOCAL REPRESENTATIVE: FOR WARRANTY MAINTENANCE, REPAIR, OR REPLACEMENT SERVICE, CONTACT:

(Name) \_\_\_\_\_  
(Address) \_\_\_\_\_  
(City) \_\_\_\_\_ (State) \_\_\_\_\_ (ZIP) \_\_\_\_\_  
(Phone) \_\_\_\_\_ / \_\_\_\_\_  
(signed) \_\_\_\_\_  
(Date) \_\_\_\_\_ (Typed Name) \_\_\_\_\_  
(Title) \_\_\_\_\_ (Firm) \_\_\_\_\_

#### CONTRACTOR:

State License No: \_\_\_\_\_  
(signed) \_\_\_\_\_  
(Date) \_\_\_\_\_ (Typed Name) \_\_\_\_\_  
(Title) \_\_\_\_\_ (Firm) \_\_\_\_\_

## FORM LETTER

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END OF SECTION

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## SECTION 02 41 00 DEMOLITION

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Selective demolition of building elements for alteration purposes.

#### 1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 10 00 - Summary: Description of items to be removed by District.
- C. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- D. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

#### 1.03 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards.
- B. CFC Ch. 33 - Fire Safety During Construction and Demolition.
- C. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

#### 1.04 DEFINITIONS

- A. Remove: Remove and legally dispose of items, except those identified for use in recycling, re-use, and salvage programs.
- B. Environmental Pollution and Damage: The presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human or animal life; affect other species of importance to humanity; or degrade the utility of the environment for aesthetic, cultural or historical purposes.
- C. Inert Fill: A permitted facility that accepts inert waste such as asphalt and concrete exclusively for the purpose of disposal.
  - 1. Inert Solids/Inert Waste: Non-liquid solid waste including, but not limited to, soil and concrete, that does not contain hazardous substances or soluble pollutants at concentrations in excess of water-quality standards established by a regional water board and does not contain significant quantities of decomposable solid waste.
- D. Class III Landfill: A landfill that accepts non-hazardous materials such as household, commercial, and industrial waste, resulting from construction, remodeling, repair, and demolition operations. A Class III landfill must have a solid waste facilities permit from the State of California.
- E. Demolition Waste: Building materials and solid waste resulting from construction, remodeling, repair, cleanup, or demolition operations that are not hazardous. This term includes, but is not limited to, asphalt concrete, Portland cement concrete, brick, lumber, gypsum wallboard,

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cardboard and other associated packaging, roofing material, ceramic tile, carpeting, plastic pipe, and steel. The materials may include rock, soil, tree stumps, and other vegetative matter resulting from land clearing and landscaping for construction or land development projects.

- F. Chemical Waste: Includes petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals and inorganic wastes.
- G. Recycling: The process of sorting, cleansing, treating and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
- H. Reuse: The use, in the same or similar form as it was produced, of a material which might otherwise be discarded.
- I. Solid Waste: All putrescible and nonputrescible solid, semisolid, and liquid wastes, including garbage, trash, refuse, paper, rubbish, ashes, industrial wastes, demolition and construction wastes, abandoned vehicles and parts thereof, discarded home and industrial appliances, dewatered, treated, or chemically fixed sewage sludge which is not hazardous waste, manure, vegetable or animal solid and semisolid wastes, and other discarded solid and semisolid wastes. "Solid waste" does not include hazardous waste, radioactive waste, or medical waste as defined or regulated by State law.

#### 1.05 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Construction Conference: Conduct a pre-construction conference one week prior to the start of the work of this section; require attendance by all affected trades.
- B. Convene a conference at the Project site 3 days prior to starting demolition to review the Drawings and Specifications, requirements of authorities having jurisdiction, instructions and requirements of serving utilities, sequencing and interface considerations and project conditions.
- C. Conference shall be attended by DSA, supervisory and quality control personnel of Contractor and all subcontractors performing this and directly-related Work.
- D. Submit minutes of meeting to District, Project Inspector and Architect, for Project record purposes.
- E. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.
  - 1. Refer to sequence requirements specified in Section 01 10 00 - Summary; and construction progress schedule requirements specified in Section 01 30 00 - Administrative Requirements.

#### 1.06 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain property of Grossmont Union High School District, demolished materials shall become the Contractor's property and shall be removed, recycled, or disposed from Project site in an appropriate and legal manner.
  - 1. Arrange a meeting no less than ten (10) days prior to demolition with the District or DSA and other designated representatives to review any salvagable items to determine if District wants to retain ownership, and discuss Contractor's Waste Management and Recycling Plan.

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### 1.07 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.
  - 1. Record drawings: Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

### 1.08 SCHEDULING

- A. Schedule Work to precede new construction.
- B. Describe demolition removal procedures and schedule.
- C. Perform work between the hours of 8am and 5pm, subject to noise abatement regulations and District's approval for noise considerations.

## PART 2 PRODUCTS -- NOT USED

## PART 3 EXECUTION

### 3.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Conform to the relevant Article of the General Conditions, local Air Quality Management District and other applicable regulatory procedures when discovering hazardous or contaminated materials.
- B. Field Measurements and Conditions:
  - 1. Survey existing conditions and correlate with requirements indicated to determine extent of demolition and recycling required.
  - 2. In addition to provisions of the Conditions of the Contract, verify dimensions and field conditions prior to construction. Verify condition of substrate and adjoining Work before proceeding with demolition Work. If conflict is found notify DSA, Project Inspector and Architect.
- C. Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction. Obtain and pay for all permits required.
- D. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
  - 1. Obtain required permits.
  - 2. Comply with applicable requirements of NFPA 241 and CFC Ch. 33.
  - 3. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
  - 4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
  - 5. Do not close or obstruct roadways or sidewalks without permit.

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6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- E. Do not begin removal until receipt of notification to proceed from District.
- F. Protect existing structures and other elements that are not to be removed.
  1. Provide bracing and shoring.
  2. Prevent movement or settlement of adjacent structures.
  3. Stop work immediately if adjacent structures appear to be in danger.
- G. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.
- H. Remove materials to be re-installed or retained in manner to prevent damage. Store and protect in accordance with requirements of Section 01 60 00 - Product Requirements.
- I. Damages: Promptly repair damages to adjacent facilities caused by demolition operations.

### **3.02 SELECTIVE DEMOLITION FOR ALTERATIONS**

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
  1. Verify that construction and utility arrangements are as indicated.
  2. Report discrepancies to Architect before disturbing existing installation.
  3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Remove existing work as indicated and as required to accomplish new work.
  1. Remove items indicated on drawings.
- C. Protect existing work to remain.
  1. Prevent movement of structure; provide shoring and bracing if necessary.
  2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  3. Repair adjacent construction and finishes damaged during removal work.
  4. Patch as specified for patching new work.

### **3.03 DEBRIS AND WASTE REMOVAL**

- A. Remove debris, junk, and trash from site.
- B. Remove from site all materials not to be reused on site; comply with requirements of Section 01 74 19 - Waste Management.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

### **END OF SECTION**

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**SECTION 03 30 00  
CAST-IN-PLACE CONCRETE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Concrete formwork.
- B. Concrete foundations and anchor bolts.
- C. Concrete reinforcement.
- D. Joint devices associated with concrete work.
- E. Concrete curing.

**1.02 RELATED REQUIREMENTS**

- A. Section 32 13 13 - Site Concrete: Sidewalks, curbs and gutters.

**1.03 REFERENCE STANDARDS**

- A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials.
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- C. ACI 301 - Specifications for Structural Concrete.
- D. ACI 302.1R - Guide to Concrete Floor and Slab Construction.
- E. ACI 302.2R - Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
- F. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- G. ACI 305R - Guide to Hot Weather Concreting.
- H. ACI 306R - Guide to Cold Weather Concreting.
- I. ACI 308R - Guide to External Curing of Concrete.
- J. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
- K. ACI 347R - Guide to Formwork for Concrete.
- L. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- M. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
- N. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- O. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
- P. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens).
- Q. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
- R. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
- S. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.

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- T. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
- U. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
- V. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- W. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
- X. ASTM D1709 - Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
- Y. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
- Z. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

#### 1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
  - 1. Including printed statement of VOC content and material safety data sheets.
- C. Mix Design: Submit proposed concrete mix design.
  - 1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
  - 2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 19 - Concrete: Design and Durability Requirements, and Chapter 26 - Construction Documents and Inspection..
- D. Samples: Submit samples of underslab vapor retarder to be used.
- E. Test Reports: Submit report for each test or series of tests specified.
- F. Mix Design: Submit mix designs prepared, stamped and signed by a Civil Engineer licensed in the State of California.
- G. Quality Control Submittals:
  - 1. Field tests: Submit reports of all slump, strength and air content tests as required by authorities having jurisdiction and as indicated on the Drawings and specified herein.
  - 2. Delivery tickets: Have available copies of delivery tickets complying with ASTM C94/C94M for each load of concrete delivered to site. Include on the tickets the additional information specified in the ASTM document.
- H. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.
- I. Project Record Documents: Accurately record actual locations of embedded utilities and components that are concealed from view upon completion of concrete work.

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### 1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
  - 1. Maintain one copy of each document on site.
- B. Follow recommendations of ACI 305R when concreting during hot weather .
- C. When air temperature in the shade and away from artificial heat falls below 40 degrees F, or when concrete without special protection is likely to be subject to freezing temperatures before expiration of specified curing period, follow recommendations of ACI 306R when concreting during cold weather.
- D. Regulatory Requirements:
  - 1. Conform to California Building Code (CBC) Chapter 19A requirement, as amended and adopted by authorities having jurisdiction.
  - 2. Chemical products field-applied to concrete shall comply with applicable air quality requirements of authorities having jurisdiction.
    - a. Comply with Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions, CALGreen Section 5.504.4 Finish material pollutant control; 5.504.4.1 Adhesives, sealants and caulks; 5.504.4.3 Paints and coatings.
- E. Testing Agency Services: District will engage an independent testing and inspection agency to conduct tests and perform other services specified for quality control during construction, as required by Sections 01 40 00 - Quality Requirements and Section 01 45 33 - Code-Required Special Inspections.
- F. Coordination: Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories. Coordinate concrete requirements with Work specified for underground utilities and mechanical and electrical equipment pads and bases.

### 1.06 DELIVERY AND HANDLING

- A. Protection During Concrete Placement: Provide protective coverings and runways, and use appropriate equipment and means of access to Work areas to avoid soiling or damage to existing conditions.
- B. Runoff: Prevent run off of water contaminated by construction agents and chemicals from soiling existing surfaces and from contaminating existing and future landscape areas.

## PART 2 PRODUCTS

### 2.01 FORMWORK

- A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
  - 1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that provides a smooth, stain-free final appearance.
  - 2. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.

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3. Form Coating: Release agent that does not adversely affect concrete or interfere with application of coatings.

## 2.02 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
  1. Type: Deformed billet-steel bars.
  2. Finish: Unfinished, unless otherwise indicated.
- B. Reinforcement Accessories:
  1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
  2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
  3. Provide galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering or wet surfaces.

## 2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type II - Moderate Portland type.
  1. Cement used in contact with soil shall be Type V - Sulfate Resistant.
  2. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
  1. Acquire aggregates for entire project from same source.
- C. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

## 2.04 ADMIXTURES

- A. Chemical Admixture:
  1. Use no admixtures not included in mix design. Products of the following manufacturers are specified and will be acceptable provided they comply with referenced standards all other requirements of the Contract Documents:
    - a. Manufacturers:
      - 1) BASF Building Systems: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).
      - 2) Dayton Superior Corporation: [www.daytonsuperior.com](http://www.daytonsuperior.com).
      - 3) Euclid Chemical Co.: [www.euclidchemical.com](http://www.euclidchemical.com).
      - 4) L&M Construction Chemicals, Inc.: [www.lmcc.com](http://www.lmcc.com).
      - 5) Larsen Products Corp.: [www.larsenproducts.com](http://www.larsenproducts.com).
      - 6) MeadowBurke Co.: [meadowburke.com](http://meadowburke.com).
      - 7) W.R. Meadows, Inc.: [www.wrmeadows.com](http://www.wrmeadows.com).
      - 8) Sika Corporation; [www.us.sika.com](http://www.us.sika.com).
      - 9) Simpson Strong-Tie: [www.strongtie.com](http://www.strongtie.com)
      - 10) Specialty Products Group: [www.SPGGoGreen.com](http://www.SPGGoGreen.com).
      - 11) US Spec Division of US Mix Products Co.: [www.usspec.com](http://www.usspec.com).

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- 12) Substitutions: See Section 01 60 00 - Product Requirements.
- B. Do not use chemicals that result in soluble chloride ions in excess of 0.1 percent by weight of cement.
  - C. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
    - 1. Manufacturers:
      - a. Euclid Chemical Company; ACCELGUARD 80: [www.euclidchemical.com/#sle](http://www.euclidchemical.com/#sle).
      - b. Accelguard 80 by Euclid Chemical Co.
      - c. Pozzutec 20 by Master Builders Technology, Inc.
      - d. Substitutions: See Section 01 60 00 - Product Requirements.
  - D. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
    - 1. Manufacturers:
      - a. L.M. Scofield Company: [www.scofield.com](http://www.scofield.com).
      - b. Eucon Retarder 75 by Euclid Chemical Co.
      - c. Pozzolith R by Master Builders Technology, Inc.
      - d. Plastiment by Sika Corporation.
      - e. Substitutions: See Section 01 60 00 - Product Requirements.
  - E. Water Reducing Admixture: ASTM C494/C494M Type A.
    - 1. Manufacturers:
      - a. Euclid Chemical Company; EUCON NW: [www.euclidchemical.com/#sle](http://www.euclidchemical.com/#sle).
      - b. Eucon WR-75 by Euclid Chemical Co.
      - c. Pozzolith Normal or Polyheed by Master Builders Technology, Inc.
      - d. Plastocrete 161 by Sika Corporation.
      - e. Substitutions: See Section 01 60 00 - Product Requirements.

## 2.05 ACCESSORY MATERIALS

- 1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single ply polyethylene is prohibited.
- 2. Performance Requirements:
  - a. Comply with ACI 302.1R and ACI 302.2R.
  - b. Water Vapor Permeance: Not more than 0.010 perms, maximum.
    - 1) Permeance as tested after conditioning (ASTM E1745).
  - c. Comply with ASTM E1745 Class A.
  - d. Puncture Resistance, ASTM D1709: 2,300 gms.
- 3. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
- 4. Manufacturers:

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- a. Fortifiber Building Systems Group; Moistop Ultra 15, 15 mils thick (0.010 max. permeance), Class A, unreinforced polyolefin: [www.fortifiber.com/#sle](http://www.fortifiber.com/#sle).
  - b. ISI Building Products; Viper VaporCheck II 15-mil (Class A): [www.isibp.com/#sle](http://www.isibp.com/#sle).
  - c. Raven Industries; VaporBlock VB15, 15 mils thick (0.01 perms), Class A, unreinforced polyolefin: [ravenefd.com](http://ravenefd.com),
  - d. Reef Industries, Inc.; Vaporguard, 15 mil (E-96 0.000 perms), Class B: [www.reefindustries.com](http://www.reefindustries.com)
  - e. Stego Industries, LLC; Stego Wrap Vapor Barrier, 15 mils: [www.stegoindustries.com](http://www.stegoindustries.com).
  - f. W. R. Meadows, Inc; PERMINATOR Class A - 15 mils (0.38 mm): [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
  - g. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
- 1. Grout: Comply with ASTM C1107/C1107M.
  - 2. Height Change, Plastic State; when tested in accordance with ASTM C827/C827M:
    - a. Maximum: Plus 4 percent.
    - b. Minimum: Plus 1 percent.
  - 3. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
  - 4. Minimum Compressive Strength at 28 Days: 8,000 pounds per square inch.
  - 5. Flowable Products:
    - a. Dayton Superior Corporation: [www.daytonsuperior.com/#sle](http://www.daytonsuperior.com/#sle).
    - b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; DURAGROUT: [www.laticrete.com/our-products/concrete-construction-chemicals/#sle](http://www.laticrete.com/our-products/concrete-construction-chemicals/#sle).
    - c. Sika Corporation; SikaGrout 328: [www.us.sika.com](http://www.us.sika.com).
    - d. SpecChem, LLC; SC Precision Grout: [www.specchemllc.com/#sle](http://www.specchemllc.com/#sle).
    - e. US SPEC; MP Grout: [www.usspec.com](http://www.usspec.com).
    - f. W. R. Meadows, Inc; 588-10K: [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
    - g. W. R. Meadows, Inc; 1428 HP: [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
    - h. Substitutions: See Section 01 60 00 - Product Requirements.
  - 6. Low-Slump, Dry Pack Products:
    - a. Dayton Superior Corporation; Dri Pak Precast Grout: [www.daytonsuperior.com/#sle](http://www.daytonsuperior.com/#sle).
    - b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; Duragrout: [www.lmcc.com/#sle](http://www.lmcc.com/#sle).
    - c. Sika Corporation; SikaGrout 212: [www.us.sika.com](http://www.us.sika.com).
    - d. US SPEC; GP Grout: [www.usspec.com](http://www.usspec.com).
    - e. Substitutions: See Section 01 60 00 - Product Requirements.

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- C. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator.
  - 1. Composition: High solids content material exhibiting positive expansion when tested in accordance with ASTM C827/C827M.
    - a. Maximum Height Change: Plus 4 percent.
    - b. Minimum Height Change: Plus 1 percent.
  - 2. Minimum Compressive Strength at 7 days, ASTM C579: 12,000 pounds per square inch.  
OR
  - 3. Minimum Compressive Strength at 7 days, ASTM D695: 12,000 pounds per square inch.
  - 4. Manufacturers:
    - a. Euclid Chemical Company; E3-DEEP POUR: [www.euclidchemical.com/#sle](http://www.euclidchemical.com/#sle).
    - b. Dayton Superior Corporation: [www.daytonsuperior.com/#sle](http://www.daytonsuperior.com/#sle).
    - c. Euclid Chemical Co.; [www.euclidchemical.com](http://www.euclidchemical.com).
    - d. Five Star Products, Inc; Five Star DP Epoxy Grout: [www.fivestarproducts.com](http://www.fivestarproducts.com).
    - e. L&M Construction Chemicals, Inc.; [www.lmcc.com](http://www.lmcc.com).
    - f. Sika Corporation; Sika Grout Pak 42: [www.us.sika.com](http://www.us.sika.com).
    - g. SpecChem, LLC; SpecPoxy Grout: [www.specchemllc.com](http://www.specchemllc.com).
    - h. US Mix Products Co.; [www.usspec.com](http://www.usspec.com).
    - i. W.R. Meadows, Inc.; REZI-WELD 3/2: [www.wrmeadows.com](http://www.wrmeadows.com).
    - j. Substitutions: See Section 01 60 00 - Product Requirements.

## 2.06 BONDING AND JOINTING PRODUCTS

## 2.07 CURING MATERIALS

- A. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
  - 1. Application: Use at concrete slab on grade.
  - 2. Product dissipates within 4 to 6 weeks.
  - 3. Provide product containing fugitive red dye.
  - 4. Manufacturers:
    - a. Dayton Superior Corporation: [www.daytonsuperior.com/#sle](http://www.daytonsuperior.com/#sle).
    - b. Euclid Chemical Company; COLOR-CRETE CURE AND SEAL VOC: [www.euclidchemical.com/#sle](http://www.euclidchemical.com/#sle).
    - c. SpecChem, LLC; SpecRez: [www.specchemllc.com/#sle](http://www.specchemllc.com/#sle).
    - d. Paul M. Wolff Co.; SHUR-CURE: [www.paulwolffco.com](http://www.paulwolffco.com).
    - e. W. R. Meadows, Inc; 1100-Clear: [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
    - f. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Moisture-Retaining Sheet: ASTM C171.
  - 1. Curing paper, regular.

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2. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.
  3. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.
- C. Water: Potable, not detrimental to concrete.

## 2.08 CONCRETE MIX DESIGN

- A. Mix Design: Contractor shall coordinate with the Testing Laboratory of Record, under supervision of Civil Engineer licensed in the State of California, to determine mix proportions to fulfill specified requirements for strength, aggregate, size and workability of concrete.
- B. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
  1. Comply with Chapter 19A requirements.
- C. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
- D. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- E. Normal Weight Concrete:
  1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on Structural Drawings.
  2. Proportions: For normal weight concrete, in accordance with ACI 301, and as noted on the Drawings.
  3. Structural Concrete: Structural concrete strengths (including non-structural floor slabs on grade), aggregate sizes and slumps indicated on Structural Drawings.
  4. Water/Cement Ratio for Concrete in Contact with Soil: Not to exceed 0.45, unless otherwise indicated on Structural Drawings.
  5. Water-Cement Ratio: Maximum 50 percent by weight.
  6. Maximum Slump: 4 inches.
  7. Maximum Aggregate Size: 3/4 inch.

## 2.09 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.
- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.
- B. Verify that concrete cover requirements are met in formwork construction and reinforcement placement.
- C. Verify that all embedded products and formed openings and recesses are correctly placed.

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### 3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Verify that forms are clean and free of rust before applying release agent.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

### 3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

### 3.04 CONCRETE MIXING

- A. Concrete Mixing, General: Comply with ACI 318 as adopted by CBC, Title 24, Part 2, Chapter 19A and ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete. Introduce and mix admixtures in compliance with manufacturer's instructions and recommendations.

### 3.05 PLACING CONCRETE

- A. Notify District's Inspector and DSA at least 2 working days in advance of placing concrete.
- B. Place concrete in accordance with ACI 304R. General: Comply with ACI 318 as adopted by CBC, Title 24, Part 2, Chapter 19A and as follows:
  - 1. Schedule continuous placement of concrete to prevent the formation of cold joints.
  - 2. Ready mix concrete shall be delivered in accordance with ASTM C94/C94M. Concrete shall be placed within 90 minutes after start of mixing.
  - 3. Provide construction joints if concrete for a particular element or component cannot be placed in a continuous operation.
  - 4. Deposit concrete as close as possible to its final location, to avoid segregation.
- C. Placement in Forms: Limit horizontal layers to depths which can be properly consolidated, but in no event greater than 24 inches.
  - 1. Consolidate concrete by means of mechanical vibrators, inserted vertically in freshly placed concrete in a systematic pattern at close intervals. Penetrate previously placed concrete to ensure that separate concrete layers are knitted together.
  - 2. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregates.
  - 3. Do not use vibrators to move concrete laterally.
- D. Notify Architect not less than 48 hours prior to commencement of placement operations.
- E. Ensure reinforcement and inserts are not disturbed during concrete placement.
- F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

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### 3.06 CONCRETE FINISHING

- A. Repair surface defects, immediately after removing formwork.

### 3.07 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
  - 1. Normal concrete: Not less than seven days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms:
  - 1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water-fog spray or saturated burlap.
  - 2. Final Curing: Begin after initial curing but before surface is dry.
    - a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.
    - b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

### 3.08 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of Work specified in other Sections, after such Work is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work. Use non-shrink grout where required or indicated.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

### 3.09 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Field Certifications: For all concrete, provide signed copy of batch plant's certificate stating quantity of each material, amount of water, admixtures, departure time and date accompanying each load of materials or concrete.

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- E. Field Tests of Concrete: Perform tests in accordance with applicable California Building Code requirements, ACI 301 and requirements of authorities having jurisdiction.
- F. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- G. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure four concrete test cylinders. Obtain test samples for every 2,000 sq ft - 50 cu yd or less of slab and structural concrete of each class of concrete placed (CBC requirement).
  - 1. Test one cylinder at 7 days and two at 28 days after placement.
  - 2. Maintain fourth cylinder to be tested at 56 days only if 28-day test fails to meet strength requirement.
  - 3. Take one additional test cylinder during cold weather concreting and cure it at job site under same conditions as concrete it represents. Test cold weather cylinder at 28 days.
- H. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- I. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

### 3.10 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
  - 1. Obtain repair details from Architect (Structural Engineer) and approved by DSA before proceeding.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

### 3.11 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.
- B. Protect concrete from marring and damage due to weather and construction activities.
  - 1. Protective measures shall include providing temporary coverings, and be in accordance with Section 01 50 00 - Temporary Facilities and Controls, and shall prohibit all non-essential construction activities, including cleaning and maintenance of construction equipment.
  - 2. In particular, protect concrete floor slabs from oil, paint and other products that might penetrate and degrade concrete surface.

## END OF SECTION

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**SECTION 05 40 00  
COLD-FORMED METAL FRAMING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Formed steel stud exterior wall framing.

**1.02 RELATED REQUIREMENTS**

- A. Section 09 22 36 - Lath.
- B. Section 09 24 00 - Cement Plastering.

**1.03 REFERENCE STANDARDS**

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.
- B. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- E. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.
- F. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members.
- G. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
- H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
- I. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Manufacturer's Qualification Statement.
- C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before the start of scheduled welding work.

**1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.

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- B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M and dated no more than 12 months before start of scheduled welding work.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Metal Framing:
  - 1. CEMCO: [www.cemcosteel.com/#sle](http://www.cemcosteel.com/#sle).
    - a. ICC ESR-3016.
    - b. ICC ESR-2012.
    - c. Intertek CCRR-0224.
  - 2. ClarkDietrich Building Systems: [www.clarkdietrich.com](http://www.clarkdietrich.com).
    - a. Intertek CCRR-0206.
    - b. Intertek CCRR-0224.
  - 3. Marino: [www.marinoware.com/#sle](http://www.marinoware.com/#sle).
    - a. ICC ESR-4062.
  - 4. SCAFCO Corporation: [www.scafco.com/#sle](http://www.scafco.com/#sle).
  - 5. Steel Construction Systems: [www.steelconsystems.com/#sle](http://www.steelconsystems.com/#sle).
  - 6. The Steel Network, Inc: [www.SteelNetwork.com/#sle](http://www.SteelNetwork.com/#sle).
  - 7. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Framing Connectors and Accessories:
  - 1. Same manufacturer as metal framing.
  - 2. ClarkDietrich Building Systems: [www.clarkdietrich.com](http://www.clarkdietrich.com).
  - 3. Simpson Strong Tie: [www.strongtie.com](http://www.strongtie.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.

### **2.02 FRAMING SYSTEM**

- A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.
- B. Design Requirements: Provide completed framing system having the following characteristics:
  - 1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100.
  - 2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
  - 3. Design Loads: In accordance with applicable codes.
  - 4. Live load deflection meeting the following, unless otherwise indicated:

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- a. Exterior Walls with Flexible Finish: Maximum horizontal deflection under wind load of 1/180 of span.
  - b. Exterior Walls with Plaster Finish: Maximum horizontal deflection under wind load of 1/360 of span.
  - c. Design non-axial loadbearing framing to accommodate not less than 1/2 in vertical deflection.
5. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
  6. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

### 2.03 FRAMING MATERIALS

- A. Studs and Track: ASTM C955; studs formed to channel, C- or Sigma-shaped with punched web; U-shaped track in matching nominal width and compatible height.
  1. Gauge and Depth: As indicated on drawings.
  2. Galvanized in accordance with ASTM A653/A653M, G60/Z180 coating, hot dipped.
    - a. Provide minimum G60 coating for applications other than interior non-loadbearing walls.
  3. Provide components fabricated from ASTM A1008/A1008M Designation SS (structural steel).
- B. Framing Connectors: Factory-made, formed steel sheet.
  1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for base metal thickness less than 10 gauge, 0.1345 inch, and factory punched holes and slots.
  2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100.
  3. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.
  4. Wall Stud Bridging Connections: Provide mechanical load-transferring devices that accommodate wind load torsion and weak axis buckling induced by axial compression loads. Provide bridging connections where indicated on the drawings and per Steel Stud Manufacturers Association standards, whichever is greater.
  5. Products:
    - a. ClarkDietrich; FastBridge Clip: [www.clarkdietrich.com/#sle](http://www.clarkdietrich.com/#sle).
    - b. Simpson Strong Tie: [www.strongtie.com](http://www.strongtie.com).
    - c. Substitutions: See Section 01 60 00 - Product Requirements.

### 2.04 FASTENERS

- A. Provide bolts, nuts, screws, powder driven fasteners, clips, washers and other fasteners as indicated on Drawings and as necessary for proper erection of items specified herein.

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- B. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.
- C. Anchorage Devices: Powder actuated, Drilled expansion bolts, and Screws with sleeves.
- D. Welding: Comply with AWS D1.1/D1.1M.

## 2.05 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components; as indicated on Drawings.
  - 1. Standard Structural Steel Shapes and Plates: ASTM A36/A36M.
  - 2. Miscellaneous Steel Items: ASTM A283/A283M, grade optional.
  - 3. Flat-Rolled Carbon Steel Sheets: ASTM A1008/A1008M.
  - 4. Cold-Rolled Carbon Steel Sheets: ASTM A1008/A1008M.
  - 5. Backing Plates: Galvanized sheet metal for attachment and support of products to be attached to framing.
    - a. As indicated on Drawings.
- B. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
- D. Water-Resistive Barrier: As specified in Section 07 25 00.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify field measurements and adjust installation as required.

### 3.02 INSTALLATION OF STUDS

- A. Configuration: Place and align tracks and install framing to configurations indicated on Drawings.
- B. Install components in accordance with Steel Stud manufacturers' instructions and ASTM C 1007 requirements.
- C. Install studs full length in one piece. Splicing of studs is not permitted.
- D. Install studs, brace, and reinforce to develop full strength and achieve design requirements.
- E. Install intermediate studs above and below openings to align with wall stud spacing.
- F. Attach backing plates to studs for attachment of fixtures anchored to walls.
- G. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
- H. Backing and Blocking: Install sheet metal backing as indicated and as required to support all products attached to wall or ceiling after completion of finish surface, including electrical fixtures, electrical panels, hardware, equipment, handrails, and trim. Cut ends of runner and

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backing plates to each stud.

- I. Touch-up field welds and damaged galvanized surfaces with primer.

### 3.03 TOLERANCES

- A. Maximum Variation from True Position: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation of any Member from Plane: 1/8 inch in 10 feet (3 mm in 3 m).

**END OF SECTION**

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**SECTION 05 50 00  
METAL FABRICATIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Shop fabricated steel items.
- B. Requirements for materials and equipment for post-installed mechanical and adhesive anchors in concrete.
- C. Pipe bollards.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

**1.03 REFERENCE STANDARDS**

- A. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures.
- B. ASTM A193/A193M - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- F. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- G. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- H. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- I. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
- J. ASTM F594 - Standard Specification for Stainless Steel Nuts.
- K. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- L. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
- M. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- N. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.
- O. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel.
- P. SSPC-PA 1 - Shop, Field, and Maintenance Painting of Steel.
- Q. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

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- R. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. ICC ES Reports: If requested, ICC Evaluation Service report indicating conformance with ICC-ES Acceptance Criteria.
- C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
  - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.
- E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172 or AISC 201.

#### **1.05 QUALITY ASSURANCE**

- A. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.
- B. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172 or AISC 201.
- C. Testing Agency Qualifications: An independent agency qualified according to ASTM E329 and Section 01 45 33 for testing indicated.
- D. Installer Training: Prior to beginning the work, manufacturer or manufacturer's representative shall provide on-site training for all contractor's personnel who will be installing anchors.

### **PART 2 PRODUCTS**

#### **2.01 REGULATORY REQUIREMENTS**

- A. Conform to applicable requirements of California Building Code (CBC), Title 24, Part 2, as amended and adopted by authorities having jurisdiction.
  - 1. Comply with Title 24, Part 9, California Fire Code Chapter 35 "Welding and Other Hot Work."

#### **2.02 MATERIALS - STEEL**

- A. Steel Sections: ASTM A36/A36M, for channels, angles and plates.
- B. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- C. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
- D. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

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- F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
  - 1. Comply with SSPC-PA 1. Coordinate with requirements specified in Section 09 91 13 - Exterior Painting .
    - a. Coordinate primer with finish paint and coating, as applicable, to provide sound foundation for field-applied topcoats despite prolonged exposure during construction.
- G. Galvanize all exterior steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

## 2.03 FABRICATION

- A. Hot-dip galvanize fabricated ferrous items, indicated as remaining unpainted, after fabrication. Field connections shall be bolted or screwed where possible. Avoid field cutting and welding which damage galvanized coating.
- B. Fit and shop assemble items in largest practical sections, for delivery to site.
- C. Fabricate items with joints tightly fitted and secured.
- D. Continuously seal joined members by intermittent welds and plastic filler.
- E. Joints Exposed to Weather or Water: Fabricate to keep water out, or provide adequate drainage of water that penetrates.
- F. Steel Tubing and Piping Fabrication: Unless otherwise indicated, close ends with plate stock so no exposed ends of tubing and piping. Grind all edges.
- G. Connections, General:
  - 1. Component parts of built-up members shall be well-pinned with closely-fitted contact.
  - 2. Conceal connections where possible.
  - 3. Otherwise, make countersinks for concealment after fabrication, except where noted.
- H. Welding: Conform to AWS D1.1/D1.1M recommendations.
  - 1. Do not field weld galvanized components to remain unfinished.
  - 2. Provide continuous welds at welded corners and seams.
  - 3. Grind exposed welds smooth and flush with base material.
  - 4. Re-weld to fill holes. Putties and fillers are not acceptable.
- I. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- J. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
  - 1. Bolted and Screwed Connections:
    - a. Provide holes and connections for work specified in other Sections.
    - b. Use bolts for field connections only.
    - c. Provide washers under heads and nuts bearing on wood.

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- d. Draw all nuts tight and nick threads of permanent connections.
  - e. Use beveled washers where bearing is on sloped surfaces.
  - f. Where screws must be used for permanent connections in ferrous metal, use flat head type, countersunk, with screw slots filled and finished smooth and flush.
- K. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

## 2.04 FABRICATED ITEMS

- A. Rough Hardware
  - 1. Provide bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as indicated on Drawings.
- B. Other Products and Fabrications
  - 1. Other Products and Fabrications: Provide all materials not specifically described but required for a complete and proper installation, as selected by the Contractor, subject to review and acceptance by Construction Manager and Architect.
- C. Bollards: Steel pipe, concrete filled, as detailed; galvanized finish.
- D. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.

## 2.05 POST INSTALLED CONCRETE ANCHORS

- A. Manufacturers:
  - 1. Manufacturers: Provide products as indicated on the approved Structural Drawings.
  - 2. Substitutions: Substitutions of products from manufacturer's not listed are not permitted.
    - a. Substitution of structural anchors requires structural calculations and DSA approval.
- B. Materials:
  - 1. Interior Use: For use in conditioned environments free from potential moisture, provide zinc plated carbon steel anchors.
  - 2. Exterior Use:
    - a. In exposed or potentially wet environments, and for attachment of exterior cladding materials, provide stainless steel anchors.
    - b. Stainless steel nuts and washers shall be of matching alloy group of equal or greater strength than the rod.
    - c. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
  - 3. Deformed Reinforcing Bars: Deformed steel rebar conforming to ASTM A615/A615M Grade 60. Permissible sizes as described in each adhesive products ICC report.
- C. Mechanical Anchors:
  - 1. Expansion, screw or undercut anchors having current ICC approval for use in cracked and uncracked concrete, with a published ICC Evaluation Service report.
    - a. Type and size as indicated on drawings.

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2. Basis of Design Approved Products conforming to this specification are acceptable for anchoring to concrete are as indicated on Drawings:
    - a. Hilti, Inc. Tulsa, OK; Hilti Kwik Bolt TZ Carbon and Stainless Steel Anchors in Cracked and Uncracked Concrete (ICC Report ESR-1917); [www.us.hilti.com](http://www.us.hilti.com).
    - b. Substitutions: See Section 01 60 00 - Product Requirements.
  3. Basis of Design Approved Products conforming to this specification are acceptable for anchoring to grouted masonry are as follows:
    - a. Simpson Wedge-All Wedge Anchor (ICC-ES ESR-1396)
    - b. Hilti Kwik Bolt 3 Expansion Anchor (ICC-ES ESR-1385)
    - c. Hilti Kwik Bolt TZ Expansion Anchor (ICC-ES ESR-3785)
    - d. Simpson Titen HD Screw Anchor (ICC-ES ESR-1056)
    - e. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Adhesive Anchors:
1. Cartridge Injection Adhesive Anchors: Threaded carbon steel rod, inserts, or reinforcing dowels complete with required nuts, washers, adhesive system and manufacturer's installation instructions.
    - a. Type and size as indicated on drawings.
    - b. Current ICC approval for use in cracked and uncracked concrete with a published ICC Evaluation Service report required.
  2. Interior Use: Unless otherwise indicated on the Drawings, provide:
    - a. Carbon steel threaded rods conforming to specification as indicated on structural drawings. Where no specification and grade are indicated, provide: ASTM A193/A193M Type B7 with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1).
  3. Exterior Use: As indicated on the Drawings, provide stainless steel anchors.
    - a. Stainless steel anchors shall be AISI Type 304 and Type 316 stainless steel provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener.
    - b. All nuts shall conform to ASTM F594, unless otherwise specified.
  4. Basis of Design Approved Products conforming to this specification are acceptable for anchoring to concrete are as indicated on Drawings:
  5. Basis of Design Approved Products conforming to this specification are acceptable for anchoring to grouted masonry are as indicated on Drawings:
- E. Power-Driven/Powder Actuated Fasteners
1. Use only if approved by Architect, generally not permitted where not specifically indicated or in load-bearing installations; as follows.
    - a. Hilti, Inc.; Hilti Low Velocity Power Driven Fasteners (ICC Report ESR-1663); [www.us.hilti.com](http://www.us.hilti.com).

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- b. Simpson Strong-Tie Company, Inc.; Simpson Strong-Tie® Powder-Actuated Fasteners, Threaded Studs and Assemblies (ICC Report ESR-2138); [www.strongtie.com](http://www.strongtie.com).

## 2.06 FINISHES - STEEL

- A. Mechanical Finishes: Complete finishing prior to fabrication wherever possible.
  - 1. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match finish.
  - 2. Protect finish on exposed surfaces by using temporary protective covering.
- B. Prime Painting: One coat.
- C. Galvanizing of Structural Steel Members: Galvanize all exterior steel members after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

## 2.07 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Field Inspection of Fabricated Products: Prior to installation, inspect products for damage and verify markings and dimensions against reviewed submittals.
- C. Environmental Conditions: Do not install products intended for interior locations when spaces are uncovered and unprotected from inclement weather.
- D. Coordination: Coordinate metal fabrications Work with Work specified in other Sections so that related Work shall be accurately and properly joined.
- E. Post Installed Anchors
  - 1. Verification of Conditions
    - a. Base Material Strength: Unless otherwise specified, do not drill holes in concrete until concrete has achieved full design strength.
    - b. Temperature of concrete surface and ambient air temperature must meet manufacturer's requirements prior to use of adhesive anchor products.
    - c. Embedded Items:
      - 1) Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors.
      - 2) Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items.

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- 3) Take precautions as necessary to avoid damaging anything embedded in the concrete including electrical/telecommunications conduit, gas pipes, and plumbing pipes.
  - 4) Notify the Architect if reinforcing steel or other embedded items are encountered during drilling.
- d. Beginning of installation indicates acceptance of existing conditions.

### 3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete.
- C. Make provision for erection loads with temporary bracing. Keep work in alignment.
- D. Obtain Architect's review prior to site cutting or making adjustments not indicated on Drawings and reviewed shop drawings.

### 3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components as indicated on drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.

### 3.04 INSTALLATION OF POST-INSTALLED ANCHORS

- A. Installation shall comply with all manufacturer's instructions and current ICC ESR report.
- B. Post-Installed Anchors in Hardened Concrete.
  1. Drilled-in anchors and/or powder driven pins in existing non-prestressed reinforced concrete: use care and caution to avoid cutting or damaging the existing reinforcing bars.
  2. Maintain a minimum clearance of one inch between the reinforcement and the drilled-in anchor and/or pin.
- C. Manufacturer shall provide on-site training for all personnel who will be installing post-installed adhesive anchors at the beginning of the work. Installation of anchors must be performed by a certified installer.
- D. Where manufacturer recommends use of special tools for installation of anchors, such tools shall be used, unless otherwise permitted specifically by the Engineer.
- E. Drill holes with rotary impact hammer drills using carbide-tipped bits. Bits must be of type required and permitted by ICC ESR report.
  1. Drill holes with rotary impact hammer drills using carbide-tipped bits or core drills using diamond core bits.
  2. Drill bits shall be of diameters as specified by the anchor manufacturer.

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3. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the concrete surface.
  4. Where anchors are to be installed in cored holes, use core bits with matched tolerances as specified by the manufacturer.
  5. Cored holes may only be used if acceptable to the Engineer and in compliance with ICC ESR report.
- F. Holes shall be cleared of debris after holes are drilled per manufacturer's instructions.
1. For adhesive installations, at a minimum, holes shall be blown out with oil-free compressed air and shall be brushed with a wire or nylon brush.
  2. Holes shall than be blown out one additional time with oil-free compressed air.
  3. Additional hole cleaning requirements may be required by manufacturer and ICC ESR Report.
- G. During adhesive curing time period, the temperature of the substrate shall be kept above the minimum substrate temperature as defined by the manufacturer. Contractor shall determine the appropriate means and methods to ensure that the temperature is kept above the required minimum temperature required before adhesive installation is begun.

### 3.05 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

### 3.06 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 45 33 - Code-Required Special Inspections.
- B. Inspection: Special inspection of post-installed anchors shall be provided as required by the ICC-ES report for that anchor and not less than the requirements of the Structural Drawings and the following (whichever is the most restrictive):
  1. Continuously observe the installation of all anchors, or as specified in the ICC report.
    - a. Minimum anchor embedments, proof loads and torques shall be as shown on the Drawings.
    - b. Load Testing: Per Structural General Notes on Drawings.
    - c. Verify anchor type, anchor dimensions, hole dimensions, anchor spacing, edge distances, anchor embedment and adherence to the manufacturer's published installation instructions.
    - d. For adhesive anchors also verify hole cleaning technique, adhesive expiration date and proper mixing and dispensing.
  2. Subsequent inspection of installation will be required when there is a change of personnel doing the installation. Change is defined as any one or more persons drilling or preparing holes, or installing anchors.
  3. Visually inspect 100% of all installed anchors.

C. Reporting:

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1. Daily reports shall reference the applicable ICC-ES report number, indicate that all specified criteria were complied with and provide itemized verification of all inspected items.
  2. Special Inspector shall immediately report any deviations from the requirements to the Architect.
- D. Defective Work:
1. Installations that are not accepted by the Special Inspector shall be considered defective.
  2. Provide additional testing and inspection to determine acceptability of defective work, as directed by the Architect at Contractor's expense.

### **3.07 REPAIR OF DEFECTIVE WORK**

- A. Remove and replace misplaced, defective or malfunctioning anchors at Contractor's expense. Replacement of anchors requires signed structural detail, unless otherwise noted.
- B. Fill empty anchor holes and patch failed anchor locations with high-strength, non-shrink non-metallic grout.

**END OF SECTION**

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## **SECTION 07 92 00 JOINT SEALANTS**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.
- D. District-provided field quality control.

#### **1.02 RELATED REQUIREMENTS**

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

#### **1.03 REFERENCE STANDARDS**

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- C. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- D. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
- E. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
- F. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.
- G. SWRI (VAL) - SWR Institute Validated Products Directory.

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
  - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
  - 2. List of backing materials approved for use with the specific product.
  - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
  - 4. Substrates the product should not be used on.
  - 5. Substrates for which use of primer is required.
  - 6. Installation instructions, including precautions, limitations, and recommended backing materials and tools.

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7. Sample product warranty.
8. Certification by manufacturer indicating that product complies with specification requirements.
9. SWRI Validation: Provide currently available sealant product validations as listed by SWRI (VAL) for specified sealants.
- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.
- F. Installation Plan: Submit at least four weeks prior to start of installation.
- G. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.
- H. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.
- I. Installation Log: Submit filled out log for each length or instance of sealant installed.
- J. Installer's Qualification Statement.

#### 1.05 QUALITY ASSURANCE

- A. Maintain one copy of each referenced document covering installation requirements on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.
- D. District will employ an independent testing agency to perform the field quality control inspection and testing as referenced in PART 3 of this section and as follows, to prepare and submit the field quality control plan and log, and to provide recommendations of remedies in the case of failure.
  1. Contractor shall cooperate with testing agency and repair failures discovered and destructive test location damage.
- E. Field Adhesion Test Procedures:
  1. Allow sealants to fully cure as recommended by manufacturer before testing.
  2. Have a copy of the test method document available during tests.
  3. Take photographs or make video records of each test, with joint identification provided in the photos/videos; for example, provide small erasable whiteboard positioned next to joint.

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4. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
  5. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
  6. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to District.
  7. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.
- F. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
1. Sample: At least 18 inches long.
  2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.
  3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.
  4. Record results on Field Quality Control Log.
  5. Repair failed portions of joints.
- G. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or other applicable method as recommended by manufacturer.

## 1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
  1. Adhesives Technology Corporation: [www.atcepoxy.com](http://www.atcepoxy.com).
  2. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).
  3. Dow Corning Corporation: [www.dowcorning.com/construction/sle](http://www.dowcorning.com/construction/sle).
  4. Fortifiber Building Systems Group: [www.fortifiber.com/sle](http://www.fortifiber.com/sle).
  5. Hilti, Inc: [www.us.hilti.com/#sle](http://www.us.hilti.com/#sle).
  6. Master Builders Solutions by BASF: [www.master-builders-solutions.basf.us/en-us/#sle](http://www.master-builders-solutions.basf.us/en-us/#sle).

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7. Momentive Performance Materials, Inc (formerly GE Silicones): [www.momentive.com/sle](http://www.momentive.com/sle).
  8. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
  9. QUIKRETE Companies: [www.quikrete.com/#sle](http://www.quikrete.com/#sle).
  10. Sherwin-Williams Company: [www.sherwin-williams.com](http://www.sherwin-williams.com).
  11. Sika Corporation: [www.usa-sika.com](http://www.usa-sika.com).
  12. Specified Technologies Inc: [www.stifirestop.com/#sle](http://www.stifirestop.com/#sle).
  13. Tremco Commercial Sealants & Waterproofing: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
  14. W.R. Meadows, Inc: [www.wrmeadows.com/sle](http://www.wrmeadows.com/sle).
  15. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
1. Adhesives Technology Corporation: [www.atcepoxy.com](http://www.atcepoxy.com).
  2. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).
  3. Dayton Superior Corporation: [www.daytonsuperior.com](http://www.daytonsuperior.com).
  4. Dow Corning Corporation: [www.dowcorning.com/construction/sle](http://www.dowcorning.com/construction/sle).
  5. Master Builders Solutions by BASF: [www.master-builders-solutions.basf.us/en-us/#sle](http://www.master-builders-solutions.basf.us/en-us/#sle).
  6. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
  7. QUIKRETE Companies: [www.quikrete.com/#sle](http://www.quikrete.com/#sle).
  8. Sherwin-Williams Company: [www.sherwin-williams.com](http://www.sherwin-williams.com).
  9. Sika Corporation: [www.usa-sika.com](http://www.usa-sika.com).
  10. Tremco Commercial Sealants & Waterproofing: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
  11. W.R. Meadows, Inc: [www.wrmeadows.com/sle](http://www.wrmeadows.com/sle).
  12. Substitutions: See Section 01 60 00 - Product Requirements.

## 2.02 JOINT SEALANT APPLICATIONS

- A. Scope:
1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
    - a. Wall expansion and control joints.
      - 1) Unit Masonry.
      - 2) Cement Plastering System.
      - 3) Metal and Composite Panels.
      - 4) Siding.
    - b. Construction joints in cast-in-place concrete
    - c. Joints between door, window, and other frames and adjacent construction.
    - d. Joints between different exposed materials.

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- e. Openings below ledge angles in masonry.
  - f. Control and expansion joints in ceilings and other overhead surfaces.
  - g. Other joints indicated below.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
- a. Joints between door, window, and other frames and adjacent construction.
  - b. Control and expansion joints on exposed interior surfaces of exterior walls.
  - c. Perimeter joints of exterior openings where indicated.
  - d. Control and expansion joints in tile.
  - e. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
    - 1) Exception: Such gaps and openings in gypsum board finished stud walls and suspended ceilings.
    - 2) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
  - f. Other joints indicated below.
3. Do not seal the following types of joints.
- a. Intentional weepholes in masonry.
  - b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
  - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
  - d. Joints where installation of sealant is specified in another section.
  - e. Joints between suspended panel ceilings/grid and walls.
- B. Type EP-1 - Exterior Joints: Use non-sag non-staining silicone sealant at storefront and openings, unless otherwise indicated.
- C. Type SM-1 - Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
- D. Type CP-1 - Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.
- E. Type IP-1 - Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
- F. Type IA-1 - Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
- G. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

## 2.03 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products with levels of volatile organic compound (VOC) content as indicated in Section 01 61 16.
- B. Colors: As indicated on the drawings. Match adjacent surface.

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## 2.04 NONSAG JOINT SEALANTS

- A. Type NS-1 - Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
  2. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
  3. Color: To be selected by Architect from manufacturer's full range.
  4. Cure Type: Single-component, neutral moisture curing.
  5. Service Temperature Range: Minus 20 to 180 degrees F.
  6. Manufacturers:
    - a. Dow; DOWSIL 790 Silicone Building Sealant: [www.dow.com/#sle](http://www.dow.com/#sle).
    - b. Dow; DOWSIL 791 Silicone Weatherproofing Sealant: [www.dow.com/#sle](http://www.dow.com/#sle).
    - c. Dow; DOWSIL 795 Silicone Building Sealant: [www.dow.com/#sle](http://www.dow.com/#sle).
    - d. Momentive Performance Materials, Inc (formerly GE Silicones): [www.momentive.com/sle](http://www.momentive.com/sle).
    - e. Pecora Corporation; Pecora 864 NST (Non-Staining Technology): [www.pecora.com/#sle](http://www.pecora.com/#sle).
    - f. Sika Corporation; Sikasil WS-290: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
    - g. Sika Corporation; Sikasil WS-295: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
    - h. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Color: To be selected by Architect from manufacturer's full range.
  2. Cure Type: Single-component, neutral moisture curing
  3. Service Temperature Range: Minus 65 to 180 degrees F.
  4. Manufacturers:
    - a. Fortifiber Building Systems Group; Moistop Sealant: [www.fortifiber.com/#sle](http://www.fortifiber.com/#sle).
    - b. Dow; DOWSIL 999-A Building and Glazing Sealant: [www.dow.com/#sle](http://www.dow.com/#sle).
    - c. Pecora Corporation; Pecora 890FTS (Field Tintable Smooth): [www.pecora.com/#sle](http://www.pecora.com/#sle).
    - d. Momentive Performance Materials, Inc (formerly GE Silicones): [www.momentive.com/sle](http://www.momentive.com/sle).
    - e. Sherwin-Williams Company; Silicone Rubber All Purpose Sealant: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
    - f. Sika Corporation; Sikasil GP: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
    - g. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Type FS-1 - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: White.

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2. Manufacturers:
  - a. BASF Construction Chemicals-Building Systems; OmniPlus, by Sonneborn Building Products Div.: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).
  - b. Dow Corning Corporation; 786 Silicone Sealant: [www.dowcorning.com](http://www.dowcorning.com).
  - c. Momentive Performance Materials, Inc (GE Silicones products); Silpruf SCS 1700 Sanitary: [www.momentive.com](http://www.momentive.com).
  - d. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): [www.pecora.com/#sle](http://www.pecora.com/#sle).
  - e. Sika Corporation; Sikasil GP: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
  - f. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Type ST-1 - Silyl-Terminated Polyether (STPE) and Polyurethane (STPU) Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
  1. Hardness Range: 20 to 40, Shore A, when tested in accordance with ASTM C661.
  2. Color: To be selected by Architect from manufacturer's full range.
  3. Service Temperature Range: Minus 40 to 180 degrees F.
  4. Manufacturers:
    - a. Sherwin-Williams Company; Stampede 100 Low-Modulus Hybrid Urethane Sealant: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
    - b. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Type PS-1 - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
  1. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
  2. Color: To be selected by Architect from manufacturer's full range.
  3. Service Temperature Range: Minus 40 to 180 degrees F.
  4. Manufacturers:
    - a. Master Builders Solutions; MasterSeal NP1: [www.master-builders-solutions.com/en-us/#sle](http://www.master-builders-solutions.com/en-us/#sle).
    - b. Sherwin-Williams Company; Stampede-1/-TX Polyurethane Sealant: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
    - c. Sika Corporation; Sikaflex-1a: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
    - d. Sika Corporation; Sikaflex-15 LM: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
    - e. W. R. Meadows, Inc; POURTHANE NS: [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
    - f. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Non-Sag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
  1. Movement Capability: Plus and minus 25 percent, minimum.
  2. Color: To be selected by Architect from manufacturer's full range.

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3. Service Temperature Range: Minus 40 to 180 degrees F.

## 2.05 SELF-LEVELING SEALANTS

- A. Self-Leveling Silicone Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.
  1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
  2. Hardness Range: 0 to 15, Shore A, when tested in accordance with ASTM C661.
  3. Color: To be selected by Architect from manufacturer's full range.
  4. Service Temperature Range: Minus 40 to 180 degrees F.
  5. Manufacturers:
    - a. Sika Corporation; Sikasil 728SL: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
    - b. Substitutions: See Section 01 60 00 - Product Requirements.
  6. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
  7. Color: To be selected by Architect from manufacturer's full range.
  8. Service Temperature Range: Minus 40 to 180 degrees F.
  9. Manufacturers:
    - a. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
    - b. Sherwin-Williams Company; Stampede 1SL Polyurethane Sealant: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
    - c. Sika Corporation; Sikaflex-1c SL: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Self-Leveling Polysulfide Sealant: ASTM C920, Grade P, Uses M and A; multicomponent; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
  1. Movement Capability: Plus and minus 25 percent.
  2. Hardness Range: 30 to 55, Shore A, when tested in accordance with ASTM C661.
  3. Color: To be selected by Architect from manufacturer's full range.
  4. Service Temperature Range: Minus 40 to 180 degrees F.
  5. Manufacturers:
    - a. W.R. Meadows, Inc; Deck-O-Seal (pourable): [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
    - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Semi-Rigid Self-Leveling Polyurea Joint Filler: Two-component, 100 percent solids; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
  1. Durometer Hardness, Type A: 75, minimum, after seven days when tested in accordance with ASTM D2240.
  2. Color: To be selected by Architect from manufacturer's standard colors.
  3. Joint Width, Minimum: 1/8 inch.

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4. Joint Depth: Provide product suitable for joints from 1/8 inch to 1 inch in depth excluding space for backer rod.
5. Manufacturers:
  - a. Adhesives Technology Corporation: [www.atcepoxy.com/#sle](http://www.atcepoxy.com/#sle).
  - b. ARDEX Engineered Cements; ARDEX ARDISEAL RAPID PLUS: [www.ardexamericas.com/#sle](http://www.ardexamericas.com/#sle).
  - c. Euclid Chemical Company; EUCO QWIKjoint UVR: [www.euclidchemical.com/#sle](http://www.euclidchemical.com/#sle).
  - d. Nox-Crete Inc; DynaFlex JF-85: [www.nox-crete.com/#sle](http://www.nox-crete.com/#sle).
  - e. Substitutions: See Section 01 60 00 - Product Requirements.

## 2.06 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
  1. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
  2. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.
- D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
  1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
  2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
  3. Record each test on Preinstallation Adhesion Test Log as indicated.
  4. If any sample fails, review products and installation procedures, consult manufacturer, or take whatever other measures are necessary to ensure adhesion; re-test in a different location; if unable to obtain satisfactory adhesion, report to Architect.

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5. After completion of tests, remove remaining sample material and prepare joint for new sealant installation.

### 3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

### 3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
  1. Width/depth ratio of 2:1.
  2. Neck dimension no greater than 1/3 of the joint width.
  3. Surface bond area on each side not less than 75 percent of joint width.
- E. Install bond breaker backing tape where backer rod cannot be used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

### 3.04 FIELD QUALITY CONTROL

- A. District will employ an independent testing agency to perform field quality control inspection and testing as specified in PART 1 under QUALITY ASSURANCE article.
- B. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet, notify Architect immediately.
- C. Destructive Adhesion Testing: If there are any failures in first 1000 linear feet, notify Architect immediately.
- D. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.
- E. Repair destructive test location damage immediately after evaluation and recording of results.

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### 3.05 POST-OCCUPANCY

- A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width; i.e. at low temperature in thermal cycle. Report failures immediately and repair.

**END OF SECTION**

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## SECTION 09 22 36 LATH

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Metal lath for cement plaster.
- B. Furring for metal lath.

#### 1.02 RELATED REQUIREMENTS

- A. Section 09 24 00 - Cement Plastering.

#### 1.03 REFERENCE STANDARDS

- A. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring.
- B. ASTM C847 - Standard Specification for Metal Lath.
- C. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- D. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- E. 2019 CBC Sections 2504, 2507, and 2510.
- F. Plaster Assemblies Manual - Technical Information Services Bureau (TSIB) of Western Walls & Ceilings Contractors Association (WWCCA); Current Edition.

#### 1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on furring and lathing components, structural characteristics, material limitations, and finish.

#### 1.05 QUALITY ASSURANCE

- A. Maintain one copy of each installation standard referenced on site throughout the duration of lathing and plastering work.
- B. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Metal Lath: All products listed are "or equal".
  - 1. Brand X Metals: [www.brandxmetals.com](http://www.brandxmetals.com).
  - 2. CEMCO: [www.cemcosteel.com/#sle](http://www.cemcosteel.com/#sle).

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3. Clarkwestern Dietrich Building Systems LLC: [www.clarkdietrich.com/#sle](http://www.clarkdietrich.com/#sle).
4. Fry Reglet: [www.fryreglet.com](http://www.fryreglet.com).
5. Pittcon Industries: [www.pittconindustries.com](http://www.pittconindustries.com).
6. Structa Wire Corporation; Structalath: [www.structawire.com/#sle](http://www.structawire.com/#sle).
7. Substitutions: See Section 01 60 00 - Product Requirements.

## **2.02 FRAMING AND LATH ASSEMBLIES**

- A. Provide completed assemblies with the following characteristics: See also CBC Table 1604A.3.
  1. Maximum Deflection of Vertical Assemblies: 1:360 under lateral point load of 100 lbs.
- B. Fire Rated Assemblies: Provide components complying with requirements for fire rated assemblies specified in the section where the plaster finish is specified.

## **2.03 FRAMING MATERIALS**

- A. Furring Channels: Formed steel, minimum 0.020 inch thick, 3/8 inch deep by 7/8 inch high, splicing permitted; galvanized.

## **2.04 LATH**

- A. Diamond Mesh Metal Lath: ASTM C847, galvanized; self-furring.
  1. Weight: To suit application comply with deflection criteria and as specified in ASTM C841 or ASTM C1063 for framing spacing.
  2. Minimum Weight: 3.4 lb/sq yd.
- B. Strip Mesh: Expanded metal lath, same weight as lath, 2 inch wide by 24 inch long; same finish as lath.
- C. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, maximum possible lengths.
  1. Material: Formed galvanized sheet steel, expanded metal flanges.

## **2.05 ACCESSORIES**

- A. Anchorage: Tie wire, nails, and other metal supports, of type and size to suit application; to rigidly secure materials in place, galvanized per ASTM C1063.
- B. Fasteners: Self-piercing tapping screws; ASTM C1002 or ASTM C954.

# **PART 3 EXECUTION**

## **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that substrates are ready to receive work and conditions are suitable for application.
- C. Do not begin until unacceptable conditions have been corrected.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

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### 3.02 INSTALLATION - GENERAL

- A. Install interior lath and furring for gypsum plaster in accordance with ASTM C841.
- B. Install metal lath and furring for Portland cement plaster in accordance with ASTM C1063.

### 3.03 LATH INSTALLATION

- A. Apply lath taut, with long dimension perpendicular to supports.
- B. Attach metal lath to supports using screws at maximum 12 inches on center.
- C. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.
- D. Place corner bead with mesh at external wall corners; fasten at outer edges of lath only.
- E. Place base screeds at termination of plaster areas; secure rigidly in place.
- F. Place 4 inch wide strips of lath centered over junctions of dissimilar backing materials, and secure rigidly in place.
- G. Place lath vertically above each top corner and each side of door frames to 6 inches above ceiling line.
- H. Place casing beads at terminations of plaster finish. Butt and align ends, cope or miter at corners. Secure rigidly in place, maximum 12 inches on centers..
- I. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

### 3.04 TOLERANCES

- A. Install accessories to lines and levels.
- B. Maximum Variation from True Lines and Levels: 1/8 inch in 10 feet.
- C. Maximum Variation from True Position: 1/8 inch.

**END OF SECTION**

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**SECTION 09 24 00  
CEMENT PLASTERING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Cement plastering.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 40 00 - Cold-Formed Metal Framing: Structural metal framing for plaster.
- B. Section 09 22 36 - Lath: Lath, beads, screeds, and joint accessories for plaster base.

**1.03 REFERENCE STANDARDS**

- A. ASTM C150/C150M - Standard Specification for Portland Cement.
- B. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- C. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster.
- D. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide data on plaster materials and trim accessories.
- C. Evaluation Service Reports: Show compliance with specified requirements.
- D. Samples:
  - 1. Submit two samples, 8 by 8 inch in size illustrating finish color and texture.
  - 2. Submit two samples of each type trim accessory.
- E. Installer's Qualification Statement.

**1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.
- B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

**1.06 FIELD CONDITIONS**

- A. Exterior Plaster Work: Do not apply plaster when substrate or ambient air temperature is 40 degrees F or lower, or when temperature is expected to drop below 40 degrees F within 48 hours of application.
- B. Interior Plaster Work: Maintain minimum ambient temperature of 50 degrees F during installation of plaster and until fully cured.

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## PART 2 PRODUCTS

### 2.01 CEMENT PLASTER APPLICATIONS

- A. Lath Plaster Base: Metal lath.
  - 1. Plaster Type: Factory prepared plaster mix.
  - 2. Number of Coats: Three.
  - 3. First Coat: Apply to a nominal thickness of 3/8 inch.
  - 4. Second Coat: Apply to a nominal thickness of 3/8 inch.
  - 5. Leveling Coat: Apply to a nominal thickness of 1/32 to 1/16 inch.
  - 6. Finish: Acrylic.

### 2.02 FACTORY PREPARED CEMENT PLASTER

- A. Exterior Portland cement plaster system made of scratch and brown base coat, leveling coat with reinforcing mesh, and acrylic finish coat; install in accordance with ASTM C926.
  - 1. Provide weather resistive barrier as part of the system.
  - 2. Manufacturers:
    - a. BASF Wall Systems: [www.wallsystems.basf.com/#sle](http://www.wallsystems.basf.com/#sle).
    - b. Dryvit; Commercial Cement Plaster (CCP) 4: [www.dryvit.com](http://www.dryvit.com).
    - c. LaHabra; FastWall 300: [www.lahabrastucco.com/#sle](http://www.lahabrastucco.com/#sle).
    - d. Omega Products International, Inc.; Super Cement with Crack Isolation System: [omega-products.com](http://omega-products.com).
    - e. Parex USA, Inc; Armourwall 300: [www.parexusa.com/#sle](http://www.parexusa.com/#sle).
    - f. Sto Corp; Sto Powerwall: [www.stocorp.com/#sle](http://www.stocorp.com/#sle).
    - g. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Premixed One-Coat Base: Mixture of Type I Portland cement complying with ASTM C150/C150M, hydrated lime complying with ASTM C207, fibers and other approved ingredients; install in accordance with ASTM C926.
  - 1. Manufacturers:
    - a. Omega Products International, Inc.; Diamond Wall Insulating One Coat System: [omega-products.com](http://omega-products.com).
- C. Premixed Base Coats: Mixture of cement, aggregate, fibers, and proprietary admixtures for scratch and brown coats; install in accordance with ASTM C926.
- D. Premixed Leveling Coat: Acrylic polymer-based blend approved for use with plaster manufacturer's base coat and finish materials.
- E. Painted Finish Coating: See Section 09 91 13.
- F. Primer: Acrylic, as recommended by coating manufacturer and compatible with plaster base coat.
- G. Premixed Textured Coating: Polymer modified acrylic coating, integrally colored, and trowel applied to substrates prepared in accordance with manufacturer's written installation

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instructions.

1. Color: To match approved sample.

### **2.03 ACCESSORIES**

- A. Lath: See Section 09 22 36.
- B. Finishing Accessories: See Section 09 22 36.
- C. Bonding Compound: Provide type recommended for bonding plaster to solid surfaces, complying with ASTM C932.
- D. Reinforcing Mesh: 4.5 oz/sq yd alkali-resistant mesh.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are properly in place.
- C. Verify mechanical and electrical equipment and services located within areas to receive this work have been properly tested and approved.

### **3.02 PREPARATION**

- A. Roughen smooth concrete surfaces and apply bonding compound in accordance with manufacturer's written installation instructions.

### **3.03 INSTALLATION - WATER-RESISTIVE BARRIER**

- A. Where the cement plaster is installed as part of a barrier wall system, install 2 layers of water-resistive barrier in accordance with water-resistive barrier manufacturer's instructions. Integrate water-resistive barrier with all flashing accessories, adjacent water-resistive barriers, doors, windows, penetrations, and cladding transitions.
- B. Apply water-resistive barrier horizontally with upper layer lapped over lower layer minimum 2 inches.
- C. Lap water-resistive barrier minimum 6 inches at vertical joints.
- D. In two layer applications, start with two horizontal layers at bottom of exterior wall or structure.

### **3.04 MIXING**

- A. Mix only as much plaster as can be used prior to initial set.
- B. Mix materials dry, to uniform color and consistency, before adding water.
- C. Protect mixtures from frost or freezing temperatures, contamination, and excessive evaporation.

### **3.05 APPLICATION**

- A. Apply plaster in accordance with manufacturer's written instructions and comply with ASTM C926.

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- B. Base Coats:
  - 1. Apply base coat(s) to fully embed lath and to specified thickness.
  - 2. Follow guidelines in ASTM C926 and manufacturer's written installation instructions for moist curing base coats and application of subsequent coats.
- C. Leveling Coat:
  - 1. Apply leveling coat to specified thickness.
  - 2. Fully embed reinforcing mesh in leveling coat.
- D. Finish Coats:
  - 1. Cement Plaster:
    - a. Apply with sufficient material and pressure to ensure complete coverage of base to specified thickness.
    - b. Apply desired surface texture while mix is still workable.
    - c. Float to a consistent finish.
  - 2. Primer and Acrylic Coatings:
    - a. Remove surface contaminants such as dust and dirt without damaging substrate.
    - b. Apply primer in accordance with manufacturer's instructions.
    - c. Apply finish coating in number of coats and to thickness recommended by manufacturer.
    - d. Finish coat to match existing texture.
- E. Finish Painting Overcoat: See Section 09 91 13 - Exterior Painting.

### **3.06 TOLERANCES**

- A. Maximum Variation from True Flatness: 1/4 inch in 10 feet.

### **3.07 REPAIR**

- A. Patching: Remove loose, damaged or defective plaster and replace with plaster of same composition; finish to match surrounding area.

## **END OF SECTION**

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**SECTION 23 00 10**  
**MECHANICAL GENERAL REQUIREMENTS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Work includes, but is not limited to, the following:
  - 1. Labor, material, equipment and transportation to complete the Work as shown on the drawings, specified herein and/or implied thereby.
  - 2. A requirement of the plumbing sections shall be to provide make-up water and drain final connections to systems and equipment.
  - 3. It is the intent of the project that the installation be coordinated to provide a complete and usable facility.
- B. Work not included in this division:
  - 1. Painting, except as hereinafter specified. See Division 9 for painting.
  - 2. Electrical, except for controls hereinafter specified. See Division 26 for electrical.
- C. Related Sections include the following:
  - 1. Division 23 Section 23 09 80 "Mechanical Commissioning."
  - 2. Division 23 Section 23 00 50 "Basic Mechanical Materials and Methods."

**1.02 DEFINITIONS**

- A. Unless otherwise specified, "all clarification from," "field direction by," "submittals to," "approved by," "processed by," "permission from," and like mentioned herein shall mean from/by/to Architect.
- B. "Provide" means furnish and install referenced item with all appurtenances.
- C. "Shall" indicates a mandatory requirement.
- D. "Air conditioning" is defined as the treatment and/or handling of any air to any degree by the systems shown on the drawings and herein specified and is not restricted to refrigerated cooling.

**1.03 DELIVERY AND STORAGE OF MATERIALS**

- A. Provide for the safety and good condition of all materials and equipment until final acceptance by the Owner. Protect all materials and equipment from damage from any cause whatever, and provide adequate and proper storage facilities during the progress of the work. Replace all damaged and defective work, material or equipment prior to filing application for final acceptance. Properly protect all openings to equipment, piping, ductwork, accessories, etc. from dirt, dust, and debris prior to and during installation of the work. Ductwork stored at the jobsite shall be covered to protect from dirt, dust, debris, fire proofing, etc.

**1.04 CODES AND STANDARDS**

- A. Work and materials shall be in full accordance with the latest rules and regulations of the Local Fire Marshal; the National Electric Code (NEC); the Uniform Plumbing Code; the California Plumbing Code; California Administrative Code, Title 24, (CAL/OSHA); Local Building Codes; the

Uniform Mechanical Code; the California Mechanical Code; Vol. II of the Uniform Building Code; Volume I and II of the California Building Code; SMACNA "Guidelines for Seismic Restraints of Mechanical Systems"; and other applicable codes, laws or regulations of bodies lawfully empowered and having jurisdiction over this project. Nothing in the plans or specifications shall be construed to permit work not conforming to these codes. When codes conflict with one another, provide larger, higher or more restrictive standards without additional costs.

#### **1.05 PERMITS**

- A. Obtain all permits, patent rights, and licenses that are required for the performing of this work by all laws, ordinances, rules and regulations, or orders of any officer and/or body. Provide all notices necessary in connection therewith, and pay all fees relating thereto and all costs and expenses incurred on account thereof. No work shall be covered before inspection by the jurisdictional authorities and observation by the Architect or the owner's designated representatives.

#### **1.06 EXPLANATION AND PRECEDENCE OF DRAWINGS**

- A. Drawings and specifications are intended to be read together so that any work mentioned in one and not the other shall be executed the same as if mentioned in both.
- B. For purposes of clearness and legibility, drawings are essentially diagrammatic. The size and location of equipment is drawn to scale wherever possible. Contractor shall make use of data in the contract documents and shall verify this information at the building site.
- C. Where the contract specifications and/or drawings are in conflict, obtain clarification of such during bidding. Where addenda for clarification of such is not timely, base the bid on the higher standards or more restrictive requirements; prior to fabrication, obtain written clarification.
- D. The drawings indicate required size and points of termination of pipes, and suggest proper routes to conform to structure, avoid obstructions and preserve clearances. It is not intended that drawings indicate necessary offsets. The Contractor shall make the installation in such a manner as to conform to the structure, avoid obstructions, preserve headroom and keep openings and passageways clear, without further instructions or costs to the Owner.
- E. It is intended that apparatus be located symmetrical with architectural elements. Refer to architectural details in completing the correlating work.
- F. The Contractor shall study drawings and specifications including, and not limited to, architectural, structural, mechanical, plumbing, fire protection, and electrical to determine conflict with ordinances and statutes. Errors or omissions shall be reported in writing, and changes shall be included in the as-built drawings and the additional work performed at no cost to the Owner.
- G. Submittal of bid shall indicate the Contractor has examined the site and drawings and has included required allowances in his bid. No allowance shall be made for any error resulting from Contractor's failure to visit job site and to review drawings and specifications. Bid shall include costs for required drawings and changes as outline above, all at no cost to owner.

#### **1.07 RECORD DRAWINGS**

- A. In addition for requirements for shop drawings specified elsewhere, provide and maintain on the job one complete set of blue line prints of the record drawings for all the mechanical and

plumbing work. Carefully record on this set of prints, work including piping, valves, etc., which is installed differently from that indicated in the specifications and on the drawings; locate dimensionally from fixed points. The depth shall be indicated for all plugged wyes, tees and capped lines.

- B. These record drawings shall be continuously kept up-to-date, and shall be available for inspection at all times. Existing lines discovered shall be indicated on these drawings.
- C. At completion of work, provide a neat and legible reproducible set of these up-to-date record drawings which shall be individually signed and dated by the Contractor and the job inspector as to their accuracy.
- D. Record drawings shall be submitted for acceptance and approval to the Architect and Mechanical Engineer before final certificate of acceptance will be issued.
- E. Record drawings shall show the exact location of all control sensor devices.

#### **1.08 CUTTING AND PATCHING**

- A. Perform all cutting and fitting required for work of this section in rough construction of the building. Obtain permission of the Structural Engineer prior to cutting any structural building elements.
- B. All patching of finished construction of building shall be performed under the sections of specifications covering these materials by the trades at no additional cost to the Owner.
- C. All cutting of concrete work by Contractor shall be by core drilling or concrete saw. No cutting or coring shall be done without first obtaining the permission of the Architect and Owner.
- D. All patching of existing surfaces shall match existing material and finish.

#### **1.09 DAMAGE BY LEAKS**

- A. Contractor shall be responsible for damage to the grounds, walks, roads, buildings, finishes, surfaces, materials, equipment, piping systems, electrical systems and their equipment and contents, caused by leaks in the piping systems being installed or having been installed herein. He shall repair at his expense all damage so caused. All repair work shall be done as directed by the Architect and Owner.

#### **1.10 EMERGENCY REPAIRS**

- A. The Owner reserves the right to make emergency repairs as required to keep equipment in operation without voiding the Contractor's guarantee bond nor relieving the Contractor of his responsibilities.

#### **1.11 LOCATIONS**

- A. Coordinate in advance of the work, requirements for openings, equipment maintenance clearances, recesses and chases in the walls, partitions, equipment housekeeping pads, framing or openings. Should furnishing this information be neglected, delayed or incorrect and additional cutting is found to be required, the cost of same shall be borne by the Contractor. Nothing in this paragraph shall be construed to relieve the Contractor of the responsibility for providing and paying for the required core drilling and openings in existing work.
- B. Diagrammatic Indications on Drawings are:
  - 1. Approximate only.

2. At various locations shown distorted for clarity.
- C. Exact Locations Shall:
  1. Be as required for proper installation in available space.
  2. Avoid interference with architectural, electrical and structural features.
  3. Be coordinated with the work of other trades toward the general purpose of having the work progress rapidly and smoothly with a minimum interference between one trade and another.
  4. Preserve headroom and keep openings and passageways clear.
  5. Have a neat arrangement symmetrical to the building lines, light and tile pattern.
  6. Be reasonably accessible for hung ceiling areas for maintenance from the floor below. Equipment, valves, and other items requiring maintenance, adjustment and/or observation shall be accessible.

#### **1.12 SUPPORTS, EQUIPMENT PADS, STAGING, ETC.**

- A. Construction supports required for the proper installation of equipment shall be in accordance with the drawings, manufacturer's requirements, seismic requirements, and applicable codes. Check architectural and structural drawings for equipment pads by others. Provide staging, scaffolds, platforms, ladders or similar facilities required to properly install the work.

#### **1.13 INTERRUPTION OF UTILITIES**

- A. The Contractor shall schedule and coordinate all interruptions of utilities with the Architect and Owner within 30 days after award of contract. The Contractor shall submit to the Owner a schedule of proposed interruptions. At least 72 hours prior to the interruption, the contractor shall submit a request indicating the proposed date and duration of interruption, the work to be accomplished, the areas which will be affected and a proposed contingency plan to be followed in the event that normal service or facilities cannot be restored on schedule. Do not commence work until the time, date, and contingency have been approved in writing by the Architect and Owner.
- B. Provide any labor and materials necessary to restore services on a contingency basis should normal service or facilities not be restored on schedule.
- C. Preparatory work associated with each interruption shall be performed during normal work hours. The actual interruption required for tie-in shall be performed between 8 P.M. and 5 A.M. Maximum shutdown during this period of any system shall be 4 hours.

#### **1.14 SUBSTITUTIONS**

- A. If substitutions of controls or equipment requires any changes in the architectural, structural, mechanical, plumbing or electrical work from that shown on the drawings(including all environmental characteristics), the extra cost of the equipment or architectural, structural, mechanical, plumbing or electrical work shall be responsibility of the Contractor requesting the substitution. All substitutions shall be approved by the Architect before purchase by the contractor.
- B. If the Contractor proposes substitutions of any equipment specified herein or on the drawings, it shall be the Contractor's responsibility to obtain approval from the Architect for such equipment as well as approval for anchorage of such equipment from the Architect, Structural



Engineer, and governing approval agencies (Department of the State Architects - DSA),. All costs required for such approval shall be the responsibility of the Contractor requesting the substitution.

#### **1.15 PREPARATION OF SUBMITTALS**

- A. Prior to commencement of work and in accordance with the General Requirements, submit for review six copies of proposed equipment and material submittals. The Contractor shall verify the delivery dates are compatible with the specified construction schedule; and verify the equipment is sized to accommodate the conditions specified. Submittals shall include manufacturer's names and model numbers and shall comply with specifications and drawings. The Contractor shall bear the cost of changes necessary to accommodate substitutions if substitution is approved.
- B. Provide formal submittal to Architect. Review of the formal submittal is only for general conformance with design concept of project and general compliance with the information given in the contract documents. The Contractor is responsible for confirmation and correlation of the dimensions, quantities and sizes, for information that pertains to fabrication methods or construction techniques, and for coordination of work of all trades. Deviations from Drawings and Specifications shall be clearly and completely indicated (by a separate letter) in the formal submittals. Reviewed Submittals shall not relieve the Contractor of responsibility for errors or deviations.
  - 1. Where specific model numbers and/or manufacturers are specified or shown, it is the intent of the contract documents to procure the specified item(s). Alternate equipment may not be used unless data is submitted for consideration as a substitution in accordance with General Requirements and this section.
  - 2. Model numbers used may not indicate all features or options required for this specific installation. Modify the specified models to comply with the requirements, as specified or shown.
  - 3. Product Data for Proposed Substitutions:
    - a. Submit copies of complete data, with drawings and samples as appropriate, including:
      - 1) Comparison of the qualities of the proposed substitution with that specified.
      - 2) Changes required in other elements of the work because of the substitution.
      - 3) Affect on construction schedule.
      - 4) Cost data comparing the proposed substitution with the product specified.
      - 5) Availability of maintenance service and source of replacement materials.
      - 6) Reference to three (3) projects similar to this where such equipment is installed and operating to two (2) or more years.
    - b. Acceptance of substitutions is entirely at the discretion of the Architect.
- C. Formal submittals shall be complete with catalog data and information properly marked to indicate equality of material (where substitution is allowed and desired), adequacy in capacity and performance to meet minimum capacities or performance as specified or indicated. Arrange the submittals in the same sequence as these Specifications and indicate the Section

and Paragraph number (in the upper right-hand side with tabs) for which each submittal is intended. Incomplete submittals shall be rejected.

- D. Do not fabricate order or deliver materials or equipment until formal submittals have been approved. Where material or equipment is used without such permission, it is deemed that the material or equipment shall be in complete compliance with drawings and specifications, without additional cost where such compliance is lacking and may be required to be altered in the field.
- E. Submittals shall be bound and shall include, at a minimum, the following:
  - 1. Complete bill of materials listing equipment furnished.
  - 2. Catalog cut sheets of every component being provided (highlighted).
  - 3. Provide completed blue-line shop drawings of the packaged equipment detailing all field connection points.
  - 4. Dimensions, clearance requirements, weights, and capacities.
  - 5. Wiring diagrams showing control interface as applicable.
  - 6. Warranty sheets.
  - 7. Pressure drops as applicable.
- F. Contractor shall incur all costs for time spent by Engineer for review of more than two submittals on each item. Costs shall be based on Engineer's hourly billing rate schedule at the time of review. Rate schedule available upon request. Engineer shall invoice the contractor upon completion of review and shall be paid by the contractor within 30 days of date of invoice. Failure to remit will withdraw approval (if any) of submittals in question.

#### **1.16 SHOP DRAWINGS:**

- A. Proceed with preparation of shop drawings immediately upon receiving an authorization to proceed for the project. Shop drawings shall be originally prepared by the contractor. Provide minimum 1/4" scale shop drawings in electronic format. Submit a complete set in one package prior to material fabrication, order and installation.
- B. Include:
  - 1. Duct and pipe elevations and sizes.
  - 2. Double line ductwork and piping (4" and larger).
  - 3. Actual size of purchased equipment from certified shop drawings.
  - 4. Access panels including ceiling panels.
  - 5. Access clearances for equipment.
  - 6. Actual locations of ceiling diffusers/ supply registers and return registers.
  - 7. Actual locations of manual volume dampers.
  - 8. Locations of structural penetrations such as beams.
  - 9. Actual location of control panels and power connections to equipment.
  - 10. Color coded duct and piping based on material used.
  - 11. Label and tag schedule for equipment.
  - 12. Duct transitions to clear beams or tight areas.

13. Room temperature sensor locations.
  14. Point of connection to utilities outside the building.
  15. Sections or 3-dimensional drawings of congested areas.
  16. Gridlines.
  17. Duct and piping supports on roof.
- C. Coordinate with other trades in preparation of shop drawings.
  - D. Submit a copy of coordinated shop drawings to General Contractor for distribution to other trades, including electrical and fire sprinkler contractor.
  - E. Submit to commissioning agent for approval to assure design intent is met.
  - F. Prior to fabrication and upon receiving approval from commissioning agent, submit a complete set of shop drawings at one time to the mechanical engineer.

#### **1.17 ELECTRICAL REQUIREMENTS**

- A. Coordinate the following items with Division 26:
  1. Power wiring
  2. Power Supply Voltage Requirements
  3. Safety switches
  4. Combination controllers
  5. Disconnect switches
  6. Motor starters
  7. Circuit breakers
  8. Motor-control equipment forming part of motor control centers or switchgear assemblies
  9. Electrical connections of the mechanical equipment to the electrical power source shall be coordinated with and provided under Division 26.

#### **1.18 MOTORS**

- A. Before order is placed for electrical devices, the Contractor shall check with the Electrical contractor and verify requirements as to type, mounting and current characteristics as well as to any special delivery instructions. Motors provided under Division 23 shall be minimum of 10% normal rating above brake horsepower (BHP) rating of equipment driven.

#### **1.19 TESTS**

- A. Contractor shall make tests required by legally constituted authorities and as listed below.
  1. Tests shall be made in the presence of the Owner or his representative and a duly authorized inspector. The Owner or his representative shall be notified 5 days before tests are made.
  2. Concealed work and insulated work shall remain uncovered until required testing has been performed and approved by the Owner. If work to be tested is covered before the approval of the Owner or his authorized representative has been obtained, it shall be uncovered for testing at the Contractor's expense.

3. Obtain required documents of certification indicating approval, acceptance and compliance with the requirements of all administrative authorities having jurisdiction over the work. No final payment shall be made until all such certificates are delivered to the Owner.
4. Furnish labor, materials, instruments and bear other costs in connection with all tests.
5. Piping systems, except as hereinafter noted, shall be given hydrostatic (with water) test of a least 150% of the maximum operating pressure but no less than 150 psig.
6. Before making test, remove or valve off from the system, gauges, traps, and other apparatus or equipment which may be damaged by test pressure.
7. Install a calibrated test pressure gauge in the system to observe any loss in pressure. Maintain the required test pressure for a sufficient length of time to enable an inspection to be made of all joints and connections. Perform tests after installation and prior to acceptance.
8. Final pressures at the end of the test period shall be no more or less than that caused by expansion or contraction of the test medium due to temperature changes.
9. After tests have been made and leaks repaired, clean and flush systems as hereinafter specified. Water piping shall be left under supply main pressure for the balance of the construction period.
10. Tests for mechanical, plumbing, and fire protection systems are specified within their own section. Equipment and ductwork system tests are specified in the test and balance section.
11. Provide necessary provisions and tests for maintaining the operational condition and cleanliness of existing systems.

#### **1.20 LABOR AND MATERIALS**

- A. Labor shall be carefully skilled for this kind of work, and under the direction of a competent foreman.
- B. Materials shall be new, in perfect condition and of domestic manufacturer. Materials for similar uses to be of same type and manufacturer.
- C. Equipment shall bear the manufacturer's label showing performance characteristics. Identifying size number shall be given only when it is not practicable or customary to show performance characteristics.
- D. Valves, pipe, fittings, etc., shall bear the manufacturer's name or trademark.
- E. Unless otherwise specified herein, equipment and fixtures shall be installed in accordance with the manufacturer's recommendations, including recommended service and removal clearances.

#### **1.21 PROTECTION AND CLEAN-UP**

- A. Protection: Provide for the safety and good condition of materials and equipment until final acceptance of the Architect. Protect materials and equipment from dirt, dust, debris, and damage from any cause whatever, and provide adequate and proper storage facilities during the progress of the work and replace all damaged and defective material, equipment or work precedent to filing application for final acceptance.
- B. Cleaning:

1. Unless a more stringent requirement is specified, thoroughly clean all parts of the piping, ductwork, fixtures, apparatus and equipment. All parts shall be thoroughly cleaned of dirt, dust, debris, cement, plaster and other materials, and all grease and oil spots removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out. Clean all systems, including piping and ductwork prior to test.
2. Exposed rough metal work shall be carefully brushed down with steel brushes to remove rust and other spots and left in clean condition to receive painter's finish. Where factory prime coat has been damaged, this Contractor shall be responsible for restoration of same.

## **1.22 ACCESS PANELS**

- A. Access Doors and Panels:
  1. Wherever volume dampers, fire dampers, smoke fire dampers, controls, valves or other items or parts of the installation which require periodic inspection or adjustments are concealed by permanent non-removable construction, an access door shall be provided. Rating of access panel shall be determined by rating of wall or ceiling in which panel is installed. Types to be as approved and as appropriate for the surface and construction in which it is installed. Verify all locations with Architect and other trades.
  2. Access doors and panels shall be of sufficient size and shall be located properly to assure service to the intended item.

## **1.23 MAINTENANCE, OPERATION INSTRUCTION**

- A. General: Thoroughly instruct the Owner's operators in every detail of operation of the system. Provide the Owner with a list of all equipment, giving the manufacturer's name, model number, serial number, parts list and complete internal wiring diagrams. All directions for operation furnished by the manufacturer shall be carefully saved and turned over to the Owner, together with written sequence of operation, operating and maintenance instructions for each system and its equipment. Instruction shall consist of a minimum of four 8-hour periods over consecutive days and shall be 30% classroom and 70% at site location. Coordinate scheduling of instruction times with Owner's operators.
- B. Specific Data: Submit four complete sets of the following data to the Owner for approval and commissioning agent for review prior to acceptance of the installation, complete and at one time; (partial or separate data will not be accepted) data shall consist of the following:
  1. Valve Directory: Indicating valve number, location, function and normal operating position for each.
  2. Color code schedule.
  3. Equipment: List of name plates, including name plate data.
  4. Manufacturer's Literature: Copies of manufacturer's instructions for operation and maintenance of all mechanical equipment, including replacement parts lists and drawings. Mark or highlight brochure literature indicating the models, sizes, capacities, curve operating points, etc., in a manner to clearly indicate the equipment installed. Remove all pages or sheets from the bulletin and catalogs that do not pertain to equipment installed on the project.

5. Written Instructions: Typewritten instructions for operation and maintenance of the system composed of OPERATING INSTRUCTIONS, MAINTENANCE INSTRUCTIONS and a MAINTENANCE SCHEDULE.
  - a. OPERATING INSTRUCTIONS shall contain a brief description of the system. Adjustments requiring the technical knowledge of the service agency personnel shall not be included in the operating instructions. The fact such adjustments are required, however, shall be noted.
  - b. MAINTENANCE INSTRUCTIONS shall list each item of equipment requiring inspection, lubrication or service and describe the performance of such maintenance.
  - c. MAINTENANCE SCHEDULE shall list each item of equipment requiring maintenance, shall show the exact type of maintenance on every component of each item of equipment, and shall show when each item of equipment should be inspected or services.
6. Instructions: Operating personnel shall be instructed in the operation of the system in accordance with typewritten, approved instructions.
- C. Binders: Provide complete sets of the above data in loose-leaf ring-type binders with permanent covers, with identification on front and on spine.

#### **1.24 SPECIAL REQUIREMENTS**

- A. During the guarantee period and as directed by the Owner, make any additional tests, adjustment, etc., that may be required and correct any defects or deficiencies arising from operation of the systems. Operational tests shall be made during both heating and cooling seasons and on all systems.
- B. Completion:
  1. The entire mechanical system shall be commissioned in accordance with ASHRAE Guideline 1-1996 and the requirements of this specification. A final commissioning report shall be approved by the Owner, Architect, and Mechanical Engineer prior to final acceptance of the work.
  2. When the installation is complete and adjustments specified herein have been made, the system, shall be operated for a period of one week, during which time it shall be demonstrated to the Owner or his representative as being completed and operating in conformance with these specifications. The Contractor shall schedule all work so that this time period, which is to confirm a "bug-free" system, will occur before the total project is accepted for substantial completion by Owner.
  3. The work hereunder shall not be reviewed for final acceptance until operating and maintenance data, manufacturer's literature, valve directories, piping identification code directory, and nameplates specified herein have been approved and properly posted in the building.

#### **1.25 WARRANTY/GUARANTEE**

- A. The contractor shall warranty/guarantee that materials, apparatus, and equipment furnished and installed under the mechanical division of these specifications shall be new and free from all defects. Should any defects develop, within one year (unless a longer period is listed in other sections of the specifications) from the date of final acceptance by the owner or from

the date of certificate of substantial completion, whichever is earlier, due to inferior or faulty materials and/or workmanship, the trouble shall be corrected by this Contractor without expense to the Owner. Any defective materials or inferior workmanship noticed at the time of installation or during the guarantee period shall be corrected immediately to the entire satisfaction of the Owner.

B. The work shall be installed of such materials and in such a manner that:

1. The operation of all parts of the system shall be noiseless to the extent that no objectionable sound of operation will be heard outside of the rooms enclosing the apparatus or equipment.
2. Apparatus or equipment shall operate in accordance with detailed specifications covering each item.
3. Contractor shall, at his own expense, make any adjustments or changes required to produce a condition of quietness satisfactory to the Engineer or his representative. Such adjustments or changes shall not reduce the performance or quantities called for on the drawings.
4. Contractor shall guarantee that his installation of all materials and equipment will meet the performance requirements of these specifications and that all equipment will deliver the specified or required capacities.
5. The Owner reserves the right to make temporary or emergency repairs as necessary to keep equipment in operating condition without voiding the guarantee contained herein nor relieving the Contractor of his responsibilities during the guarantee period.
6. Contractor shall be responsible for all damage to any part of the premises caused by leaks or break in pipe lines, fixtures or equipment furnished and installed under his contract for a period of one year after date of acceptance of the project by Owner. He shall replace in kind, at his own expense, any and all items so damaged to the complete satisfaction of the Owner.

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**SECTION 23 00 50**  
**BASIC MECHANICAL MATERIALS AND METHODS**

**1.01 SUMMARY**

- A. This Section includes the following basic mechanical materials and methods to complement other Division 23 Sections.
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Concrete base construction requirements.
  - 3. Escutcheons.
  - 4. Dielectric fittings.
  - 5. Flexible connectors.
  - 6. Mechanical sleeve seals.
  - 7. Equipment nameplate data requirements.
  - 8. Labeling and identifying mechanical systems and equipment is specified in Division 23 Section "Identification for HVAC Piping and Equipment."
  - 9. Nonshrink grout for equipment installations.
  - 10. Field-fabricated metal and wood equipment supports.
  - 11. Installation requirements common to equipment specification sections.
  - 12. Cutting and patching.
  - 13. Touchup painting and finishing.
- B. Pipe and pipe fitting materials are specified in Division 23 piping system Sections.
- C. Related Sections include the following:

**1.02 DEFINITIONS**

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for rubber materials:
  - 1. CR: Chlorosulfonated polyethylene synthetic rubber.
  - 2. EPDM: Ethylene propylene diene terpolymer rubber.

### **1.03 SUBMITTALS**

- A. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.
- B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.
- C. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.
- D. Coordination Drawings: For access panel and door locations.
- E. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
  - 1. Planned piping layout, including valve and specialty locations and valve-stem movement.
  - 2. Clearances for installing and maintaining insulation.
  - 3. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
  - 4. Equipment and accessory service connections and support details.
  - 5. Exterior wall and foundation penetrations.
  - 6. Fire-rated wall and floor penetrations.
  - 7. Sizes and location of required concrete pads and bases.
  - 8. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
  - 9. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
  - 10. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.
- F. Samples: Of color, lettering style, and other graphic representation required for each identification material and device.

### **1.04 QUALITY ASSURANCE**

- A. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.
- B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
- C. Protect flanges, fittings, and piping specialties from moisture and dirt.
- D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

### **1.06 SEQUENCING AND SCHEDULING**

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section.
- G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Dielectric Unions:
    - a. Epco Sales Inc.
    - b. Watts Industries, Inc.; Water Products Div.
    - c. Zurn Industries, Inc.; Wilkins Div.
  - 2. Dielectric Flanges:
    - a. Epco Sales Inc.
    - b. Watts Industries, Inc.; Water Products Div.
  - 3. Dielectric-Flange Insulating Kits:
    - a. Calpico, Inc.

- b. Central Plastics Co.
- 4. Dielectric Couplings:
  - a. Calpico, Inc.
  - b. Lochinvar Corp.
- 5. Dielectric Nipples:
  - a. Grinnell Corp.; Grinnell Supply Sales Co.
  - b. Victaulic Co. of America.
- 6. Mechanical Sleeve Seals:
  - a. Calpico, Inc.
  - b. Metraflex Co.
  - c. Thunderline/Link-Seal.

## **2.02 PIPE AND PIPE FITTINGS**

- A. Refer to individual Division 23 piping Sections for pipe and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

## **2.03 JOINING MATERIALS**

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32.
  - 1. Alloy E: Approximately 95 percent tin and 5 percent antimony, lead free.
- F. Brazing Filler Metals: AWS A5.8.
  - 1. BCuP Series: Copper-phosphorus alloys.
  - 2. BAg1: Silver alloy.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.
- I. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.

1. Sleeve: ASTM A 126, Class B, gray iron.
2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

#### **2.04 DIELECTRIC FITTINGS**

- A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.
- B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.
- C. Insulating Material: Suitable for system fluid, pressure, and temperature.
- D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
- E. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
- F. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
  1. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure as required to suit system pressures.
- G. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
- H. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

#### **2.05 MECHANICAL SLEEVE SEALS**

- A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

#### **2.06 PIPING SPECIALTIES**

- A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
  1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
  2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
  3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
  4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
    - a. Underdeck Clamp: Clamping ring with setscrews.
  5. PE: Manufactured, reusable, tapered, cup shaped, smooth outer surface, with nailing flange for attaching to wooden forms.

- B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
  - 1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
  - 2. OD: Completely cover opening.
  - 3. Cast Brass: Split casting, with concealed hinge and set screw.
    - a. Finish: Rough brass.
    - b. Finish: Polished chrome-plate.
  - 4. Stamped Steel: One piece, with spring clips and chrome-plated finish.
  - 5. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome-plated finish.
  - 6. Cast-Iron Floor Plate: One-piece casting.

## **2.07 GROUT**

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
  - 1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psig, 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

## **PART 3 - EXECUTION**

### **3.01 PIPING SYSTEMS - COMMON REQUIREMENTS**

- A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 23 piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.
- C. Install piping at indicated slope.
- D. Install components with pressure rating equal to or greater than system operating pressure.
- E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping free of sags and bends.
- G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- I. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. Install fittings for changes in direction and branch connections.

- L. Install couplings according to manufacturer's written instructions.
- M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
  - 1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish.
  - 2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
  - 3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
  - 4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
  - 5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.
- N. Sleeves are not required for core drilled holes.
- O. Permanent sleeves are not required for holes formed by PE removable sleeves.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Build sleeves into walls and slabs as work progresses.
  - 3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
    - b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
    - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Sections for flashing.
      - 1) Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.
  - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Refer to Division 7 Sections for materials.
  - 5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.
- Q. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
  - 2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.

3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- R. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials. Refer to Division 7 Sections for materials.
- T. Verify final equipment locations for roughing-in.
- U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- V. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
  1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
  2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
  3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
  4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
  5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
    - a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    - b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
    - c. Align threads at point of assembly.
    - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    - e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
  6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
  7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and



gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

- W. Piping Connections: Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
  2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
  3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### **3.02 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS**

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- E. Install equipment giving right of way to piping installed at required slope.
- F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

### **3.03 PAINTING AND FINISHING**

- A. Refer to Division 9 Section "Painting" for paint materials, surface preparation, and application of paint.
- B. Apply paint to exposed piping according to the following, unless otherwise indicated:
  1. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
  2. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
  3. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
  4. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
  5. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.

- 6. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
- C. Paint visible sheet metal behind ceiling inlets and outlets flat black.
- D. Do not paint piping specialties with factory-applied finish.
- E. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### **3.04 CONCRETE BASES**

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

### **3.05 ERECTION OF METAL SUPPORTS AND ANCHORAGE**

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

### **3.06 ERECTION OF WOOD SUPPORTS AND ANCHORAGE**

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

### **3.07 CUTTING AND PATCHING**

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

### **3.08 GROUTING**

- A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placing of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases to provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout according to manufacturer's written instructions.

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**SECTION 23 05 29**  
**HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. This Section includes the following hangers and supports for mechanical system piping and equipment:
  - 1. Steel pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Metal framing systems.
  - 4. Thermal-hanger shield inserts.
  - 5. Fastener systems.
  - 6. Pipe stands.
  - 7. Pipe positioning systems.
  - 8. Equipment supports.
- B. Related Sections include the following:
  - 1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
  - 2. Division 21 Section "Wet-Pipe Sprinkler Systems" for pipe hangers for fire-protection piping.
  - 3. Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation devices.
  - 4. Division 23 Section "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
  - 5. Division 23 Section "Metal Ducts" for duct hangers and supports.

**1.02 DEFINITIONS**

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

**1.03 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
  - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

#### **1.04 SUBMITTALS**

- A. Product Data: For the following:
  1. Steel pipe hangers and supports.
  2. Thermal-hanger shield inserts.
  3. Powder-actuated fastener systems.
  4. Pipe positioning systems.
- B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.
- C. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
  1. Trapeze pipe hangers. Include Product Data for components.
  2. Metal framing systems. Include Product Data for components.
  3. Pipe stands. Include Product Data for components.
  4. Equipment supports.
- D. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  1. Detail fabrication and assembly of trapeze hangers.
  2. Design Calculations: Calculate requirements for designing trapeze hangers.
- E. Welding Certificates.

#### **1.05 QUALITY ASSURANCE**

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- B. Welding: Qualify procedures and personnel according to the following:
  1. AWS D1.1, "Structural Welding Code--Steel."

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

## **2.02 STEEL PIPE HANGERS AND SUPPORTS**

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
  - 1. B-Line Systems, Inc.; a division of Cooper Industries.
  - 2. ERICO/Michigan Hanger Co.
  - 3. Grinnell Corp.
  - 4. National Pipe Hanger Corporation.
  - 5. PHD Manufacturing, Inc.
  - 6. PHS Industries, Inc.
  - 7. Piping Technology and Products, Inc.
  - 8. Tolco, Inc.
- C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

## **2.03 TRAPEZE PIPE HANGERS**

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

## **2.04 METAL FRAMING SYSTEMS**

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Manufacturers:
  - 1. B-Line Systems, Inc.; a division of Cooper Industries.
  - 2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
  - 3. Power-Strut Div.; Tyco International, Ltd.
  - 4. Unistrut Corp.; Tyco International, Ltd.
  - 5. Thomas & Betts Corporation
  - 6. Tolco, Inc.
- C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

## **2.05 THERMAL-HANGER SHIELD INSERTS**

- A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Manufacturers:
  - 1. ERICO/Michigan Hanger Co.
  - 2. Pipe Shields, Inc.

3. Rilco Manufacturing Company, Inc.
- C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.
- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

## **2.06 FASTENER SYSTEMS**

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
  1. Manufacturers:
    - a. Hilti, Inc.
    - b. ITW Ramset/Red Head.
    - c. Masterset Fastening Systems, Inc.
- B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated or stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
  1. Manufacturers:
    - a. B-Line Systems, Inc.; a division of Cooper Industries.
    - b. Hilti, Inc.
    - c. ITW Ramset/Red Head.

## **2.07 PIPE STAND FABRICATION**

- A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
  1. Manufacturers:
    - a. ERICO/Michigan Hanger Co.
    - b. MIRO Industries.
- C. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.
  1. Manufacturers:
    - a. MIRO Industries.
- D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
  1. Manufacturers:



- a. ERICO/Michigan Hanger Co.
  - b. MIRO Industries.
  - c. Portable Pipe Hangers.
- 2. Base: Plastic.
- 3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
- 4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.
- E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
  - 1. Manufacturers:
    - a. Portable Pipe Hangers.
  - 2. Bases: One or more plastic.
  - 3. Vertical Members: Two or more protective-coated-steel channels.
  - 4. Horizontal Member: Protective-coated-steel channel.
  - 5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.
- F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

## **2.08 PIPE POSITIONING SYSTEMS**

- A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.
- B. Manufacturers:
  - 1. C & S Mfg. Corp.
  - 2. HOLDRITE Corp.; Hubbard Enterprises.
  - 3. Samco Stamping, Inc.

## **2.09 EQUIPMENT SUPPORTS**

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

## **2.10 MISCELLANEOUS MATERIALS**

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
  - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.

## **PART 3 - EXECUTION**

### **3.01 HANGER AND SUPPORT APPLICATIONS**

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
  - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
  - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
  - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
  - 5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
  - 6. Adjustable Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8.
  - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
  - 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
  - 9. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
  - 10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
  - 11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
  - 12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
  - 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
  - 14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.

15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
  16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
  17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
  18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.
  19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
  20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
  21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
  2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
  2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
  3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
  4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
  5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
  3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
  6. C-Clamps (MSS Type 23): For structural shapes.
  7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
  8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
  9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
  10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
  11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
  12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    - a. Light (MSS Type 31): 750 lb.
    - b. Medium (MSS Type 32): 1500 lb.
    - c. Heavy (MSS Type 33): 3000 lb.
  13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
  14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
  15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
  2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
  3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
  4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
  5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.

6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
  - a. Horizontal (MSS Type 54): Mounted horizontally.
  - b. Vertical (MSS Type 55): Mounted vertically.
  - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- O. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

### **3.02 HANGER AND SUPPORT INSTALLATION**

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
  1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
  2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
  1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Pipe Stand Installation:
1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
  2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 Sections for roof accessories and curbs.
- G. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 22 Sections for plumbing fixtures.
- H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- K. Install lateral bracing with pipe hangers and supports to prevent swaying.
- L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- M. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- O. Insulated Piping: Comply with the following:
1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
  2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
  3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

- a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
- 4. Shield Dimensions for Pipe: Not less than the following:
  - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
  - b. NPS 4: 12 inches long and 0.06 inch thick.
  - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
  - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
  - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
- 5. Pipes NPS 8 and Larger: Include wood inserts.
- 6. Insert Material: Length at least as long as protective shield.
- 7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### **3.03 EQUIPMENT SUPPORTS**

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

### **3.04 METAL FABRICATIONS**

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

### **3.05 ADJUSTING**

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

### **3.06 PAINTING**

- A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

- B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION



**SECTION 23 05 93**  
**TESTING, ADJUSTING, AND BALANCING FOR HVAC**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:
  - 1. Balancing airflow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
  - 2. Adjusting total HVAC systems to provide indicated quantities.
  - 3. Measuring electrical performance of HVAC equipment.
  - 4. Setting quantitative performance of HVAC equipment.
  - 5. Verifying that automatic control devices are functioning properly.
  - 6. Measuring sound and vibration.
  - 7. Reporting results of the activities and procedures specified in this Section.
- B. Related Sections include the following:
  - 1. Division 23 Section 23 09 80 "Mechanical Commissioning."
  - 2. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.
  - 3. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

**1.02 DEFINITIONS**

- A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.
- B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.
- C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.
- D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.
- E. Report Forms: Test data sheets for recording test data in logical order.
- F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.
- G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.
- H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

- I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.
- J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.
- K. Test: A procedure to determine quantitative performance of a system or equipment.
- L. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.
- M. AABC: Associated Air Balance Council.
- N. AMCA: Air Movement and Control Association.
- O. CTI: Cooling Tower Institute.
- P. NEBB: National Environmental Balancing Bureau.
- Q. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

### **1.03 SUBMITTALS**

- A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.
- B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.
- C. Contract Documents Examination Report: Within 45 days from the Contractor's Notice to Proceed, submit 2 copies of the Contract Documents review report as specified in Part 3 of this Section.
- D. Strategies and Procedures Plan: Within 60 days from the Contractor's Notice to Proceed, submit 2 copies of the testing, adjusting, and balancing strategies and step-by-step procedures as specified in Part 3 "Preparation" Article below. Include a complete set of report forms intended for use on this Project.
- E. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.
- F. Sample Report Forms: Submit 2 sets of sample testing, adjusting, and balancing report forms.
- G. Warranty: Submit 2 copies of special warranty specified in the "Warranty" Article below.

### **1.04 QUALITY ASSURANCE**

- A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by either AABC or NEBB.
- B. Testing, Adjusting, and Balancing Conference: Meet with the Owner's and the Architect's representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Provide 7 days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:
  - a. Submittal distribution requirements.
  - b. Contract Documents examination report.
  - c. Testing, adjusting, and balancing plan.
  - d. Work schedule and Project site access requirements.
  - e. Coordination and cooperation of trades and subcontractors.
  - f. Coordination of documentation and communication flow.
- C. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:
  1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
  2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.
- D. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing."
- E. Testing, Adjusting, and Balancing Reports: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
- F. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards.
- G. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."
- H. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

#### **1.05 PROJECT CONDITIONS**

- A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

#### **1.06 COORDINATION**

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.
- B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.
- C. Perform testing, adjusting, and balancing after leakage and pressure tests on air distribution systems have been satisfactorily completed.

#### **1.07 WARRANTY**

- A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

- B. National Project Performance (or special) Guarantee: Provide a guarantee on AABC'S "National Standards" (or NEBB) forms stating that AABC (or NEBB) will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:
  - 1. The certified Agent has tested and balanced systems according to the Contract Documents.
  - 2. Systems are balanced to optimum performance capabilities within design and installation limits.

## **PART 2 - PRODUCTS (Not Applicable)**

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.
  - 1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
  - 2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- B. Examine approved submittal data of HVAC systems and equipment.
- C. Examine Architect's and Engineer's design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- D. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.
- E. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.
- F. Examine system and equipment test reports.
- G. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and

fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

- H. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- I. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- J. Examine fan coil units to verify that they are accessible and their controls are connected and functioning.
- K. Examine plenums, utilized for outside air, to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.
- L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- M. Examine equipment for installation and for properly operating safety interlocks and controls.
- N. Examine automatic temperature system components to verify the following:
  - 1. Dampers, valves, and other controlled devices operate by the intended controller.
  - 2. Dampers and valves are in the position indicated by the controller.
  - 3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions.
  - 4. Automatic modulating and shutoff valves are properly connected.
  - 5. Thermostats are located to avoid adverse effects of sunlight, drafts, and cold walls.
  - 6. Sensors are located to sense only the intended conditions.
  - 7. Sequence of operation for control modes is according to the Contract Documents.
  - 8. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
  - 9. Interlocked systems are operating.
  - 10. Changeover from heating to cooling mode occurs according to design values.
- O. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

### **3.02 PREPARATION**

- A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.
- B. Complete system readiness checks and prepare system readiness reports. Verify the following:
  - 1. Permanent electrical power wiring is complete.
  - 2. Automatic temperature-control systems are operational.
  - 3. Equipment and duct access doors are securely closed.
  - 4. Balance, smoke, and fire dampers are open.
  - 5. Isolating and balancing valves are open and control valves are operational.

6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
7. Windows and doors can be closed so design conditions for system operations can be met.

### **3.03 GENERAL TESTING AND BALANCING PROCEDURES**

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC national standards (or NEBB's Procedural Standards for Testing Adjusting, and Balancing of Environmental Systems") and this Section.
- B. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.
- C. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.
- D. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

### **3.04 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES**

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- D. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.
- J. Check for proper sealing of air-handling unit components.

### **3.05 CONSTANT-VOLUME AIR SYSTEMS' BALANCING PROCEDURES**

- A. The procedures in this Article apply to constant-volume supply-, return-, and exhaust-air systems. Additional procedures are required for variable-air-volume, and process exhaust-air systems. These additional procedures are specified in other articles in this Section.
- B. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:
    - a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
    - b. Measure static pressure directly at the fan outlet or through the flexible connection.
    - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
    - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
  2. Measure static pressure across each air-handling unit component.
    - a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
  3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers under final balanced conditions.
  4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
  5. Adjust fan speed higher or lower than design with the approval of the Architect. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
  6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.
- C. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.
1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
    - a. Where sufficient space in submains and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
  2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submains and branch ducts to design airflows within specified tolerances.
- D. Measure terminal outlets and inlets without making adjustments.
1. Measure terminal outlets using a direct-reading hood or the outlet manufacturer's written instructions and calculating factors.
- E. Adjust terminal outlets and inlets for each space to design airflows within specified tolerances of design values. Make adjustments using volume dampers rather than extractors and the dampers at the air terminals.

1. Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

### **3.06 MOTORS**

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
  1. Manufacturer, model, and serial numbers.
  2. Motor horsepower rating.
  3. Motor rpm.
  4. Efficiency rating if high-efficiency motor.
  5. Nameplate and measured voltage, each phase.
  6. Nameplate and measured amperage, each phase.
  7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

### **3.07 TEMPERATURE TESTING**

- A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.
- B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of 2 successive 8-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.
- C. Measure outside-air, wet- and dry-bulb temperatures.

### **3.08 TEMPERATURE-CONTROL VERIFICATION**

- A. Verify that controllers are calibrated and commissioned.
- B. Check transmitter and controller locations and note conditions that would adversely affect control functions.
- C. Record controller settings and note variances between set points and actual measurements.
- D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).
- E. Verify free travel and proper operation of control devices such as damper and valve operators.
- F. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow measurements. Note the speed of response to input changes.
- G. Confirm interaction of electrically operated switch transducers.
- H. Confirm interaction of interlock and lockout systems.
- I. Verify main control supply-air pressure and observe compressor and dryer operations.
- J. Record voltages of power supply and controller output. Determine if the system operates on a grounded or nongrounded power supply.



- K. Note operation of electric actuators using spring return for proper fail-safe operations.

### **3.09 TOLERANCES**

- A. Set HVAC system airflow rates within the following tolerances:
  - 1. Supply, Return and Exhaust Fans: Plus 10 percent to minus 5 percent.
  - 2. Air Outlets and Inlets: Plus 10 percent to minus 5 percent.

### **3.10 REPORTING**

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

### **3.11 FINAL REPORT**

- A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
  - 1. Include a list of the instruments used for procedures, along with proof of calibration.
- C. Final Report Contents: In addition to the certified field report data, include the following:
  - 1. Fan curves.
  - 2. Manufacturers' test data.
  - 3. Field test reports prepared by system and equipment installers.
  - 4. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.
- D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:
  - 1. Title page.
  - 2. Name and address of testing, adjusting, and balancing Agent.
  - 3. Project name.
  - 4. Project location.
  - 5. Architect's name and address.
  - 6. Engineer's name and address.
  - 7. Contractor's name and address.
  - 8. Report date.

9. Signature of testing, adjusting, and balancing Agent who certifies the report.
10. Summary of contents, including the following:
  - a. Design versus final performance.
  - b. Notable characteristics of systems.
  - c. Description of system operation sequence if it varies from the Contract Documents.
11. Nomenclature sheets for each item of equipment.
12. Data for terminal units, including manufacturer, type size, and fittings.
13. Notes to explain why certain final data in the body of reports vary from design values.
14. Test conditions for fans and pump performance forms, including the following:
  - a. Settings for outside-, return-, and exhaust-air dampers.
  - b. Conditions of filters.
  - c. Cooling coil, wet- and dry-bulb conditions.
  - d. Face and bypass damper settings at coils.
  - e. Fan drive settings, including settings and percentage of maximum pitch diameter.
  - f. Variable speed drive settings for variable-air-volume systems.
  - g. Settings for supply-air, static-pressure controller.
  - h. Other system operating conditions that affect performance.
- E. System Diagrams: Include schematic layouts of air distribution systems. Present with single-line diagrams and include the following:
  1. Quantities of outside, supply, return, and exhaust airflows.
  2. Duct, outlet, and inlet sizes.
  3. Pipe and valve sizes and locations.
  4. Balancing stations.
- F. Air-Handling Unit Test Reports: For air-handling and fan coil units with coils, include the following:
  1. Unit Data: Include the following:
    - a. Unit identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and unit size.
    - e. Manufacturer's serial number.
    - f. Unit arrangement and class.
    - g. Discharge arrangement.
    - h. Sheave make, size in inches, and bore.
    - i. Sheave dimensions, center-to-center and amount of adjustments in inches.
    - j. Number of belts, make, and size.
    - k. Number of filters, type, and size.

2. Motor Data: Include the following:
    - a. Make and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.
    - e. Sheave make, size in inches, and bore.
    - f. Sheave dimensions, center-to-center and amount of adjustments in inches.
  3. Test Data: Include design and actual values for the following:
    - a. Total airflow rate in cfm.
    - b. Total system static pressure in inches wg.
    - c. Fan rpm.
    - d. Discharge static pressure in inches wg.
    - e. Filter static-pressure differential in inches wg.
    - f. Cooling coil static-pressure differential in inches wg.
    - g. Heating coil static-pressure differential in inches wg.
    - h. Outside airflow in cfm.
    - i. Return airflow in cfm.
    - j. Outside-air damper position.
    - k. Return-air damper position.
- G. Fan Test Reports: For supply and exhaust fans, include the following:
1. Fan Data: Include the following:
    - a. System identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and size.
    - e. Manufacturer's serial number.
    - f. Arrangement and class.
    - g. Sheave make, size in inches, and bore.
    - h. Sheave dimensions, center-to-center and amount of adjustments in inches.
  2. Motor Data: Include the following:
    - a. Make and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.
    - e. Sheave make, size in inches, and bore.
    - f. Sheave dimensions, center-to-center and amount of adjustments in inches.
    - g. Number of belts, make, and size.

3. Test Data: Include design and actual values for the following:
  - a. Total airflow rate in cfm.
  - b. Total system static pressure in inches wg.
  - c. Fan rpm.
  - d. Discharge static pressure in inches wg.
  - e. Suction static pressure in inches wg.
- H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
  1. Report Data: Include the following:
    - a. System and air-handling unit number.
    - b. Location and zone.
    - c. Traverse air temperature in deg F.
    - d. Duct static pressure in inches wg.
    - e. Duct size in inches.
    - f. Duct area in sq. ft..
    - g. Design airflow rate in cfm.
    - h. Design velocity in fpm.
    - i. Actual airflow rate in cfm.
    - j. Actual average velocity in fpm.
    - k. Barometric pressure in psig.
  - I. Compressor and Condenser Reports: For refrigerant side of unitary systems, stand-alone refrigerant compressors, air-cooled condensing units, include the following:
    1. Unit Data: Include the following:
      - a. Unit identification.
      - b. Location.
      - c. Unit make and model number.
      - d. Manufacturer's compressor serial numbers.
      - e. Compressor make.
      - f. Compressor model and serial numbers.
      - g. Refrigerant weight in lb.
      - h. Low ambient temperature cutoff in deg F.
    2. Test Data: Include design and actual values for the following:
      - a. Entering-air, dry-bulb temperature in deg F.
      - b. Leaving-air, dry-bulb temperature in deg F.
      - c. Control settings.
      - d. Unloader set points.
      - e. Low-pressure-cutout set point in psig.

- f. High-pressure-cutout set point in psig.
  - g. Suction pressure in psig.
  - h. Suction temperature in deg F.
  - i. Condenser refrigerant pressure in psig.
  - j. Condenser refrigerant temperature in deg F.
  - k. Oil pressure in psig.
  - l. Oil temperature in deg F.
  - m. Voltage at each connection.
  - n. Amperage for each phase.
  - o. The kW input.
  - p. Crankcase heater kW.
  - q. Number of fans.
  - r. Condenser fan rpm.
  - s. Condenser fan airflow rate in cfm.
  - t. Condenser fan motor make, frame size, rpm, and horsepower.
  - u. Condenser fan motor voltage at each connection.
  - v. Condenser fan motor amperage for each phase.
- J. Instrument Calibration Reports: For instrument calibration, include the following:
- 1. Report Data: Include the following:
    - a. Instrument type and make.
    - b. Serial number.
    - c. Application.
    - d. Dates of use.
    - e. Dates of calibration.

### **3.12 ADDITIONAL TESTS**

- A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION

**SECTION 23 07 19**  
**HVAC PIPING INSULATION**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes insulating the following HVAC piping systems:
  - 1. Condensate drain piping, indoors.
  - 2. Refrigerant suction and hot-gas piping, indoors and outdoors.

**1.02 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).
- B. LEED Submittals:
  - 1. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.
  - 2. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.

**1.03 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

### **1.06 COORDINATION**

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

### **1.07 SCHEDULING**

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## **PART 2 - PRODUCTS**

### **2.01 INSULATION MATERIALS**

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Aeroflex USA, Inc.; Aerocel.
    - b. Armacell LLC; AP Armaflex.
    - c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.
- G. Mineral-Fiber, Preformed Pipe Insulation:
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Johns Manville; Micro-Lok.
    - b. Knauf Insulation; 1000-Degree Pipe Insulation.

- c. Owens Corning; Fiberglas Pipe Insulation.
- 2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, without factory-applied jacket.

## **2.02 ADHESIVES**

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
    - b. Eagle Bridges - Marathon Industries; 225.
    - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
    - d. Mon-Eco Industries, Inc.; 22-25.
  - 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  - 1. Verify that systems to be insulated have been tested and are free of defects.
  - 2. Verify that surfaces to be insulated are clean and dry.
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
  - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils (0.127 mm) thick and an epoxy finish 5 mils (0.127 mm) thick if operating in a temperature range between 140 and 300 deg F (60 and 149 deg C). Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
  - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F (0 and 149 deg C) with an epoxy coating. Consult coating manufacturer for



appropriate coating materials and application methods for operating temperature range.

### **3.03 GENERAL INSTALLATION REQUIREMENTS**

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- O. For above-ambient services, do not install insulation to the following:
  - 1. Vibration-control devices.
  - 2. Testing agency labels and stamps.

3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

### **3.04 PENETRATIONS**

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  1. Seal penetrations with flashing sealant.
  2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
  4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
  1. Comply with requirements in Section 07 84 00 "Firestopping" for firestopping and fire-resistive joint sealers.
- D. Insulation Installation at Floor Penetrations:
  1. Pipe: Install insulation continuously through floor penetrations.
  2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 84 00 "Firestopping."

### **3.05 GENERAL PIPE INSULATION INSTALLATION**

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
  1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
  2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

### **3.06 INSTALLATION OF MINERAL-FIBER INSULATION**

- A. Insulation Installation on Straight Pipes and Tubes:
  1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
  2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
  3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches (150 mm) o.c.
  4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Fittings and Elbows:
  1. Install preformed sections of same material as straight segments of pipe insulation when available.
  2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

### **3.07 FIELD-APPLIED JACKET INSTALLATION**

- A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
  1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

### **3.08 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
  1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

### **3.09 PIPING INSULATION SCHEDULE, GENERAL**

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  - 1. Drainage piping located in crawl spaces.
  - 2. Underground piping.
  - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### **3.10 INDOOR PIPING INSULATION SCHEDULE**

- A. Condensate and Equipment Drain Water below 60 Deg F (16 Deg C):
  - 1. All Pipe Sizes: Insulation shall be the following: Retain one or more of six subparagraphs below.
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch (13 mm) thick.
- B. Refrigerant Suction and Hot-Gas Piping:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
    - b. Flexible Elastomeric: 1 inch thick.
- C. Refrigerant Suction and Hot-Gas Flexible Tubing:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
    - b. Flexible Elastomeric: 1 inch thick

### **3.11 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE**

- A. Refrigerant Suction and Hot-Gas Piping:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.
    - b. Flexible Elastomeric: 1-1/2 inch thick.
- B. Refrigerant Suction and Hot-Gas Flexible Tubing:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.
    - b. Flexible Elastomeric: 1-1/2 inch thick.

### **3.12 INDOOR, FIELD-APPLIED JACKET SCHEDULE**

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:

1. None.
- D. Piping, Exposed:

1. None.

### **3.13 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE**

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
1. None.
- D. Piping, Exposed:
1. PVC: 30 mils thick.

END OF SECTION

**SECTION 23 09 00**  
**INSTRUMENTATION AND CONTROL FOR HVAC**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Furnish all labor, materials, equipment, and service necessary for a complete and operating temperature and lighting control system, utilizing Direct Digital Controls as shown on the drawings and as described herein. Drawings are diagrammatic only.
- B. All labor, material, equipment and software not specifically referred to herein or on the plans, that is required to meet the functional intent of this specification, shall be provided without additional cost to the Owner.
- C. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s).

**1.02 SYSTEM DESCRIPTION**

- A. The entire temperature and lighting control system shall be comprised of a network of interoperable, stand-alone digital controllers communicating via LonMark/LonTalk communication protocols to a Network Area Controller (NAC). Temperature Control System products shall be manufactured by Honeywell. Equivalent LonWorks products must be approved in writing by the consulting Engineer and be submitted for approval ten (10) days prior to the date of the bid submittal.
- B. The Temperature and Lighting Control System as provided in this Division shall be based on the Honeywell WEBs System incorporating the Niagara Framework™. Equivalent products must be approved in writing by the consulting Engineer and be submitted for approval ten (10) days prior to the date of the bid submittal. Systems not developed on the Niagara Framework platform are unacceptable.

**1.03 SUBMITTAL**

- A. Eight copies of shop drawings of the components and devices for the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers catalog data sheets and installation instructions for all controllers, valves, dampers, sensors, routers, etc. Shop drawings shall also contain complete wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings. A complete written Sequence of Operation shall also be included with the submittal package.
- B. Submittal shall also include a trunk cable schematic diagram depicting operator workstations, control panel locations and a description of the communication type, media and protocol.
- C. Submittal shall also include a complete point list of all points to be connected to the temperature and lighting control system. Controls Contractor shall provide necessary point lists, protocol documentation, and factory support information for systems provided.
- D. Submittal shall also include a copy of each of the graphics developed for the Graphic User Interface including a flowchart (site map) indicating how the graphics are to be linked to one another for system navigation. The graphics are intended to be 80% - 90% complete at this

stage with the only remaining changes to be based on review comments from the A/E design team and/or Owner.

- E. Include the following display graphics for each of the sites:
  - 1. Site plan view of entire campus identifying each building – include the display of outside air temperature & humidity.
  - 2. Individual buildings, including room layout with display of all space temperatures and occupied mode, outside air temperature & humidity.
  - 3. Mechanical equipment display for each AC unit to include space temperature, heating and cooling setpoints, supply air temperature, fan status, occupied mode, outside temperature & humidity.
  - 4. Boiler and hot water pumps showing all related points.
  - 5. Page showing all room temperatures, room temperature setpoints, occupied mode, AC unit fan status and AC unit mode (heating or cooling).
  - 6. Page showing integrated lighting control points and other miscellaneous points.
- F. Upon completion of the work, provide a complete set of 'as-built' drawings and application software on compact disk. Drawings shall be provided as AutoCAD™ or Visio™ compatible files. Eight copies of the 'as-built' drawings shall be provided in addition to the documents on compact disk. Controls Contractor shall provide as-builts for their portions of work.

#### **1.04 SPECIFICATION NOMENCLATURE**

- A. Acronyms used in this specification are as follows:

NAC	Network Area Controller
IDC	Interoperable Digital Controller
IBC	Interoperable BACnet Controller
GUI	Graphical User Interface
WBI	Web Browser Interface
POT	Portable Operator's Terminal
PMI	Power Measurement Interface
DDC	Direct Digital Controls
LAN	Local Area Network
WAN	Wide Area Network
OOT	Object Oriented Technology
PICS	Product Interoperability Compliance Statement

#### **1.05 AGENCY AND CODE APPROVALS**

- A. All products of the temperature and lighting control system shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided with the submittal package. Systems or products not currently offering the following approvals are not acceptable.
  - 1. UL-916; Energy Management Systems
  - 2. C-UL listed to Canadian Standards Association C22.2 No. 205-M1983 "signal Equipment"
  - 3. CE

4. FCC, Part 15, Subpart J, Class A Computing Devices

**1.06 SOFTWARE LICENSE AGREEMENT**

- A. The Owner shall agree to the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.
- B. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). In addition, the Owner shall receive ownership of all job specific configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and/or configured for use with the Server(s), and any related LAN / WAN / Intranet and Internet connected routers and devices. Any and all required IDs and passwords for access to any component or software program shall be provided to the owner. The owner shall determine which organizations to be named in the SI organization ID ("orgid") of all software licenses. Owner shall be free to direct the modification of the "orgid" in any software license, regardless of supplier.

**1.07 DELIVERY, STORAGE AND HANDLING**

- A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

**1.08 JOB CONDITIONS**

- A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to ensure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural features.

**PART 2 - MATERIALS**

**2.01 ACCEPTABLE CONTROL MANUFACTURER/CONTRACTOR**

- A. Honeywell "Authorized Controls Integrator" – R & R Controls Inc.  
4564 B Alvarado Canyon Road  
San Diego, CA 92120  
ph. 619-516-1880  
fx. 619 516-1881

**2.02 GENERAL**

- A. The temperature and lighting control system shall be comprised of a network of interoperable, stand-alone digital controllers, a computer system, graphical user interface software, printers, network devices, valves, dampers, sensors, and other devices as specified herein. All systems and software within temperature and lighting control system shall be Year 2000 compliant and shall be supported by compliance documentation from the manufacturer.



- B. The installed system shall provide secure password access to all features, functions and data contained in the overall temperature and lighting control system.

### **2.03 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES**

- A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate ANSI/ASHRAE Standard 135-2001 BACnet, LonWorks technology, MODBUS, OPC, and other open and proprietary communication protocols in one open, interoperable system.
- B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. In addition, adherence to industry standards including ANSI / ASHRAE™ Standard 135-2001, BACnet and LonMark to assure interoperability between all system components is required. For each LonWorks device that does not have LonMark certification, the device supplier must provide an XIF file and a resource file for the device. For each BACnet device, the device supplier must provide a PICS document showing the installed device's compliance level. Minimum compliance is Level 3; with the ability to support data read and write functionality. Physical connection of BACnet devices shall be via Ethernet (BACnet Ethernet/IP,) and/or RS-485 (BACnet MSTP) as specified.
- C. All components and controllers supplied under this Division shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.
- D. The supplied system must incorporate the ability to access all data using standard Web browsers without requiring proprietary operator interface and configuration programs. An Open Database Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on a supplier-installed server for all database access. Systems requiring proprietary database and user interface programs shall not be acceptable.
- E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.
  - 1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces.
  - 2. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

### **2.04 NETWORKS**

- A. The Local Area Network (LAN) shall be a 100 Megabits/sec Ethernet network supporting BACnet, Java, XML, HTTP, and SOAP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Area Controllers (NACs), user workstations and, if specified, a local server.
- B. Local area network minimum physical and media access requirements:
  - 1. Ethernet; IEEE standard 802.3
  - 2. Cable; 100 Base-T, UTP-8 wire, category 5
  - 3. Minimum throughput; 100 Mbps.

## **2.05 NETWORK ACCESS**

- A. Remote Access.
  - 1. For Local Area Network installations, provide access to the LAN from a remote location, via the Internet. The Owner shall provide a connection to the Internet to enable this access via high-speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line, T1 Line or via the customer's Intranet to a corporate server providing access to an Internet Service Provider (ISP). Customer agrees to pay monthly access charges for connection and ISP.

## **2.06 NETWORK AREA CONTROLLER (NAC)**

- A. The Network Area Controller (NAC) shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the NAC. It shall be capable of executing application control programs to provide:
  - 1. Calendar functions
  - 2. Scheduling
  - 3. Trending
  - 4. Alarm monitoring and routing
  - 5. Time synchronization
  - 6. Integration of LonWorks controller data and BACnet controller data
  - 7. Network Management functions for all LonWorks based devices
- B. The Network Area Controller must provide the following hardware features as a minimum:
  - 1. One Ethernet Port – 10/100 Mbps
  - 2. One RS-232 port
  - 3. One LonWorks Interface Port – 78KB FTT-10A
  - 4. One RS-485 ports
  - 5. Battery Backup
  - 6. Flash memory for long term data backup (If battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity)
  - 7. The NAC must be capable of operation over a temperature range of 32 to 122°F
  - 8. The NAC must be capable of withstanding storage temperatures of between 0 and 158°F
  - 9. The NAC must be capable of operation over a humidity range of 5 to 95% RH, non-condensing
- C. The NAC shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the NAC shall be an ODBC-compliant database or must provide an ODBC data access mechanism to read and write data stored within it.
- D. The NAC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 32 simultaneous users.
- E. Event Alarm Notification and actions

1. The NAC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
  2. The NAC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up telephone connection, or wide-area network.
  3. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but limited to:
    - a. To alarm
    - b. Return to normal
    - c. To fault
    - d. Provide for the creation of a minimum of eight of alarm classes for the purpose of routing types and or classes of alarms, i.e.: security, HVAC, Fire, etc.
  4. Provide timed (schedule) routing of alarms by class, object, group, or node.
  5. Provide alarm generation from binary object "runtime" and /or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.
- F. Control equipment and network failures shall be treated as alarms and annunciated.
- G. Alarms shall be annunciated in any of the following manners as defined by the user:
1. Screen message text
  2. Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:
    - a. Day of week
    - b. Time of day
    - c. Recipient
  3. Pagers via paging services that initiate a page on receipt of email message
  4. Graphic with flashing alarm object(s)
  5. Printed message, routed directly to a dedicated alarm printer
- H. The following shall be recorded by the NAC for each alarm (at a minimum):
1. Time and date
  2. Location (building, floor, zone, office number, etc.)
  3. Equipment (air handler #, access way, etc.)
  4. Acknowledge time, date, and user who issued acknowledgement.
  5. Number of occurrences since last acknowledgement.
- I. Alarm actions may be initiated by user defined programmable objects created for that purpose.
- J. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.
- K. A log of all alarms shall be maintained by the NAC and/or a server (if configured in the system) and shall be available for review by the user.

- L. Provide a “query” feature to allow review of specific alarms by user-defined parameters.
- M. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.
- N. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.

## **2.07 Data Collection and Storage**

- A. The NAC shall have the ability to collect data for any property of any object and store this data for future use.
- B. The data collection shall be performed by log objects, resident in the NAC that shall have, at a minimum, the following configurable properties:
  - 1. Designating the log as interval or deviation.
  - 2. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
  - 3. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
  - 4. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
  - 5. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.
- C. All log data shall be stored in a relational database in the NAC and the data shall be accessed from a server (if the system is so configured) or a standard Web browser.
- D. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.
- E. All log data shall be available to the user in the following data formats:
  - 1. HTML
  - 2. XML
  - 3. Plain Text
  - 4. Comma or tab separated values
- F. Systems that do not provide log data in HTML and XML formats at a minimum shall not be acceptable.
- G. The NAC shall have the ability to archive its log data either locally (to itself), or remotely to a server or other NAC on the network. Provide the ability to configure the following archiving properties, at a minimum:
  - 1. Archive on time of day
  - 2. Archive on user-defined number of data stores in the log (buffer size)
  - 3. Archive when log has reached it’s user-defined capacity of data stores
  - 4. Provide ability to clear logs once archived

## **2.08 AUDIT LOG**

- A. Provide and maintain an Audit Log that tracks all activities performed on the NAC. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the NAC), to another NAC on the network, or to a server. For each log entry, provide the following data:
  - 1. Time and date
  - 2. User ID
  - 3. Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

## **2.09 DATABASE BACKUP AND STORAGE**

- A. The NAC shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.
- B. Copies of the current database and, at the most recently saved database shall be stored in the NAC. The age of the most recently saved database is dependent on the user-defined database save interval.
- C. The NAC database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

## **2.10 INTEROPERABLE DIGITAL CONTROLLER (IDC)**

- A. Controls shall be Honeywell Excel 10 microprocessor based Interoperable LonWorks Controllers (IDC) or approved equal. Where possible, all Interoperable Digital Controllers shall bear the applicable LonMark™ interoperability logo on each product delivered.
- B. HVAC control shall be accomplished using LonMark™ based devices where the application has a LonMark profile defined. Where LonMark devices are not available for a particular application, devices based on LonWorks shall be acceptable. For each LonWorks device that does not have LonMark certification, the device supplier must provide an XIF file for the device. Publicly available specifications for the Applications Programming Interface (API) must be provided for each LonWorks / LonMark controller defining the programming or setup of each device. The Controls Contractor shall provide all programming, documentation and programming tools necessary to set up and configure the supplied devices per the specified sequences of operation.
- C. The Controls Contractor shall run the LonWorks network trunk to the nearest Network Area Controller (NAC). Coordinate locations of the NAC to ensure that maximum network wiring distances, as specified by the LonWorks wiring guidelines, are not exceeded. A maximum of 126 devices may occupy any one LonWorks trunk and must be installed using the appropriate trunk termination device. All LonWorks and LonMark devices must be supplied using FTT-10A LonWorks communications transceivers.
- D. The Network Area Controller (NAC) will provide all scheduling, alarming, trending, and network management for the LonMark / LonWorks based devices.
- E. The IDCs shall communicate with the NAC at a baud rate of not less than 78.8K baud. The IDC shall provide LED indication of communication and controller performance to the technician, without cover removal.
- F. All IDCs shall be fully application programmable and shall at all times maintain their LONMARK certification, if so certified. Controllers offering application selection only (non-

programmable), require a 10% spare point capacity to be provided for all applications. All control sequences within or programmed into the IDC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.

- G. The Controls Contractor supplying the IDC's shall provide documentation for each device, with the following information at a minimum:
  - 1. Network Variable Inputs (nvi's); name and type
  - 2. Network Variable Outputs (nvo's); name and type
  - 3. Network configuration parameters (nci, nco); name and type
- H. It is the responsibility of the Division 15 contractor to ensure that the proper Network Variable Inputs and Outputs (nvi and nvo) are provided in each IDC, as required by the point charts.
- I. The supplier of any programmable IDC shall provide one copy of the manufacturer's programming tool, with documentation, to the owner.

## **2.11 GRAPHICAL USER INTERFACE SOFTWARE**

- A. Operating System: WEBSTATION-AX™
- B. The GUI shall employ browser-like functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu-pull downs, and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System and basic computing skills. These shall include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.
- C. Real-Time Displays. The GUI, shall at a minimum, support the following graphical features and functions:
  - 1. Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of a graphic background, the GUI shall support the use of scanned pictures.
  - 2. Graphic screens shall have the capability to contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URL's, and links to other graphic screens.
  - 3. Graphics shall support layering and each graphic object shall be configurable for assignment to a layer. A minimum of six layers shall be supported.
  - 4. Modifying common application objects, such as schedules, calendars, and set points shall be accomplished in a graphical manner.
    - a. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
    - b. Holidays shall be set by using a graphical calendar without requiring any keyboard entry from the operator.
  - 5. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.

6. Adjustments to analog objects, such as set points, shall be done by right-clicking the selected object and using a graphical slider to adjust the value. No entry of text shall be required.
- D. System Configuration. At a minimum, the GUI shall permit the operator to perform the following tasks, with proper password access:
  1. Create, delete or modify control strategies.
  2. Add/delete objects to the system.
  3. Tune control loops through the adjustment of control loop parameters.
  4. Enable or disable control strategies.
  5. Generate hard copy records or control strategies on a printer.
  6. Select points to be alarmable and define the alarm state.
  7. Select points to be trended over a period of time and initiate the recording of values automatically.
- E. On-Line Help. Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.
- F. Security. Each operator shall be required to log on to that system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format.
- G. System Diagnostics. The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.
- H. Alarm Console
  1. The system will be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition, and allow the operator to view details of the alarm and acknowledge the alarm. The use of the Alarm Console can be enabled or disabled by the system administrator.
  2. When the Alarm Console is enabled, a separate alarm notification window will supersede all other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and un-acknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator shall not be acceptable.

## **2.12 WEB BROWSER CLIENTS**

- A. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer™ or Netscape Navigator™. Systems requiring

additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable.

- B. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the FMCS, shall not be acceptable.
- C. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.
- D. The Web browser client shall support at a minimum, the following functions:
  - 1. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.
  - 2. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.
  - 3. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
  - 4. Storage of the graphical screens shall be in the Network Area Controller (NAC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
  - 5. Real-time values displayed on a Web page shall update automatically without requiring a manual “refresh” of the Web page.
  - 6. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
    - a. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.
    - b. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
    - c. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
    - d. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
    - e. View logs and charts
    - f. View and acknowledge alarms
    - g. Setup and execute SQL queries on log and archive information
  - 7. The system shall provide the capability to specify a user’s (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.



8. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

## **2.13 SERVER FUNCTIONS AND HARDWARE**

- A. A central server, located at the San Marcos Unified School District's Maintenance Office. The server shall support all Network Area Controllers (NAC) connected to the customer's network whether local or remote.
- B. Local connections shall be via an Ethernet LAN. Remote connections can be via ISDN, ADSL, T1 or dial-up connection.
- C. It shall be possible to provide access to all Network Area Controllers via a single connection to the server. In this configuration, each Network Area Controller can be accessed from a remote Graphical User Interface (GUI) or from a standard Web browser (WBI) by connecting to the server.
- D. The server shall provide the following functions, at a minimum:
  1. Global Data Access: The server shall provide complete access to distributed data defined anywhere in the system.
  2. Distributed Control: The server shall provide the ability to execute global control strategies based on control and data objects in any NAC in the network, local or remote.
  3. The server shall include a master clock service for its subsystems and provide time synchronization for all Network Area Controllers (NAC).
  4. The server shall accept time synchronization messages from trusted precision Atomic Clock Internet sites and update its master clock based on this data.
  5. The server shall provide scheduling for all Network Area Controllers and their underlying field control devices.
  6. The server shall provide demand limiting that operates across all Network Area Controllers. The server must be capable of multiple demand programs for sites with multiple meters and or multiple sources of energy. Each demand program shall be capable of supporting separate demand shed lists for effective demand control.
  7. The server shall implement the BACnet Command Prioritization scheme (16 levels) for safe and effective contention resolution of all commands issued to Network Area Controllers. Systems not employing this prioritization shall not be accepted.
  8. Each Network Area Controller supported by the server shall have the ability to archive its log data, alarm data and database to the server, automatically. Archiving options shall be user-defined including archive time and archive frequency.
  9. The server shall provide central alarm management for all Network Area Controllers supported by the server. Alarm management shall include:
    - a. Routing of alarms to display, printer, email and pagers
    - b. View and acknowledge alarms
    - c. Query alarm logs based on user-defined parameters
  10. The server shall provide central management of log data for all Network Area Controllers supported by the server. Log data shall include process logs, runtime and event counter logs, audit logs and error logs. Log data management shall include:

- a. Viewing and printing log data
- b. Exporting log data to other software applications
- c. Query log data based on user-defined parameters

#### **2.14 SYSTEM PROGRAMMING**

- A. The Graphical User Interface software (GUI) shall provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the GUI shall be through password access as assigned by the system administrator.
- B. A library of control, application, and graphic objects shall be provided to enable the creation of all applications and user interface screens. Applications are to be created by selecting the desired control objects from the library, dragging or pasting them on the screen, and linking them together using a built in graphical connection tool. Completed applications may be stored in the library for future use. Graphical User Interface screens shall be created in the same fashion. Data for the user displays is obtained by graphically linking the user display objects to the application objects to provide “real-time” data updates. Any real-time data value or object property may be connected to display its current value on a user display. Systems requiring separate software tools or processes to create applications and user interface displays shall not be acceptable.
- C. Programming Methods
  - 1. Provide the capability to copy objects from the supplied libraries, or from a user-defined library to the user’s application. Objects shall be linked by a graphical linking scheme by dragging a link from one object to another. Object links will support one-to-one, many-to-one, or one-to-many relationships. Linked objects shall maintain their connections to other objects regardless of where they are positioned on the page and shall show link identification for links to objects on other pages for easy identification. Links will vary in color depending on the type of link; i.e., internal, external, hardware, etc.
  - 2. Configuration of each object will be done through the object’s property sheet using fill-in the blank fields, list boxes, and selection buttons. Use of custom programming, scripting language, or a manufacturer-specific procedural language for configuration will not be accepted.
  - 3. The software shall provide the ability to view the logic in a monitor mode. When on-line, the monitor mode shall provide the ability to view the logic in real time for easy diagnosis of the logic execution. When off-line (debug), the monitor mode shall allow the user to set values to inputs and monitor the logic for diagnosing execution before it is applied to the system.
  - 4. All programming shall be done in real-time. Systems requiring the uploading, editing, and downloading of database objects shall not be allowed.
  - 5. The system shall support object duplication within a customer’s database. An application, once configured, can be copied and pasted for easy re-use and duplication. All links, other than to the hardware, shall be maintained during duplication.

#### **2.15 LONWORKS NETWORK MANAGEMENT**

- A. The Graphical User Interface software (GUI) shall provide a complete set of integrated LonWorks network management tools for working with LonWorks networks. These tools shall

manage a database for all LonWorks devices by type and revision, and shall provide a software mechanism for identifying each device on the network. These tools shall also be capable of defining network data connections between LonWorks devices, known as “binding”. Systems requiring the use of third party LonWorks network management tools shall not be accepted.

- B. Network management shall include the following services: device identification, device installation, device configuration, device diagnostics, device maintenance and network variable binding.
- C. The network configuration tool shall also provide diagnostics to identify devices on the network, to reset devices, and to view health and status counters within devices.
- D. These tools shall provide the ability to “learn” an existing LonWorks network, regardless of what network management tool(s) were used to install the existing network, so that existing LonWorks devices and newly added devices are part of a single network management database.
- E. The network management database shall be resident in the Network Area Controller (NAC), ensuring that anyone with proper authorization has access to the network management database at all times. Systems employing network management databases that are not resident, at all times, within the control system, shall not be accepted.

## **2.16 OBJECT LIBRARIES**

- A. A standard library of objects shall be included for development and setup of application logic, user interface displays, system services, and communication networks.
- B. The objects in this library shall be capable of being copied and pasted into the user’s database and shall be organized according to their function. In addition, the user shall have the capability to group objects created in their application and store the new instances of these objects in a user-defined library.
- C. In addition to the standard libraries specified here, the supplier of the system shall maintain an on-line accessible (over the Internet) library, available to all registered users to provide new or updated objects and applications as they are developed.
- D. All control objects shall conform to the control objects specified in the BACnet specification.
- E. The library shall include applications or objects for the following functions, at a minimum:
  - 1. Scheduling Object. The schedule must conform to the schedule object as defined in the BACnet specification, providing 7-day plus holiday & temporary scheduling features and a minimum of 10 on/off events per day. Data entry to be by graphical sliders to speed creation and selection of on-off events.
  - 2. Calendar Object. . The calendar must conform to the calendar object as defined in the BACnet specification, providing 12-month calendar features to allow for holiday or special event data entry. Data entry to be by graphical “point-and-click” selection. This object must be “linkable” to any or all scheduling objects for effective event control.
  - 3. Duty Cycling Object. Provide a universal duty cycle object to allow repetitive on/off time control of equipment as an energy conserving measure. Any number of these objects may be created to control equipment at varying intervals
  - 4. Temperature Override Object. Provide a temperature override object that is capable of overriding equipment turned off by other energy saving programs (scheduling, duty cycling etc.) to maintain occupant comfort or for equipment freeze protection.

5. Start-Stop Time Optimization Object. Provide a start-stop time optimization object to provide the capability of starting equipment just early enough to bring space conditions to desired conditions by the scheduled occupancy time. Also, allow equipment to be stopped before the scheduled un-occupancy time just far enough ahead to take advantage of the building's "flywheel" effect for energy savings. Provide automatic tuning of all start / stop time object properties based on the previous day's performance.
  6. Demand Limiting Object. Provide a comprehensive demand-limiting object that is capable of controlling demand for any selected energy utility (electric, oil, and gas). The object shall provide the capability of monitoring a demand value and predicting (by use of a sliding window prediction algorithm) the demand at the end of the user defined interval period (1-60 minutes). This object shall also accommodate a utility meter time sync pulse for fixed interval demand control. Upon a prediction that will exceed the user defined demand limit (supply a minimum of 6 per day), the demand limiting object shall issue shed commands to either turn off user specified loads or modify equipment set points to effect the desired energy reduction. If the list of sheddable equipment is not enough to reduce the demand to below the set point, a message shall be displayed on the users screen (as an alarm) instructing the user to take manual actions to maintain the desired demand. The shed lists are specified by the user and shall be selectable to be shed in either a fixed or rotating order to control which equipment is shed the most often. Upon suitable reductions in demand, the demand-limiting object shall restore the equipment that was shed in the reverse order in which it was shed. Each sheddable object shall have a minimum and maximum shed time property to effect both equipment protection and occupant comfort.
- F. The library shall include control objects for the following functions. All control objects shall conform to the objects as specified in the BACnet specification.
1. Analog Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. Allow high, low and failure limits to be assigned for alarming. Also, provide a time delay filter property to prevent nuisance alarms caused by temporary excursions above or below the user defined alarm limits.
  2. Analog Output Object - Minimum requirement is to comply with the BACnet standard for data sharing.
  3. Binary Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. The user must be able to specify either input condition for alarming. This object must also include the capability to record equipment run-time by counting the amount of time the hardware input is in an "on" condition. The user must be able to specify either input condition as the "on" condition.
  4. Binary Output Object - Minimum requirement is to comply with the BACnet standard for data sharing. Properties to enable minimum on and off times for equipment protection as well as interstart delay must be provided. The BACnet Command Prioritization priority scheme shall be incorporated to allow multiple control applications to execute commands on this object with the highest priority command being invoked. Provide sixteen levels of priority as a minimum. Systems not employing the BACnet method of contention resolution shall not be acceptable.
  5. PID Control Loop Object - Minimum requirement is to comply with the BACnet standard for data sharing. Each individual property must be adjustable as well as to be disabled

to allow proportional control only, or proportional with integral control, as well as proportional, integral and derivative control.

6. Comparison Object - Allow a minimum of two analog objects to be compared to select either the highest, lowest, or equality between the two linked inputs. Also, allow limits to be applied to the output value for alarm generation.
  7. Math Object - Allow a minimum of four analog objects to be tested for the minimum or maximum, or the sum, difference, or average of linked objects. Also, allow limits to be applied to the output value for alarm generation.
  8. Custom Programming Objects - Provide a blank object template for the creation of new custom objects to meet specific user application requirements. This object must provide a simple BASIC-like programming language that is used to define object behavior. Provide a library of functions including math and logic functions, string manipulation, and e-mail as a minimum. Also, provide a comprehensive on-line debug tool to allow complete testing of the new object. Allow new objects to be stored in the library for re-use.
  9. Interlock Object - Provide an interlock object that provides a means of coordination of objects within a piece of equipment such as an Air Handler or other similar types of equipment. An example is to link the return fan to the supply fan such that when the supply fan is started, the return fan object is also started automatically without the user having to issue separate commands or to link each object to a schedule object. In addition, the control loops, damper objects, and alarm monitoring (such as return air, supply air, and mixed air temperature objects) will be inhibited from alarming during a user-defined period after startup to allow for stabilization. When the air handler is stopped, the interlocked return fan is also stopped, the outside air damper is closed, and other related objects within the air handler unit are inhibited from alarming thereby eliminating nuisance alarms during the off period.
  10. Temperature Override Object - Provide an object whose purpose is to provide the capability of overriding a binary output to an "On" state in the event a user specified high or low limit value is exceeded. This object is to be linked to the desired binary output object as well as to an analog object for temperature monitoring, to cause the override to be enabled. This object will execute a Start command at the Temperature Override level of start/stop command priority unless changed by the user.
  11. Composite Object - Provide a container object that allows a collection of objects representing an application to be encapsulated to protect the application from tampering, or to more easily represent large applications. This object must have the ability to allow the user to select the appropriate parameters of the "contained" application that are represented on the graphical shell of this container.
- G. The object library shall include objects to support the integration of devices connected to the Network Area Controller (NAC). At a minimum, provide the following as part of the standard library included with the programming software:
1. LonMark/LonWorks devices. These devices shall include, but not be limited to, devices for control of HVAC, lighting, access, and metering. Provide LonMark manufacturer-specific objects to facilitate simple integration of these devices. All network variables defined in the LonMark profile shall be supported. Information (type and function)

regarding network variables not defined in the LonMark profile shall be provided by the device manufacturer.

2. For devices not conforming to the LonMark standard, provide a dynamic object that can be assigned to the device based on network variable information provided by the device manufacturer. Device manufacturer shall provide an XIF file, resource file and documentation for the device to facilitate device integration.
3. For BACnet devices, provide the following objects at a minimum:
  - a. Analog In
  - b. Analog Out
  - c. Analog Value
  - d. Binary
  - e. Binary In
  - f. Binary Out
  - g. Binary Value
  - h. Multi-State In
  - i. Multi-State Out
  - j. Multi-State Value
  - k. Schedule Export
  - l. Calendar Export
  - m. Trend Export
  - n. Device
4. For each BACnet object, provide the ability to assign the object a BACnet device and object instance number.
5. For BACnet devices, provide the following support at a minimum
  - a. Segmentation
  - b. Segmented Request
  - c. Segmented Response
  - d. Application Services
  - e. Read Property
  - f. Read Property Multiple
  - g. Write Property
  - h. Write Property Multiple
  - i. Confirmed Event Notification
  - j. Unconfirmed Event Notification
  - k. Acknowledge Alarm
  - l. Get Alarm Summary
  - m. Who-has
  - n. I-have

- o. Who-is
- p. I-am
- q. Subscribe COV
- r. Confirmed COV notification
- s. Unconfirmed COV notification
- t. Media Types
- u. Ethernet
- v. BACnet IP Annex J
- w. MSTP
- x. BACnet Broadcast Management Device (BBMD) function
- y. Routing

## **2.17 MODBUS SYSTEM INTEGRATION**

- A. The Network Area Controller shall support the integration of device data from Modbus RTU, ASCII, or TCP control system devices. The connection to the Modbus system shall be via an RS-232, RS485, or Ethernet IP as required by the device.
- B. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of the Modbus system data into the FPMS. Objects provided shall include at a minimum:
  - 1. Read/Write Modbus AI Registers
  - 2. Read/Write Modbus AO Registers
  - 3. Read/Write Modbus BI Registers
  - 4. Read/Write Modbus BO Registers
- C. The Network Area Controller shall perform all scheduling, alarming, logging and global supervisory control functions, of the Modbus system devices.
- D. The Controls Contractor shall provide a Modbus system communications driver. The equipment system vendor that provided the equipment utilizing Modbus shall provide documentation of the system's Modbus interface and shall provide factory support at no charge during system commissioning

## **2.18 OTHER CONTROL SYSTEM HARDWARE**

- A. Space Temperature Wall Module. Wall Module shall be Honeywell or equivalent.
  - 1. Wall module shall have a 20K Ohm NTC thermistor temperature sensor with operating range of 45 to 99 F under a locking cover/enclosure with UL 916 listing designed for mounting on a standard electrical switch box.
  - 2. Space temperature sensors shall be accurate to plus or minus one F degree.
  - 3. Where specified, space temperature sensors shall have a setpoint knob calibrated for warmer-cooler adjustments
  - 4. Where specified, wall module shall also have an after-hours override pushbutton and LED override indicator.

5. Insulating foam shall be installed on the back of all space temperature wall modules to prevent air infiltration from wall opening.
- B. Duct Mount and Outside Air Temperature Sensors: Temperature sensors with an accuracy of  $\pm 0.3^{\circ}\text{F}$ . Temperature sensors shall be Honeywell or equivalent.
  1. Outside air sensors shall include an integral sun shield.
  2. Duct sensors shall have sensor approximately in center of the duct, and shall have selectable lengths of 6, 12, and 18 inches.
  3. Multipoint averaging element sensors shall be provided where specified and shall have a minimum of one foot of sensor length for each square foot of duct area (provide multiple sensors if necessary).
  4. Pipe mount sensors shall have copper, or stainless steel separable wells.
- C. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point shall be provided where specified. Current switches shall include an integral LED for indication of trip condition and a current level below trip set point.
- D. Humidity Sensors. Humidity sensors shall be Honeywell or equivalent.
  1. Duct and room sensors shall have a sensing range of 5% to 95%.
  2. Duct sensors shall be provided with a sampling chamber.
  3. Outdoor air humidity sensors shall have a sensing range of 20% to 95% RH. They shall have a compensated ambient temperature range of  $-40^{\circ}\text{F}$  to  $170^{\circ}\text{F}$ .
- E. Control Panels: Furnish control panels of code gauge steel with locking doors for mounting all devices as shown. Control panels shall meet all requirements of Title 24, California Administrative Code. All external wiring shall be connected to terminal strips mounted within the panel. A complete set of 'as-built' control drawings (relating to the controls within that panel) shall be furnished within each control panel.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. All work described in this section shall be performed by a Honeywell "Authorized Controls Integrator" that has a successful history in the design and installation of integrated control systems using Niagara Framework™. The installing contractor shall have a local office located within 20 miles from San Marcos Unified School District and a minimum of ten years of integration experience installing Honeywell DDC control systems and shall provide documentation in the submittal package verifying the company's experience.
- B. The Controls Contractor shall have employees at the local branch that are fully trained and certified for the Honeywell WEBs Systems incorporating Niagara Framework™. Copies of the employees Niagara Training Certificates shall be included in the submittals.
- C. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.



- D. Drawings of the temperature and lighting control system network are diagrammatic only and any apparatus not shown, but required to make the system operative to the complete satisfaction of the Owner shall be furnished and installed without additional cost.
- E. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by this contractor in accordance with these specifications.
- F. Controls Contractors shall have a C-10 License in good standing in the state of California.

### **3.02 WIRING**

- A. All electrical control wiring and power wiring to the control panels, NAC, computers and network components shall be installed in conduit and be the responsibility of the Controls Contractor.
- B. All wiring shall be in accordance with the National Electrical Code and any applicable local codes. All temperature and lighting control system wiring shall be installed in the conduit types allowed by the National Electrical Code or applicable local codes. Where plenum rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.
- C. Echelon Compliant Direct Burial Cable shall be used for all underground communication bus wiring between buildings to prevent damage from moisture. The existing underground conduit systems are not watertight.

### **3.03 WARRANTY**

- A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.
- B. Within this period, upon notice by the Owner, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by this contractor at no expense to the Owner.

### **3.04 WARRANTY ACCESS**

- A. The Owner shall grant to this contractor, reasonable access to the temperature and lighting control system during the warranty period.
- B. The owner shall allow the contractor to access the temperature and lighting control system from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period.

### **3.05 SOFTWARE LICENSE**

- A. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). The owner, or his appointed agent, shall determine which organizations to be named in the "orgid" of all Niagara Framework software licenses.
- B. The owner, or his appointed agent, shall be free to direct the modification of the "orgid" in any Niagara Framework software license, regardless of supplier.
- C. The owner, or his appointed agent, shall receive ownership of all job specific software configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all

configuration and programming that is generated for a given project and /or configured for use within Niagara Framework (Niagara) based controllers and/or servers and any related LAN / WAN / Intranet and Internet connected routers and devices. Any and all required Ids and passwords for access to any component or software program shall be provided to the owner.

### **3.06 ACCEPTANCE TESTING**

- A. Upon completion of the installation, this contractor shall load all system software and start-up the system. This contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.
- B. This contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.
- C. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in presence of Owner's Representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.
- D. System Acceptance: Satisfactory completion is when this contractor have performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

### **3.07 OPERATOR INSTRUCTION, TRAINING**

- A. During system commissioning and at such time acceptable performance of the temperature and lighting control system hardware and software has been established this contractor shall provide both off-site and on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by factory-trained personal that are familiar with the system hardware, software and accessories.
- B. This contractor shall provide 4 hours of instruction to the owner's designated personnel on the operation of the temperature and lighting control system and describe its intended use with respect to the programmed functions specified. Operator orientation of the systems shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories, and appropriate operator intervention required in responding to the System's operation. Contractor to provide local training facility that will accommodate up to 12 school district employees.

## **PART 4 - SEQUENCES OF OPERATION**

### **4.01 SEQUENCE OF OPERATION**

- A. Constant Volume Air Handling Unit, 1-Stage Cooling, 1-Stage Heating, with Economizer Enabled from Outside Air Dry Bulb Temperature.
- B. Constant Volume HVAC Unit Controller Software. The constant volume unit controller shall be configurable for air handlers with staged or analog heating and cooling, minimum or

modulating economizer outside or mixing damper dampers, and enthalpy or dry bulb economizer changeover. Controller shall comply with LonMark HVAC profile #8030.

1. Fan Off. Anytime the fan is off, all system heating and cooling shall be off, and the mixing dampers shall be positioned closed to the outside air.
2. Fan and Mode Control. System fan and heating/cooling temperature setpoints shall normally be placed in the occupied, standby, or unoccupied mode of operation and control via a system scheduler unique seven-day schedule. Prior to scheduled occupied periods, the unoccupied temperature setpoint shall be ramped up to the occupied setpoint over a time period proportional to the temperature difference between the room temperature and the occupied temperature setpoint such that at occupancy time the occupied temperature is reached. During unoccupied and standby periods the outside air damper shall be closed and the fan shall remain off until heating or cooling is demanded to satisfy the unoccupied and standby temperature setpoints. The standby mode of operation is for periods of temporary vacancy such as the lunch hour, and shall use owner determined temperature setpoints a degree or two away from the occupied comfort settings.
3. System shall automatically revert to the proper mode of operation after restoration of power after a power failure. Units shall restart at a random staggered time interval after power restoration.
4. Occupant Schedule Override Control. When any room HVAC system is operating in a mode other than OCCUPIED, each room temperature sensor wall module schedule override button shall provide the room occupant with ability to place the system in the occupied mode of operation for 60 (180 default, user programmable) minutes by pressing the module override button. Via the button, the occupant shall also have the ability to cancel the override command, or to place the system in the unoccupied mode when operating in the occupied mode. Via the module LED, the occupant shall have the ability to note the status of the system overrides as being in the override mode, override unoccupied mode, continuously occupied mode via a network command, or in the normal mode of operation (LED off).
5. Fan Fail Alarm. Any time the fan is commanded on and the fan differential pressure switch piped across the fan, or a fan current sensor, does not prove air flow or fan operation, a fan-failed alarm shall be presented to the operator station. This alarm check shall be delayed upon fan start for 10 seconds (adjustable) to give the system time to prove flow prior to creating a false alarm.
6. Temperature Control, Occupied Periods. Heating control shall operate with 6 cycles per hour, and cooling control shall operate with 4 cycles per hour unless the equipment manufacturer dictates other parameters. If the scheduler commands the fan to stop during periods of electric duct heating, the heater shall be de-energized and the fan shall continue to run for 60 seconds to dissipate the residual heater heat prior to stopping airflow. A staging PID algorithm with heating and cooling anticipation features shall be employed for all staging control. Upon a drop in space temperature below the heating setpoint, the lead duct heater shall be energized, the on time proportional to the heating load. After the lead heater stage becomes full on, a further increase in the heating load shall cause the lag heating stage to be cycled, the on time proportional to the increasing load. The reverse of this shall happen on a decrease in heating load. Upon a rise in space temperature above the cooling setpoint, the lead compressor/coil shall

be energized, the on time proportional to the cooling load. After the lead cooling stage becomes full on, a further increase in the cooling load shall cause the lag compressor/coil stage to be cycled, the on time proportional to the increasing load. The reverse of this shall happen on a decrease in cooling load.

7. If the space temperature drops or rises to either the heating or cooling unoccupied temperature setpoint during unoccupied periods, the system shall start and operate in the heating or cooling mode until the unoccupied temperature setpoints have been satisfied. The same operation shall occur for the standby mode of operation where specified.
8. Discharge Low Limit. If at any time the discharge airdrops below the user defined discharge air temperature low limit, an alarm shall be issued and the mixing dampers shall be driven closed to the outside air. As the temperature rises, the dampers shall modulate open to the minimum ventilation position and the alarm shall clear.
9. Wall Sensor Module. Wall temperature sensor module shall be located where shown on the plans, and shall include the temperature sensor, the occupied/unoccupied override selection push button with override status LED (where specified), a warmer-cooler setpoint adjustment knob (where specified), and a jack for connecting to the LonTalk communication network. The system owner determines the normal heating and cooling room temperature setpoints for all wall module sensors (such as 73F & 77F). The warmer-cooler adjustment knob on the wall module shall give room occupants the ability to vary these values by an owner determined increment, such as two degrees, by rotating the setpoint knob. The setpoint knob shall not affect Setpoints in use when the room is unoccupied.

## PART 5 - POINT LISTS

### 5.01 SUMMARY

- A. The points in the following table shall be accessible from the Graphical User Interface (GUI) and/or the Web browser interface (WBI). The supplier of the IDC and IBC devices shall ensure that the points listed in this table are accessible on their respective networks, by the Network Area Controller (NAC).
- B. The following abbreviations apply to the point table to indicate what level of functionality must be provided:

D = Display only  
 M = Modify value  
 A = Alarm  
 L = Log  
 S = Schedule  
 GC = Global supervisory control routine such as demand limiting

System Points						
Typical for all AC Units	D	M	A	L	S	GC
AC Unit S/S		X			X	X
AC Unit Status	X		X	X		

AC Unit Supply Air Temperature	X		X	X		
Space Temperature	X		X	X		
Space Cooling Setpoint		X		X		X
Space Heating Setpoint		X		X		X
Cooling Stage	X			X		
Heating Stage	X			X		
Smoke Detector	X		X			
Other misc. points						
MDF Room Temperature	X		X	X		

Note: Refer to the mechanical drawings for the lighting controls points

D = Display only

M = Modify value

A = Alarm

L = Log

S = Schedule

GC = Global supervisory control routine such as demand limiting

END OF SECTION

**SECTION 23 23 00**  
**REFRIGERANT PIPING**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. This Section includes refrigerant piping used for air-conditioning applications.

**1.02 PERFORMANCE REQUIREMENTS**

- A. Line Test Pressure for Refrigerant R-410A:
  - 1. Suction Lines for Air-Conditioning Applications: 300 psig (2068 kPa).
  - 2. Suction Lines for Heat-Pump Applications: 535 psig (3689 kPa).
  - 3. Hot-Gas and Liquid Lines: 535 psig (3689 kPa).

**1.03 ACTION SUBMITTALS**

- A. Product Data: For each type of valve and refrigerant piping specialty indicated.
- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
  - 1. Shop Drawing Scale: 1/4 inch equals 1 foot (1:50).
  - 2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

**1.04 INFORMATIONAL SUBMITTALS**

- A. Welding certificates.
- B. Field quality-control test reports.

**1.05 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

**1.06 QUALITY ASSURANCE**

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

## **1.07 PRODUCT STORAGE AND HANDLING**

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

## **1.08 COORDINATION**

- A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations.

## **PART 2 - PRODUCTS**

### **2.01 COPPER TUBE AND FITTINGS**

- A. Copper Tube: ASTM B 88, Type K or L (ASTM B 88M, Type A or B).
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8.
- F. Flexible Connectors:
  - 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
  - 2. End Connections: Socket ends.
  - 3. Offset Performance: Capable of minimum 3/4-inch (20-mm) misalignment in minimum 7-inch- (180-mm-) long assembly.
  - 4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).
  - 5. Maximum Operating Temperature: 250 deg F (121 deg C).

### **2.02 VALVES AND SPECIALTIES**

- A. Diaphragm Packless Valves:
  - 1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
  - 2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
  - 3. Operator: Rising stem and hand wheel.
  - 4. Seat: Nylon.
  - 5. End Connections: Socket, union, or flanged.
  - 6. Working Pressure Rating: 500 psig (3450 kPa).
  - 7. Maximum Operating Temperature: 275 deg F (135 deg C).
- B. Packed-Angle Valves:
  - 1. Body and Bonnet: Forged brass or cast bronze.
  - 2. Packing: Molded stem, back seating, and replaceable under pressure.
  - 3. Operator: Rising stem.
  - 4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.

5. Seal Cap: Forged-brass or valox hex cap.
  6. End Connections: Socket, union, threaded, or flanged.
  7. Working Pressure Rating: 500 psig (3450 kPa).
  8. Maximum Operating Temperature: 275 deg F (135 deg C).
- C. Check Valves:
1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
  2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
  3. Piston: Removable polytetrafluoroethylene seat.
  4. Closing Spring: Stainless steel.
  5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
  6. End Connections: Socket, union, threaded, or flanged.
  7. Maximum Opening Pressure: 0.50 psig (3.4 kPa).
  8. Working Pressure Rating: 500 psig (3450 kPa).
  9. Maximum Operating Temperature: 275 deg F (135 deg C).
- D. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
  2. Core: Removable ball-type check valve with stainless-steel spring.
  3. Seat: Polytetrafluoroethylene.
  4. End Connections: Copper spring.
  5. Working Pressure Rating: 500 psig (3450 kPa).
- E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.
1. Body and Bonnet: Plated steel.
  2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
  3. Seat: Polytetrafluoroethylene.
  4. End Connections: Threaded.
  5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and [24] [115] [208]-V ac coil.
  6. Working Pressure Rating: 400 psig (2760 kPa).
  7. Maximum Operating Temperature: 240 deg F (116 deg C).
  8. Manual operator.
- F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
  2. Piston, Closing Spring, and Seat Insert: Stainless steel.
  3. Seat Disc: Polytetrafluoroethylene.
  4. End Connections: Threaded.
  5. Working Pressure Rating: 400 psig (2760 kPa).



6. Maximum Operating Temperature: 240 deg F (116 deg C).
- G. Thermostatic Expansion Valves: Comply with ARI 750.
  1. Body, Bonnet, and Seal Cap: Forged brass or steel.
  2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
  3. Packing and Gaskets: Non-asbestos.
  4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
  5. Suction Temperature: [40 deg F (4.4 deg C)].
  6. Superheat: Adjustable.
  7. Reverse-flow option (for heat-pump applications).
  8. End Connections: Socket, flare, or threaded union.
- H. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.
  1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
  2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
  3. Packing and Gaskets: Non-asbestos.
  4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
  5. Seat: Polytetrafluoroethylene.
  6. Equalizer: Internal
  7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and 24-V ac coil.
  8. End Connections: Socket.
  9. Throttling Range: Maximum 5 psig (34 kPa).
  10. Working Pressure Rating: 500 psig (3450 kPa).
  11. Maximum Operating Temperature: 240 deg F (116 deg C).
- I. Straight-Type Strainers:
  1. Body: Welded steel with corrosion-resistant coating.
  2. Screen: 100-mesh stainless steel.
  3. End Connections: Socket or flare.
  4. Working Pressure Rating: 500 psig (3450 kPa).
  5. Maximum Operating Temperature: 275 deg F (135 deg C).
- J. Angle-Type Strainers:
  1. Body: Forged brass or cast bronze.
  2. Drain Plug: Brass hex plug.
  3. Screen: 100-mesh monel.
  4. End Connections: Socket or flare.
  5. Working Pressure Rating: 500 psig (3450 kPa).
  6. Maximum Operating Temperature: 275 deg F (135 deg C).
- K. Moisture/Liquid Indicators:

1. Body: Forged brass.
  2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
  3. Indicator: Color coded to show moisture content in ppm.
  4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
  5. End Connections: Socket or flare.
  6. Working Pressure Rating: 500 psig (3450 kPa).
  7. Maximum Operating Temperature: 240 deg F (116 deg C).
- L. Replaceable-Core Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
  2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
  3. Desiccant Media: Activated charcoal.
  4. Designed for reverse flow (for heat-pump applications).
  5. End Connections: Socket.
  6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
  7. Maximum Pressure Loss: 2 psig (14 kPa).
  8. Working Pressure Rating: 500 psig (3450 kPa).
  9. Maximum Operating Temperature: 240 deg F (116 deg C).
- M. Permanent Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell.
  2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
  3. Desiccant Media: Activated charcoal.
  4. Designed for reverse flow (for heat-pump applications).
  5. End Connections: Socket.
  6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
  7. Maximum Pressure Loss: 2 psig (14 kPa).
  8. Working Pressure Rating: 500 psig (3450 kPa).
  9. Maximum Operating Temperature: 240 deg F (116 deg C).
- N. Mufflers:
1. Body: Welded steel with corrosion-resistant coating.
  2. End Connections: Socket or flare.
  3. Working Pressure Rating: 500 psig (3450 kPa).
  4. Maximum Operating Temperature: 275 deg F (135 deg C).

## **2.03 REFRIGERANTS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Atofina Chemicals, Inc.
  - 2. DuPont Company; Fluorochemicals Div.
  - 3. Honeywell, Inc.; Genetron Refrigerants.
  - 4. INEOS Fluor Americas LLC.
- B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

## **PART 3 - EXECUTION**

### **3.01 PIPING APPLICATIONS FOR REFRIGERANT R-410A**

- A. Suction Lines NPS 1-1/2 (DN 40) and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.
- B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR or L (B), annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

### **3.02 PIPING INSTALLATION**

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Refer to Section 23 09 00 "Instrumentation and Control for HVAC" and Section 23 09 93 "Sequence of Operations for HVAC Controls" for solenoid valve controllers, control wiring, and sequence of operation.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

- L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 08 31 13 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- M. Install refrigerant piping in protective conduit where installed belowground.
- N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- O. Slope refrigerant piping as follows:
  - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
  - 2. Install horizontal suction lines with a uniform slope downward to compressor.
  - 3. Install traps and double risers to entrain oil in vertical runs.
  - 4. Liquid lines may be installed level.
- P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- R. Identify refrigerant piping and valves according to Section 23 05 53 "Identification for HVAC Piping and Equipment."
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 23 05 18 "Escutcheons for HVAC Piping."

### **3.03 PIPE JOINT CONSTRUCTION**

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
  - 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
  - 2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.
- F. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

- G. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.
- H. Welded Joints: Construct joints according to AWS D10.12/D10.12M.
- I. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

### **3.04 HANGERS AND SUPPORTS**

- A. Hanger, support, and anchor products are specified in Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
  - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet (6 m) long.
  - 2. Roller hangers and spring hangers for individual horizontal runs 20 feet (6 m) or longer (on pipe sizes 1-1/2 inch and larger).
  - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze (on pipe sizes 1-1/2 inch and larger).
  - 4. Spring hangers to support vertical runs (on pipe sizes 1-1/2 inch and larger).
  - 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
  - 1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
  - 2. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
  - 3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod size, 1/4 inch (6.4 mm).

### **3.05 FIELD QUALITY CONTROL**

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
  - 1. Comply with ASME B31.5, Chapter VI.
  - 2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
  - 3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
    - a. Fill system with nitrogen to the required test pressure.
    - b. System shall maintain test pressure at the manifold gage throughout duration of test.
    - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

### **3.06 SYSTEM CHARGING**

- A. Charge system using the following procedures:
  - 1. Install core in filter dryers after leak test but before evacuation.
  - 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers (67 Pa). If vacuum holds for 12 hours, system is ready for charging.
  - 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).
  - 4. Charge system with a new filter-dryer core in charging line.

### **3.07 ADJUSTING**

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
  - 1. Open shutoff valves in condenser water circuit.
  - 2. Verify that compressor oil level is correct.
  - 3. Open compressor suction and discharge valves.
  - 4. Open refrigerant valves except bypass valves that are used for other purposes.
  - 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

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**SECTION 23 81 26**  
**SPLIT-SYSTEM AIR-CONDITIONERS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. This Section includes split-system air-conditioning units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.
- B. Related Sections include the following:
  - 1. Division 23 Section 23 09 80 "Mechanical Commissioning."

**1.02 SUBMITTALS**

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.
- C. Shop Drawings: Diagram power, signal, and control wiring.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.
- F. Warranty: Special warranty specified in this Section.

**1.03 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- C. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- D. Units shall be designed to operate with HCFC-free refrigerants.

**1.04 COORDINATION**

- A. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations specified in Division 7 Section "Roof Accessories."

**1.05 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.



1. Warranty Period: Five years from date of Substantial Completion on compressors and coils, and one year on parts.

#### **1.06 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Filters: One set of filters for each unit.

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Carrier Air Conditioning; Div. of Carrier Corporation.
  2. Trane Company (The); Unitary Products Group.
  3. York International Corp.

#### **2.02 EXPOSED EVAPORATOR-FAN COMPONENTS**

- A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
  1. Insulation: Faced, glass-fiber duct liner.
  2. Drain Pans: Galvanized steel, with connection for drain; insulated.
  3. Ductless unit with finished enclosure exposed in room, adjustable deflection supply grille, return grille and wall mount or suspended support brackets.
- B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.
- C. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
- D. Fan Motors: Comply with requirements in 23 Section "Common Motor Requirements for HVAC Equipment."
  1. Special Motor Features: Multi-tapped, variable speed with internal thermal protection and permanent lubrication.
- E. Disposable Filters: 1 inch thick, in fiberboard frames.
- F. Wiring Terminations: Connect motor to chassis wiring with plug connection.

#### **2.03 Concealed Evaporator-Fan Components:**

- A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
- B. Insulation: Faced, glass-fiber duct liner.
- C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 210/240.
- D. Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch; leak tested to 300 psig underwater; with a two-position control valve.

- E. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
- F. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
- G. Fan Motors:
  - 1. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."
  - 2. Multitapped, multispeed with internal thermal protection and permanent lubrication.
  - 3. Three-phase, permanently lubricated, ball-bearing motors with built-in thermal-overload protection.
  - 4. Wiring Terminations: Connect motor to chassis wiring with plug connection.
- H. ASHRAE compliance in "Airstream Surfaces" Subparagraph below may be required to comply with Project requirements or authorities having jurisdiction. Retain first subparagraph to comply with LEED Prerequisite IEQ 1.
- I. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- J. Filters: Permanent, cleanable.
- K. Condensate Drain Pans: Provide factory supplied drainable condensate drain pan with connection at lowest point of pan.

#### **2.04 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS**

- A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
- B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
  - 1. Compressor Type: Scroll.
  - 2. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
  - 3. Refrigerant Charge: R-410a.
- C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.
- D. Fan: Aluminum-propeller type, directly connected to motor.
- E. Motor: Permanently lubricated, with integral thermal-overload protection.
- F. Low Ambient Kit: Permits operation below 45 deg F.

#### **2.05 ACCESSORIES**

- A. Control equipment and sequence of operation are specified in Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls."

- B. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install roof-mounting compressor-condenser components on equipment supports specified in Division 7 Section "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.
- D. Install seismic restraints.
- E. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch. Refer to Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- F. Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

#### **3.02 CONNECTIONS**

- A. Piping installation requirements are specified in other Division 23 sections. Drawings indicate general arrangement of piping, fittings and specialties.
- B. Install piping adjacent to unit to allow service and maintenance.
- C. Ground equipment according to Division 26.
- D. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

#### **3.03 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.

#### **3.04 STARTUP SERVICE**

- A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

END OF SECTION

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## SECTION 26 01 00

### ELECTRICAL GENERAL PROVISIONS

#### PART 1 – GENERAL

##### SUMMARY

- 1.1 This Division of the specification outlines the provisions of the contract work to be performed under this Division.
- 1.2 This Section applies to and forms a part of each section of specifications in Division 26 and all work performed under Division 26, 27 and 28.
- 1.3 In addition, work in this Division is governed by the provisions of the bidding requirements, contract forms, general conditions and all sections under general requirements.
- 1.4 These specifications contain statements which may be more definitive or more restrictive than those contained in the General Conditions. Where these statements occur, they shall take precedence over the General Conditions.
- 1.5 Where the words 'provide' or 'provision' are used, it shall be definitely interpreted as 'furnishing and installing complete in operating condition'. Where the words 'as indicated' or 'as shown' are used, it shall mean as shown on contract drawings.
- 1.6 Where items are specified in the singular, this Division shall provide the quantity as shown on drawings plus any spares or extras mentioned on drawings or specifications. All specified and supplied equipment shall be new.

##### CONTRACTOR QUALIFICATIONS

- 1.7 The Contractor shall have a current California C-10 Electrical Contractor's license and all individuals working on this project shall have passed the Department of Industrial Relations Division of apprenticeship Standards – "Electrician Certification Program."

##### CODES, PERMITS AND FEES

- 1.8 Comply with all applicable laws, ordinances, rules, regulations, codes, or rulings of governmental units having jurisdiction as well as standards of NFPA and serving utility requirements.
- 1.9 Obtain permits, fees, inspections, meter and the like, associated with work in each section of this Division.
- 1.10 Installation procedures, methods and conditions shall comply with the latest requirements of the Federal Occupational Safety and Health Act (OSHA).

## EXAMINATION OF PREMISES

- 1.11 Examine the construction drawings and premises prior to bidding. No allowances will be made for not being knowledgeable of existing conditions.

## STANDARDS

- 1.12 The following standard publications of the latest editions enforced, and supplements thereto shall form a part of these specifications. All electrical work must, as a minimum, be in accordance with these standards.
- 1.12.1 2019 California Electrical Code (CEC), Part 3 Title 24 CCR.
  - 1.12.2 National Fire Protection Association.
  - 1.12.3 Underwriters' Laboratories, Inc. (UL).
  - 1.12.4 Certified Ballast Manufacturers' Association (CBM).
  - 1.12.5 National Electrical Manufacturers' Association (NEMA).
  - 1.12.6 Institution of Electrical & Electronics Engineers (IEEE).
  - 1.12.7 American Society for Testing & Materials (ASTM).
  - 1.12.8 National Board of Fire Underwriters (NBFU).
  - 1.12.9 National Board of Standards (NBS).
  - 1.12.10 American National Standards Institute (ANSI).
  - 1.12.11 Insulated Power Cable Engineers Association (IPECS).
  - 1.12.12 Electrical Testing Laboratories (ETL).
  - 1.12.13 National Electrical Safety Code (NESC).
  - 1.12.14 2019 California Building Code (CBC), Part 2, Title 24 CCR.
  - 1.12.15 2019 California Fire Code (CFC), Part 9, Title 24, CCR.
  - 1.12.16 2016 NFPA 72 with California State Amendments
  - 1.12.17 National Electrical Testing Association (NETA), 2010 or most current

## DEFINITIONS

- 1.13 Concealed: Hidden from sight, as in trenches, chases, hollow construction, or above furred spaces, hung ceilings - acoustical or plastic type, or exposed to view only in tunnels, attics, shafts, crawl spaces, unfinished spaces, or other areas solely for maintenance and repair.
- 1.14 Exposed, Non-Concealed, Unfinished Space: A room or space that is ordinarily accessible only to building maintenance personnel, a room noted on the 'finish schedule' with exposed and unpainted construction for walls, floors, or ceilings or specifically mentioned as 'unfinished'.
- 1.15 Finish Space: Any space ordinarily visible, including exterior areas.

## WORK AND MATERIALS

- 1.16 Unless otherwise specified, all materials must be new and of the best quality. Materials previously incorporated into other projects, salvaged, or refurbished are not considered new. Perform all labor in a thorough and workmanlike manner.
- 1.17 All materials provided under the contract must bear the UL label where normally available. Note that this requirement may be repeated under equipment specifications. In general, such devices as will void the label should be provided in separate enclosures and wired to the labeled unit in proper manner.

#### SHOP DRAWINGS AND SUBMITTALS

- 1.18 Submit shop drawings and all data in accordance with Division 1 of these specifications and as noted below for all equipment provided under this Division.
- 1.19 Shop drawings submittal demonstrate to the Architect that the Contractor understands the design concept. The Contractor demonstrates their understanding by indicating which equipment and material they intend to furnish and install and by detailing the fabrication and installation methods of material and equipment he intends to use. If deviations, discrepancies, or conflicts between submittals and specifications are discovered either prior to or after submittals are processed, notify the Architect immediately.
- 1.20 Manufacturer's data and dimension sheets shall be submitted giving all pertinent physical and engineering data including weights, cross sections and maintenance instructions. Standard items of equipment such as receptacles, switches, plates, etc., which are cataloged items, shall be listed by manufacturer.
- 1.21 Index all submittals and reference them to these specifications. All submittal items shall be assembled and submitted, one for each specification section. (Multiple specification sections may be grouped together in one common submittal binder, as long as each individual section is clearly identified.) Partial or incomplete submittal sections will not be reviewed.

#### EQUIPMENT PURCHASES

- 1.22 Arrange for purchase and delivery of all materials and equipment within 20 days after approval of submittals. All materials and equipment must be ordered in ample quantities for delivery at the proper time. If items are not on the project in time to expedite completion, the Owner may purchase said equipment and materials and deduct the cost from the contract sum.
- 1.23 Provide all materials of similar class or service by one manufacturer.

#### COOPERATIVE WORK

- 1.24 Correct without charge any work requiring alteration due to lack of proper supervision or failure to make proper provision in time. Correct without charge any damage to adjacent work caused by the alteration.



- 1.25 Cooperative work includes: General supervision and responsibility for proper location and size of work related to this Division, but provided under the other sections of these specifications, and installation of sleeves, inserts, and anchor bolts for work under each section in this Division.

#### VERIFICATION OF DIMENSIONS

- 1.26 Scaled and figured dimensions are approximate only. Before proceeding with work, carefully check and verify dimensions, etc., and be responsible for properly fitting equipment and materials together and to the structure in spaces provided.
- 1.27 Drawings are essentially diagrammatic, and many offsets, bends, pull boxes, special fittings, and exact locations are not indicated. Carefully study drawings and premises in order to determine best methods, exact location, routes, building obstructions, etc. and install apparatus and equipment in manner and locations to avoid obstructions, preserve headroom, keep openings and passageways clear, and maintain proper clearances.

#### CLOSING-IN OF UNINSPECTED WORK

- 1.28 Cover no work until inspected, tested, and approved by the Architect. Where work is covered before inspection and test, uncover it and when inspected, tested, and approved, restore all work to original proper condition at no additional cost to Owner.

#### EXCAVATION AND BACKFILL

- 1.29 All excavation and backfill shall be in accordance with Division 1 of these specifications and as noted below.
- 1.30 Perform all necessary excavation, shoring, and backfilling required for the proper laying of all conduits inside the building and premises, and outside as may be necessary.
- 1.31 Excavate all trenches open cut, keep trench banks as nearly vertical as practicable, and sheet and brace trenches where required for stability and safety. Excavate trenches true to line and make bottoms no wider than necessary to provide ample work room. Grade trench bottoms accurately. Machine grade only to the top line of the conduits, doing the remainder by hand. Do not cut any trench near or under footings without first consulting the Architect. All trenches shall be done in accordance with OSHA standards and regulations.
- 1.32 Backfilling shall be done with each layer compacted before another layer is added. No stones or coarse lumps shall be laid directly on a conduit or conduits.
- 1.33 Trenches shall be filled with the specified material. Sod, if any, shall be removed in cut sections and replaced in same manners.

- 1.34 Provide pumps and drainage of all open trenches for purposes of installing electrical duct and wiring.
- 1.35 Perform all backfilling in accordance with the requirements of and under the direction of the Geotechnical Engineer.
- 1.36 Where new underground trenching is required on sites or in any area where existing underground utilities exist, the Contractor shall provide an independent professional utility locating service to locate exact vertical and horizontal locations of all existing utilities. Where existing utilities are found the Contractor shall hand dig those areas to avoid disruption. The Contractor shall be responsible for immediate repairs to existing underground utilities damaged during construction. The Contractor shall repair all existing asphalt, concrete and landscape surfaces damaged or removed during construction to match their original conditions. Where trenching extends through public streets or roadways, the Contractor shall notify underground service alert in addition to the independent locating service 48 hours before start of construction to determine location of existing utilities by calling (800) 422-4133.

#### CONCRETE

- 1.37 Where used for structures to be provided under the contract such as bases, etc., concrete work, and associated reinforcing shall be as specified under Division 3 of these specifications.
- 1.38 See other sections for additional requirements for underground vaults, cable ducts, etc.

#### ACCESSIBILITY

- 1.39 Install all control devices or other specialties requiring reading, adjustment, inspection, repairs, removal, or replacement conveniently and accessibly throughout the finished building.
- 1.40 All required access doors or panels in walls and ceilings are to be furnished and installed as part of the work under this Section. Refer to Division 1 of these specifications and as noted below.
- 1.41 Where located in fire rated assemblies, provide doors which match the rating of the assembly and are approved by the jurisdictional authority.
- 1.42 Refer to 'finish schedule' for types of walls and ceilings in each area and the architectural drawings for rated wall construction.
- 1.43 Coordinate work of the various sections to locate specialties requiring accessibility with others to avoid unnecessary duplication of access doors.

## FLASHING

- 1.44 Flash and counter flash all conduits penetrating roofing membrane as shown on Architectural drawings. All work shall be in accordance with Division 7 of these specifications.

## IDENTIFICATION OF EQUIPMENT

- 1.45 All electrical equipment shall be labeled, tagged, stamped, or otherwise identified in accordance with the following schedules:

### 1.45.1 General:

- 1.45.1.1 In general, the installed laminated nameplates as hereinafter called for shall also clearly indicate its use, areas served, circuit identification, voltage and any other useful data.

- 1.45.1.2 All auxiliary systems, including communications, shall be labeled to indicate function.

### 1.45.2 Lighting and Local Panelboards:

- 1.45.2.1 Panel identification shall be with white and black micarta nameplates. Letters shall be no less than 3/8" high.

- 1.45.2.2 Circuit directory shall be two column typewritten card set under glass or glass equivalent. Each circuit shall be identified by the room number and/or number of unit and other pertinent data as required.

### 1.45.3 Distribution Switchboards and Feeders Sections:

- 1.45.3.1 Identification shall be with 1" x 4" laminated white micarta nameplates with black lettering on each major component, each with name and/or number of unit and other pertinent data as required. Letters shall be no less than 3/8" high.

- 1.45.3.2 Circuit breakers and switches shall be identified by number and name with 3/8" x 1-1/2" laminated micarta nameplates with 3/16" high letters mounted adjacent to or on circuit breaker or switch.

### 1.45.4 Disconnect Switches, Motor Starters and Transformers:

- 1.45.4.1 Identification shall be with white micarta laminated labels and 3/8" high black lettering.

- 1.45.5 All communication system terminal boxes including T.V., telephone/intercom, security, fire alarm, clock, and computer networking shall be provided with white micarta laminated labels and 3/8" high black lettering.

#### CONSTRUCTION FACILITIES

- 1.46 Furnish and maintain from the beginning to the completion all lawful and necessary guards, railings, fences, canopies, lights, warning signs, etc. Take all necessary precautions required by City, State Laws, and OSHA to avoid injury or damage to any persons and property.
- 1.47 Temporary power and lighting for construction purposes shall be provided under this Section. All work shall be in accordance with Division 1 of these specifications.

#### GUARANTEE

- 1.48 Guarantee all material, equipment and workmanship for all sections under this Division in writing to be free from defect of material and workmanship for one year from date of final acceptance, as outlined in the general conditions. Replace without charge any material or equipment proven defective during this period. The guarantee shall include performance of equipment under all site conditions, conditions of load, installing any additional items of control and/or protective devices, as required.

#### PATENTS

- 1.49 Refer to the General Conditions for Contractor's responsibilities regarding patents.

#### PLUMBING (DIVISION 22) / HEATING, VENTILATING, AND AIR CONDITIONING (DIVISION 23) / ELECTRICAL – COORDINATION REQUIREMENTS

- 1.50 All electrical work performed for this project shall conform to the California Electrical Code, to Local Building Codes and in conformance with Division 22, 23, and 26 of these specifications, whether the work is provided under the "Plumbing", "Heating, Ventilating, and Air Conditioning", or the "Electrical" Division of these specifications. Where the Division 22 and/or Division 23 Contractor is required to provide electrical work, he shall arrange for the work to be done by a licensed Division 26 Contractor, using qualified electricians. The Division 22 and/or Division 23 Contractor shall be solely and completely responsible for the correct functioning of all equipment regardless of who provided the electrical work.
- 1.51 The work under Division 22 and/or Division 23 shall include the following:
- 1.51.1 All motors required by mechanical equipment.
- 1.51.2 All starters for mechanical equipment which are not provided under the electrical division as part of a motor control center or otherwise indicated on the electrical drawings.

- 1.51.3 All wiring interior to packaged equipment furnished as an integral part of the equipment.
- 1.51.4 All control **wiring and conduit** for mechanical control systems.
- 1.51.5 All control systems required by mechanical equipment.
- 1.52 The work under Division 26 shall include the following:
  - 1.52.1 All power wiring and conduit; and conduit only for EMS control conductors between each building and the main control panel.
  - 1.52.2 Electrical disconnects as shown on the electrical drawings.
  - 1.52.3 Starters forming part of a motor control center.
- 1.53 All power wiring and conduit to equipment furnished under Division 22 and/or Division 23 shall be provided under Division 26. Control wiring and conduit, whether line voltage or low voltage, shall be provided under the division which furnishes the equipment.
- 1.54 Power wiring shall be defined as all wiring between the panelboard switchboard overcurrent device, motor control center starter or switch, and the safety disconnect switch or control panel serving the equipment. Also, the power wiring between safety disconnect switch and the equipment line terminals.
- 1.55 Control wiring shall be defined as all wiring, either line voltage or low voltage, required for the control and interlocking of equipment, including but not limited to wiring to motor control stations, solenoid valves, pressure switches, limit switches, flow switches, thermostats, humidistats, safety devices, smoke detectors, and other components required for the proper operation of the equipment.
- 1.56 All motor starters which are not part of motor control centers and which are required for equipment furnished under this Division shall be furnished and installed by the Division furnishing the equipment and power wiring connected under Division 26. Motor starters and control devices in motor control centers shall be furnished and installed under Division 26.
- 1.57 Division 26 Contractor shall make all final connections of power wiring to equipment furnished under this Division.
- 1.58 Wiring diagrams complete with all connection details shall be furnished under each respective Section.
- 1.59 Motor starters supplied by Plumbing and/or Heating, Ventilating and Air Conditioning shall be fused combination type minimum NEMA Size 1, and conform to appropriate NEMA standards for the service required. Provide NEMA type 3R/12 gasketed

enclosures in wet locations. Provide all starters with appropriately sized overload protection and heater strips provided in each phase, hand/off auto switches, a minimum of 2 NO and NC auxiliary contacts as required, and an integral disconnecting means. For ½ horsepower motors and below, when control requirements do not dictate the use of a starter, a manual motor starter switch with overload protection in each phase may be provided. Acceptable manufacturers are Allen Bradley, General Electric, Square D, Furnas and Cutler Hammer.

#### EQUIPMENT ROUGH-IN

- 1.60 Rough-in all equipment, fixtures, etc. as designed on the drawings and as specified herein. The drawings indicate only the approximate location of rough-ins. Mounting heights of all switches, receptacles, wall mounted fixtures and such equipment must be coordinated with the Architectural Designs. The Contractor shall obtain all rough-in information before progressing with any work for rough-in connections. Minor changes in the contract drawings shall be anticipated and provided for under this Division of the specifications to comply with rough-in requirements.

#### OWNER FURNISHED AND OTHER EQUIPMENT

- 1.61 Rough-in and make final connections to all Owner furnished equipment shown on the drawings and specified, and all equipment furnished under other sections of the specifications.

#### EQUIPMENT FINAL CONNECTIONS

- 1.62 Provide all final connections for the following:
- 1.62.1 All equipment furnished under this Division.
  - 1.62.2 Electrical equipment furnished under other sections of the specification.
  - 1.62.3 Owner furnished equipment as specified under this Division.

#### INSERTS, ANCHORS, AND MOUNTING SLEEVES

- 1.63 Inserts and anchors must be:
- 1.63.1 Furnished and installed for support of work under this Division.
  - 1.63.2 Mounting of equipment that is of such size as to be free standing and that equipment which cannot conveniently be located on walls, such as motor starters, etc., shall be rigidly supported on a framework of galvanized steel angle of Unistrut or B-line systems with all unfinished edges painted.
  - 1.63.3 Furnish and install all sleeves as required for the installation of all work under all Sections of this Division and for all communication systems including any

communication systems described in this Section which are bid to the General Contractor. Sleeves through floors, roof, and walls shall be as described in "Conduit and Fittings" Section 26 05 33.

#### SEISMIC ANCHORING

- 1.64 All switchgear and other free-standing electrical equipment or enclosures shall be anchored to the floor and braced at the top of the equipment to the structure. The Contractor shall submit drawings signed by the Contractor's registered structural Engineer indicating method of compliance prior to installation.
- 1.65 All sound systems, communication, signal or data networking equipment or enclosures shall be anchored to the structure. The Contractor shall submit drawings signed by the Contractor's registered Structural Engineer indicating method of compliance prior to installation.

#### RUST PROOFING

- 1.66 Rust proofing must be applied to all ferrous metals and shall be in accordance with Section 05500 of these specifications and as noted below.
  - 1.66.1 Hot-dipped galvanized shall be applied and after forming of angle-iron, bolts, anchors, etc.
  - 1.66.2 Hot-dipped galvanized coating shall be applied after fabrication for junction boxes and pull boxes cast in concrete.

#### GENERAL WIRING

- 1.67 Where located adjacent in walls, outlet boxes shall not be placed back to back, nor shall extension rings be used in place of double boxes, all to limit sound transmission between rooms. Provide short horizontal nipple between adjacent outlet boxes, which shall have depth sufficient to maintain wall coverage in rear by masonry wall.
- 1.68 In those instances where outlet boxes, recessed terminal boxes, or recessed equipment enclosures are installed in a fire rated assembly, provide "Flamesafe FSD 1077" fire stopping pads or approved equal, over the outlet or box.
- 1.69 Complete rough-in requirements of all equipment to be wired under the contract are not indicated. Coordinate with respective trades furnishing equipment or with the Architect as the case may be for complete and accurate requirements to result in a neat, workmanlike installation.

#### SEPARATE CONDUIT SYSTEMS

- 1.70 Each electrical and signal system shall be contained in a separate conduit system as shown on the drawings and as specified herein. This includes each power system, each

lighting system, each signal system of whatever nature, telephone, standby system, sound system, control system, fire alarm system, etc.

- 1.71 Further, each item of building equipment must have its own run of power wiring. Control wiring may be included in properly sized conduit for equipment feeders of #6 AWG and smaller, having separate conduit for larger sizes.

#### CLEANUP

- 1.72 In addition to cleanup specified under other sections, thoroughly clean all parts of the equipment. Where exposed parts are to be painted, thoroughly clean off any spattered construction materials and remove all oil and grease spots. Wipe the surface carefully and scrape out all cracks and corners.
- 1.73 Use steel brushes on exposed metal work to carefully remove rust, etc., and leave smooth and clean.
- 1.74 During the progress of the work, keep the premises clean and free of debris.

#### UTILITY SERVICES

#### PAINTING

- 1.75 Paint all unfinished metal as required in accordance with Division 1 of these specifications. (Galvanized and factory painted equipment shall be considered as having a sub-base finish.)
- 1.76 Paint all exposed conduit locations in finished spaces to match the finish on the surfaces they are attached to. Verify all color selections with the Architect prior to painting.

#### GENERAL DEMOLITION REQUIREMENTS

- 1.77 Remove existing work and items which are required to be removed in such manner that minimum damage and disturbance is caused to adjacent and connection work scheduled to remain. Repair or replace existing work schedule.
- 1.78 Include preparation of existing areas to receive new materials and removal of materials and equipment to alter or repair the existing building as indicated and as specified.
- 1.79 Perform demolition exercising proper care to prevent injury to the public, workmen and adjoining property.
- 1.80 Perform the removal, cutting, drilling of existing work with extreme care and use small tools in order not to jeopardize the structural integrity of the building.
- 1.81 Rebuild to existing condition or better, existing work which has to be removed to allow the installation of new work as required.



- 1.82 Remove, protect and reinstall existing items as indicated. Replace materials scheduled for reuse which are damaged by the Contractor to the extent that they cannot be reused, with equal quality material, and installation.
- 1.83 Do not reuse in this project materials and items removed from existing site or building, except with specific written approval by the Architect in each case, unless such removed material or item is specifically indicated or specified to be reused.
- 1.84 Remove materials and equipment indicated to be salvaged for reinstallation and store to prevent damage and reinstall as the work progresses. Do not reuse in this project, other materials and equipment removed from existing site or building, except with specific written approval by the Architect in each case.
- 1.85 Patch areas requiring patching, including damage caused by removing, relocating or adding fixtures and equipment, damages caused by demolition at adjacent materials.
- 1.86 Do not stockpile debris in the existing building, without the approval of the Architect. Remove debris as it accumulates from removal operations to a legal disposal area.
- 1.87 Contractor to assume existing oil filled and dry transformers, oil switches, ballasts, lamps, wooden poles, cross arms, computers, computer monitors, and conductor insulation containing materials considered hazardous. Comply with local, state and federal regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution. Contractor shall be responsible for removal of the above hazardous materials where encountered. Include all costs for such removal as part of this contract.
- 1.88 All fluorescent, compact fluorescent, high intensity discharge, metal halide, mercury vapor, high and low-pressure sodium, and neon lamps are to be disposed of as required by the California Waste Rule Regulations as described in the California Code of Regulations, Title 22, Division 4.5 and Chapter 23.

#### PROJECT CLOSEOUT

- 1.89 Prior to completion of project, compile a complete equipment maintenance manual for all equipment supplied under sections of this Division, in accordance with Division 1 of these specifications and as described below.
- 1.90 Equipment Lists and Maintenance Manuals:
  - 1.90.1 Prior to completion of job, Contractor shall compile a complete equipment list and maintenance manuals. The equipment list shall include the following items for every piece of material equipment supplied under this Section of the specifications:

- 1.90.1.1 Name, model, and manufacturer.
  - 1.90.1.2 Complete parts drawings and lists.
  - 1.90.1.3 Local supply for parts and replacement and telephone number.
  - 1.90.1.4 All tags, inspection slips, instruction packages, etc., removed from equipment as shipped from the factory, properly identified as to the piece of equipment it was taken from.
- 1.91 Maintenance manuals shall be furnished for each applicable section of the specifications and shall be suitably bound with hard covers and shall include all available manufacturers' operating and maintenance instructions, together with "as-built" drawings to properly operate and maintain the equipment. The equipment lists and maintenance manuals shall be submitted in duplicate to the Architect for approval not less than 10 days prior to the completion of the job. The maintenance manuals shall also include the name, address, and phone numbers of all subcontractors involved in any of the work specified herein. Four copies of the maintenance manuals bound in single volumes shall be provided.

#### RECORD DRAWINGS

- 1.92 The Division 26 Contractor shall maintain record drawings as specified in accordance with Division 1 of these specifications, and as noted below.
- 1.93 Drawings shall show locations of all concealed underground conduit runs, giving the number and size of conduit and wires. Underground ducts shall be shown with cross section elevations and shall be dimensioned in relation to permanent structures to indicate their exact location. Drawing changes shall not be identified only with referencing CORs and RFIs, the drawings shall reflect all of the actual additions or changes made. All as-built drawing information shall be prepared by the contractor in AutoCAD, updating the contract computer files as needed to reflect actual installed conditions for all site plans, lighting, power, communication, networking, audio visual, security or fire alarms systems included in the scope of work for this project.
- 1.94 One set of these record drawings shall be delivered to the Architect. The engineer will review documents for completeness and will not be responsible for editing contractor computer files.

#### CHANGES AND EXTRA WORK

- 1.95 When **changes** in work are requested, the Division 26 Contractor shall provide unit prices for the work involved in accordance with Division 1 of these specifications, and the following:
- 1.95.1 The material Costs shall **not exceed** the latest edition of the "Trade Service" end column "C" price list. The materials prices may be higher only where the

Contractor can produce invoices to substantiate higher material costs. The Contractor shall submit a print out copy of the trade service sheets with the change order to substantiate these values.

- 1.95.2 The labor Costs shall **not exceed** the latest edition of the "NECA Manual of Labor Units" **normal column**.
- 1.96 When **credits** in work are requested, the Division 26 Contractor shall provide unit prices for the work involved in accordance with Division 1 of these specifications, and the following:
- 1.96.1 The Material Costs shall **not be less than 80% of** the latest edition of the "Trade Service" end column price list. The materials prices may be lower only where the Contractor can produce invoices to substantiate lower material costs. Restocking fees may also be included in this amount where applicable.
- 1.96.2 The Labor Costs shall **not be less than 80% of** the latest edition of the "NECA Manual of Labor Units" **normal column**.
- 1.97 Conduit pricing for conduits of all types sized 3" or smaller.
- When changes in the scope of work require the Contractor to estimate conduit Installations, they shall **NOT include labor values (only material cost may be included)** for any of the below items. The labor values for conduit installation represented in the NECA manual are inflated to a point where additional labor for the below items can not be justified.
- 1.97.1 Couplings.
- 1.97.2 Set Screw or Compression Fittings, locknuts, Bushings and washers.
- 1.97.3 Conduit straps and associated screws or nails.
- 1.97.4 LB fittings or other specialty fittings or specialty mounting hardware may be included where needed.
- 1.98 Wire pricing for all types and sizes.
- When changes in the scope of work require the Contractor to estimate wire installations, they shall **NOT include labor values (only material cost may be included)** for any of the below items. The labor values for wire installation represented in the NECA manual are inflated to a point where additional labor for the below items can not be justified.
- 1.98.1 Locknuts, Bushings, tape, wire markers.
- 1.99 When changes in the scope of work require other equipment installations such as lighting fixtures, panelboards, switchboards, wiring devices, communications equipment

etc. the Contractor shall **NOT include labor values (only material cost may be included)** for any of the below items. The labor values for these equipment items represented in the NECA manual are inflated to a point where additional labor for the below items can not be justified.

1.99.1 Associated screws, nails, bolts, anchors or supports.

1.99.2 Locknuts, washers, tape.

1.100 The total labor hours for extra work will be required to be calculated as follows:

1.100.1 Change orders with 1 to 30 total labor hours

General Laborer	10%	of total labor hours
Journeyman	10%	of total labor hours
Foreman	80%	of total labor hours

1.100.2 Change orders with 31 to 100 total labor hours

General Laborer	20%	of total labor hours
Journeyman	40%	of total labor hours
Foreman	40%	of total labor hours

1.100.3 Change orders with over 100 total labor hours

General Laborer	30%	of total labor hours
Journeyman	50%	of total labor hours
Foreman	20%	of total labor hours

1.101 When change orders are issued which allow the work to be completed in the normal sequence of construction, the labor rates shall be based on the most current "Prevailing Wage" – straight time total hourly rate. When change orders require the Contractor to work out of sequence the "Prevailing Wage"– daily overtime hourly rate shall apply. Special condition situations shall be reviewed on an individual basis for alternate hourly rate schedules.

1.102 Costs **will not** be permitted for additional supervision on site or office time for processing any change order other than the 10% overhead allowance as described in Division 1. Cost for special equipment required to install items for an individual change order are permitted and must be individually identified. Lump Sum cost for small tools or any other cost not specifically required for the change order are not permitted.

1.103 Contractor estimates shall be formatted to clearly identify each of the following:

1.103.1 Line item description of each type of material or labor item.

1.103.2 Description of quantity for each item.

1.103.3 Description of (material cost per / quantity).

1.103.4 Description of (labor cost per / quantity).

1.103.5 Description of total labor hour breakdown per Foreman, Journeyman or General Laborer as described above.

#### ELECTRONIC FILES

1.104 The Contractor shall make a **written** request directly to Johnson Consulting Engineers for electronic drawing files. As a part of the written request, please include the following information:

1.104.1 Clearly indicate each drawing sheet needed (i.e., E1.1, E2.1, etc.).

1.104.2 Identify the name, phone number, mailing address and e-mail address of the person to receive the files.

1.104.3 Provide written confirmation and agreement with the requirements described for payment of computer files, as described below.

1.105 Detail or riser diagram sheets, or any other drawings other than floor plans or site plans, **will not be made available to the Contractor.**

1.106 Files will only be provided in the AutoCAD format in which they were created.

1.107 Requests for files will be processed as soon as possible; a minimum of 7 working days should be the normal processing time. The Contractor shall be completely responsible for requesting the files in time for their use.

END OF SECTION

**SECTION 26 05 19**  
**POWER CONDUCTORS**

**PART 1 – GENERAL**

- 1.1 Furnish and install wire and cable for branch circuits and feeders specified herein and as shown on the electrical drawings.
- 1.2 Submittals: Submit manufacturers' data for the following items:
  - 1.2.1 All cables and terminations
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
  - 1.3.1 Not including all items listed in the above itemized description.
  - 1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining, or clouding the items to be reviewed, or crossing out the items which are not applicable.
  - 1.3.3 Not including actual manufacturer's catalog information of proposed products.
  - 1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed

**PART 2 – PRODUCTS**

- 2.1 Wire and cable Rated 120 volt to 600 volt.
  - 2.1.1 All wire and cable shall be new, 600 volt insulated copper, of types specified below for each application. All wire and cable shall bear the UL label and shall be brought to the job in unbroken packages. Wire insulation shall be the color as specified herein and shall be type THWN-2. Insulated conductors shall be installed in all exterior exposed raceways. Conductors for branch circuit lighting, receptacle, power and miscellaneous systems shall be a minimum of No. 12 AWG. Increase conductor size to No. 10 AWG for 120 volt circuits greater than 100 feet from the panel to the load and for 277 volt circuits greater than 200 feet from the panel to the load. Circuit home-runs indicated to be larger than No. 12 must be increased the entire length of the circuit, including equipment grounding conductor. Wire sizes No. 14 through No. 10 shall be solid. No. 8 and larger shall be stranded.
  - 2.1.2 Aluminum conductors will be permitted (only where specifically identified on the drawings. See "600 Volt Feeder Schedule") in sizes 2/0 or larger. Conductors shall be listed by Underwriters Laboratories (UL) and suitable for operation at 600 volts or less, at a maximum operating temperature of 90N C ma

ximum in wet or dry locations. Conductors shall be marked "SUN-RES". Aluminum alloy conductors shall be compact stranded conductors of STABILOY® (AA-8030) as manufactured by Alcan Cable or Listed equal. AA-8000 Series aluminum alloy conductor material shall be recognized by The Aluminum Association.

2.1.3 MC type armored cable reference Section 26 05 33.

2.2 Wire and cable for systems below 120 volts.

2.2.1 All low voltage and communications systems cables routed underground shall be provided with a moisture resistant outer jacket, West Penn "Aquaseal" or equal, unless otherwise specified.

### PART 3 - EXECUTION

3.1 Wire and cable shall be pulled into conduits without strain using powdered soapstone, mineralac, or other approved lubricant. In no case shall wire be repulled if same has been pulled out of a conduit run for any purpose. No conductor shall be pulled into conduit until conduit system is complete, including junction boxes, pull boxes, etc.

3.2 All connections of wires shall be made as noted below:

3.2.1 Connections to outlets and switches: Wire formed around binding post of screw.

3.2.2 No. 10 wire and smaller: Circuit wiring connections to lighting fixtures and other hard wired equipment shall be made with pressure type solderless connectors, Buchanan, Scotchlock, Wing Nut, or approved equal. Alternate "WAGO" #773 series or "IDEAL" #32, 33, 34 and 39 series push wire style connectors are also acceptable.

3.3 All wiring shall be continuous without splicing unless where specifically noted on the drawings or where permitted below.

3.3.1 No. 10 wire and smaller above grade: Quantities as needed, connection made with pressure type solderless connectors, Scotchlock or equal.

3.3.2 No. 10 wire and smaller below grade: Quantities as needed, connection made with 'Raychem' long barrel compression terminals with crimping tool and quantity of crimps as recommended by manufacturer, provide 'Raychem' WCSM-S series in-line heat shrink, sealant coated splice kit. Alternate products must be UL listed for direct burial/submersible and rated to (1000V).

3.3.3 No. 8 wire and larger above grade: Quantities only where indicated, 'Raychem' long barrel compression terminals with crimping tool and quantity of crimps as recommended by manufacturer, provide 'Raychem' WCSM-S series in-line heat

shrink, sealant coated splice kit. Alternate products must be UL listed for direct burial/submersible and rated to (1000V).

- 3.3.4 No. 8 wire and larger below grade: Quantities only where indicated, 'Raychem' long barrel compression terminals with crimping tool and quantity of crimps as recommended by manufacturer, provide 'Raychem' WCSM-S series in-line heat shrink, sealant coated splice kit. Alternate products must be UL listed for direct burial/submersible and rated to (1000V).

- 3.4 All wiring throughout shall be color coded as follows:

	<u>480 volt system</u>	<u>208 or 240 volt system</u>
A Phase	Brown	Black
B Phase	Orange	Red
C Phase	Yellow	Blue
Neutral	Grey	White
Ground	Green	Green

- 3.5 Wiring must be color coded throughout its entire length, except feeders may have color coded plastic tape at both ends and any other accessible point.
- 3.6 All control wiring in a circuit shall be color coded, each phase leg having a separate color, and with all segments of the control circuit, whether in apparatus or conduit, utilizing the same color coding.
- 3.7 At all terminations of control wiring, the wiring shall have a numbered T&B or Brady plastic wire marker.
- 3.8 Cables when installed are to be properly trained in junction boxes, etc., and in such a manner as to prevent any forces on the cable which might damage the cable.
- 3.9 All conductors to be installed into a common raceway, shall be pulled into the raceway at the same time.
- 3.10 All conductors shall be installed in such a manner as to not exceed the manufacturers' recommended pulling tension and bending radius. The equipment used for pulling must be specifically designed for the purpose. Motorized vehicles such as pickup trucks, are not acceptable.

END OF SECTION



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## SECTION 26 05 26

### GROUNDING

#### PART 1 – GENERAL

- 1.1 Furnish and install grounding and grounding conductors and electrodes as specified herein and as shown on the drawings.
- 1.2 Submit catalog data for all components.
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
  - 1.3.1 Not including all items listed in the above itemized description.
  - 1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
  - 1.3.3 Not including actual manufacturer's catalog information of proposed products.
  - 1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.

#### PART 2 – EXECUTION

- 2.1 Grounding
  - 2.1.1 All panelboard cabinets, equipment, enclosures, and complete conduit system shall be grounded securely in accordance with pertinent sections of CEC Article 250. Conductors shall be copper. All electrically operated equipment shall be bonded to the grounded conduit system. All non-current carrying conductive surfaces that are likely to become energized and subject to personal contact shall be grounded by one or more of the methods detailed in CEC Article 250. All ground connections shall have clean contact surfaces. Install all grounding conductors in conduit and make connections readily accessible for inspection.
  - 2.1.2 Provide an insulated equipment grounding conductor in all branch circuit and feeder raceway systems, sized in accordance with CEC 250-1122.
  - 2.1.3 Provide an additional individual insulated grounding conductor for each circuit which contains an isolated ground receptacle or surge suppression receptacle.
  - 2.1.4 Grounding of metal raceways shall be assured by means of provisions of grounding bushings on feeder conduit terminations at the panelboard, and by means of insulated continuous stranded copper grounding wire extended from the ground bus in the panelboard to the conduit grounding bushings.

2.1.5 Except for connections which access for periodic testing is required, make grounding connections which are buried or otherwise inaccessible by exothermite type process.

2.1.6 The following ohmic values shall be test certified for each item listed. A written report signed and witnessed by the project IOR shall be provided to the engineer. If the ohmic value listed cannot be obtained additional grounding shall be installed to reach the value listed.

2.1.6.1 Service. ....10 ohms.

2.1.6.2 Step down transformers and non-current carrying metal parts  
..... 25 ohms.

2.1.6.3 Manholes, handholes, etc.  
..... 10 ohms.

END OF SECTION

**SECTION 26 05 33**  
**CONDUIT AND FITTINGS**

**PART 1 – GENERAL**

- 1.1 Furnish and install conduit and fittings as shown on the drawings and as specified herein.
- 1.2 Submit Manufacturer's data on the following:
  - 1.2.1 Conduit.
  - 1.2.2 Fittings
  - 1.2.3 Fire stopping Material.
  - 1.2.4 Surface Raceways.
  - 1.2.5 Type MC or MC-PCS cable, provide construction details and UL "E" number.
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
  - 1.3.1 Not including all items listed in the above itemized description.
  - 1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
  - 1.3.3 Not including actual manufacturer's catalog information of proposed products.
  - 1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.

**PART 2 – PRODUCTS**

- 2.1 Rigid steel conduit, intermediate metal conduit (IMC), electrical metallic tubing (EMT) and flexible metallic conduit shall be steel, hot dipped galvanized after fabrication.
- 2.2 PVC conduit shall be Carlon or approved equal.
- 2.3 Liquid tight flexible metal conduit shall be Anaconda Sealtite type UA or approved equal. Fittings shall be Appleton, Crouse-Hinds, Steel City, T&B, or equivalent.
- 2.4 MC type armored cable, when utilized, shall be provided with the following:
  - 2.4.1 Comply with UL 1479 and CEC 330

- 2.4.2 90°C, copper, THHN conductors.
- 2.4.3 Minimum #12 insulated grounding conductor.
- 2.4.4 Conductors sized No. 10 and smaller shall be solid, No. 8 and larger shall be stranded.
- 2.4.5 Oversized (150%) neutrals or separate neutrals shall be provided.
- 2.4.6 Increase phase conductors to No. 10 AWG for 120 volt circuits greater than 100 feet from panel to load and for 277 volt circuits greater than 200 feet from panel to load. Where required increase conductor sizes for entire length of circuit.
- 2.4.7 Interlocked armored aluminum sheath.
- 2.4.8 AC or BX type armored cable shall not be substituted in lieu of MC type cable.
- 2.4.9 Color code cable according to cable type and configuration.
- 2.4.10 Acceptable manufacturers are AFC and Alflex.
- 2.5 MC-PCS luminary armored cable , when utilized, shall be provided with the following:
  - 2.5.1 Comply with UL 1479 and CEC 330
  - 2.5.2 90°C, copper, THHN conductors.
  - 2.5.3 Minimum #12 insulated grounding conductor.
  - 2.5.4 Lighting phase conductors sized No. 10 and smaller shall be solid, lighting control conductors shall be sized no. 16 solid.
  - 2.5.5 Interlocked armored aluminum sheath.
  - 2.5.6 AC or BX type armored cable shall not be substituted in lieu of MC type cable.
  - 2.5.7 Color code phase cable according to cable type and configuration. color code control conductors purple/gray.
  - 2.5.8 Acceptable manufacturers are AFC and Alflex.
- 2.6 Fire stopping material shall provide an effective seal against fire, heat, smoke and fire gases. Fire stopping material shall be tested to comply with ASTM E 814 and UL 1479. The submittal for this product shall include the UL listed system number and installation requirements for each type of penetration seal required for this project.

- 2.7 Each length of conduit shall be stamped with the name or trademark of the manufacturer and shall bear the UL label.
- 2.8 All plastic conduit shall be rigid, schedule 40, heavy wall PVC. All PVC conduit shall be UL listed. Underground utility company conduits shall comply with local utility co. requirements.
- 2.9 Plastic conduit shall be stored on a flat surface, and protected from the direct rays of the sun.
- 2.10 Where branch circuit or communication raceways cannot be concealed in ceilings or walls and are required to be exposed in interior spaces, provide nonmetallic surface raceway system sized per the manufacturer capacity requirements. A full complement of nonmetallic fittings must be available and matching device boxes and cover plates must be provided. The color of the raceway system, components and boxes shall be (white). Where data networking cabling is to be installed, all raceway fittings shall meet Category 5 radius requirements. Where specific raceway types have been noted on the drawings they shall be as follows:

2.10.1 System 'SR'	Hubbell	WALLTRAK 1 series
	Wiremold	ECLIPSE PN05series
	Panduit	LD5 series
	Hellerman-Tyton	TSR2 series
2.10.2 System 'SR2'	Hubbell	WALTRAK 22
	Wiremold	2300D Series
	Panduit	D2P10
	Hellerman-Tyton	TSR3 series
2.10.3 System 'SR3'	Hubbell	BASETRAK series
	Wiremold	5400 - series
	Panduit	70 series
	Hellerman-Tyton	MCR Infostream" series

Provide with offset boxes, inline boxes may only be used where specifically shown on the drawings.

### PART 3 – FITTINGS

- 3.1 All metallic fittings, including those for EMT, flexible conduit, or malleable iron. Die cast fittings of any other material are not permitted.
- 3.2 Locknuts shall be steel or malleable iron with sharp clean cut threads.
- 3.3 Entrance seals shall be 0.Z. type FSK or equivalent.

- 3.4 Bushings and locknuts: Where conduits enter boxes, panels, cabinets, etc., they shall be rigidly clamped to the box by locknuts on the outside, and a lock nut and plastic bushing on the inside of the box. All conduits shall enter the box squarely.
- 3.5 Furnish and install insulated bushings as per CEC article No. 300 - 4 (F) on all conduits. The use of insulated bushings does not exclude the use of double locknuts to fasten conduit to the box.
- 3.6 Transition from plastic to steel conduits shall be with PVC female threaded adaptors.
- 3.7 Couplings and connectors for rigid steel or IMC conduit must be threaded, or compression type (set screw fittings are not permitted).
- 3.8 Couplings and connectors for EMT shall be compression, watertight. Set screw connectors are not acceptable, except for systems below 120 volts.
- 3.9 MC or MC-PCS type armored cable shall be provided with listed clamp type die cast zinc set screw connectors. Anti-short bushings shall be provided at all cable ends.
- 3.10 Connectors for flexible metal conduit shall be steel or malleable iron with screw provided to clinch the conduit into the adapter body. For sizes up to ¾" a screw-in, "Jake type," fitting may be used.
- 3.11 Install approved expansion fittings, or liquid tight flex conduit with a minimum 6" slack for conduits passing through all expansion and seismic joints.

#### **PART 4 - EXECUTION**

- 4.1 All branch circuits shall be installed concealed in walls or above ceilings or in concrete floor slabs. PVC conduits installed in concrete floor slabs shall transition to PVC coated rigid steel where conduits penetrate above finished grade or finished floor.
- 4.2 Conduit sizes for various numbers and sizes of wire shall be as required by the CEC, but not smaller than ½" for power wiring and ¾" for communications and fire alarm systems unless otherwise noted. Conduit in slab or below grade shall be ¾" minimum trade size, unless otherwise identified.
- 4.3 Conduit size shall be such that the required number and sizes of wires can be easily pulled in and the Contractor shall be responsible for the selection of the conduit sizes to facilitate the ease of pulling. Conduit sizes shown on the drawings are minimum sizes in accordance with appropriate tables in the CEC. If because of bends or elbows a larger conduit size is required, the Contractor shall so furnish without further cost to the Owner.
- 4.4 The Contractor shall be entirely responsible for the proper protection of this work from the other trades on the job. When conduit becomes bent or holes are punched through

same, or outlets moved after being roughed-in, the Contractor shall replace same, without additional cost to the Owner.

4.5 Rigid steel conduit or IMC shall be used as follows:

4.5.1 Exposed exterior locations.

4.5.2 Exposed interior locations below eight feet above floor, except in electrical rooms and closets.

4.5.3 In hazardous or classified areas as required by CEC.

4.6 EMT conduit shall be used for areas as follows:

4.6.1 All interior communications, signal, and data networking systems.

4.6.2 All interior power wiring systems where not required to be in rigid steel, IMC or flexible conduit.

4.7 Flexible conduit shall be used for areas as follows:

4.7.1 To connect motors, transformers, and other equipment subjected to vibration or where specifically detailed on the drawings.

4.7.2 Flexible conduit shall not be used to replace EMT in other locations where the conduit will be exposed.

4.7.3 Flexible metal conduit shall be ferrous. Installation shall be such that considerable slack is realized. The conduit shall contain separate code sized grounding conductor.

4.7.4 Liquid tight flexible conduit shall be used in conformance with CEC in lengths not to exceed 4'. For equipment connections, route the conduit at 90 degrees to the adjacent path for point of connection. The conduit shall contain separate code sized grounding conductor. Use liquid tight flexible conduit for all equipment connections exposed in possible wet, corrosive or oil contaminated areas, e.g., shops and outside areas.

4.8 MC armored cable may be used as follows:

4.8.1 All branch circuit wiring for lighting and power circuits where permitted and installed in compliance with UL 1569 and CEC 330.

4.9 MC-PCS luminary armored cable may be used as follows:

4.9.1 All Lighting branch circuit wiring for lighting circuits where permitted and installed in compliance with UL 1569 and CEC 300-22(c), 330. This cable permits



conductors of control circuits to be placed in a cable with lighting power circuits or class 1 circuits.

4.9.2 It shall not be considered an acceptable option to install lighting control class 1 circuits as an open wire installation.

4.10 MC and MC-PCS armored cable shall **not** be used for the following areas:

4.10.1 Any exterior, underground or buried in concrete circuits.

4.10.2 Any circuits feeding HVAC equipment or pumps or any circuit with 30 AMPs or greater overcurrent protection.

4.10.3 Any exposed interior locations except in electrical, communication or mechanical equipment rooms.

4.10.4 Any exposed interior damp/wet locations, kitchens, science classrooms, shop areas, or concealed in science classroom casework, unless provided with approved PVC jacket.

4.10.5 Any hazardous rated area.

4.11 Plastic conduit shall be used for all exterior underground, in slab, and below slab on grade conduit installations. Install bell ends at all conduit terminations in manholes and pull boxes. Where plastic conduit transitions from below grade to above grade, no plastic conduit shall extend above finished exterior grade, or above interior finished floor level.

4.12 Plastic conduit joints shall be made up in accordance with the manufacturer's recommendations for the particular conduit and coupling selected. Conduit joint couplings shall be made watertight. Plastic conduit joints shall be made up by brushing a plastic solvent cement on the inside of a plastic fitting and on the outside of the conduit ends. The conduit and fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly.

4.13 All underground conduit depths shall be as detailed on the drawings or a minimum of 30" below finished grade (when not specifically detailed otherwise), for all exterior underground conduits. Where concrete slurry or concrete encasement is provided, include "Red" color dye in mixture.

4.14 All underground conduits for power systems (600v and higher), shall be concrete encased and a minimum of 48" below grade or as detailed on the drawings. Where concrete slurry or concrete encasement is provided, include "Red" color dye in mixture.

4.15 Conduit shall be continuous from outlet to outlet, cabinet or junction box, and shall be so arranged that wire may be pulled in with the minimum practical number of junction boxes.

- 4.16 All conduits shall be concealed wherever possible. All conduit runs may be exposed in mechanical equipment rooms, electrical equipment rooms, electrical closets, and in existing or unfinished spaces. No conduit shall be run exposed in finished areas without the specific approval of the Architect.
- 4.17 All raceways which are not buried or embedded in concrete shall be supported by straps, clamps, or hangers to provide a rigid installation. Exposed conduit shall be run in straight lines at right angles to or parallel with walls, beams, or columns. In no case shall conduit be supported or fastened to other pipes or installed to prevent the ready removal of other trades piping. Wire shall not be used to support conduit.
- 4.18 It shall be the responsibility of the Contractor to consult the other trades before installing conduit and boxes. Any conflict between the location of conduit and boxes, piping, duct work, or structural steel supports, shall be adjusted before installation. In general, large pipe mains, waste, drain, and steam lines shall be given priority.
- 4.19 Conduits above lay-in grid type ceilings shall be installed in such a manner that they do not interfere with the "lift-out" feature of the ceiling system. Conduit runs shall be installed to maintain the following minimum spacing wherever practical.
- 4.19.1 Water and waste piping not less than 3".
- 4.19.2 Steam and steam condensate lines not less than 12".
- 4.19.3 Radiation and reheat lines not less than 6".
- 4.20 Provide all necessary sleeves and chases required where conduits pass through floors or walls as part of the work of this section. Core drilling will only be permitted where approved by the Architect.
- 4.21 All empty conduits and surface mounted raceways shall be provided with a ¼" polypropylene plastic pull cord and threaded plastic or metal plugs over the ends. Fasten plastic "Dymo" tape label to exposed spare conduit to identify "power" or "communication" system, and to where it goes.
- 4.22 The ends of all conduits shall be securely plugged, and all boxes temporarily covered to prevent foreign material from entering the conduits during construction. All conduit shall be thoroughly swabbed out with a dry swab to remove moisture and debris before conductors are drawn into place.
- 4.23 Bending: Changes in direction shall be made by bends in the conduit. These shall be made smooth and even without flattening the pipe or flaking the finish. Bends shall be of as long a radius as possible, and in no case smaller than CEC requirements.
- 4.23.1 For power conduits for conductors (600v and below), provide minimum 36" radius (vertical) and 72" radius (horizontal) bends.

- 4.23.2 For power conduits for conductors (greater than 600v), provide minimum 72" radius (vertical) and 72" radius (horizontal) bends.
- 4.24 Supports: Conduit shall be supported at intervals as required by the California Electrical Code. Where conduits are run individually, they shall be supported by approved conduit straps or beam clamps. Straps shall be secured by means of toggle bolts on hollow masonry, machine screws or bolts on metal surfaces, and wood screws on wood construction. [No perforated straps or wire hangers of any kind will be permitted. Where individual conduits are routed, or above ceilings, they shall be supported by hanger rods and hangers.] Conduits installed exposed in damp locations shall be provided with clamp backs under each conduit clamp, to prevent accumulation of moisture around the conduits.
- 4.25 Where a number of conduits are to be run exposed and parallel, one with another, they shall be grouped and supported by trapeze hangers. Hanger rods shall be fastened to structural steel members with suitable beam clamps or to concrete inserts set flush with surface. A reinforced rod shall be installed through the opening provided in the concrete inserts. Beam clamps shall be suitable for structural members and conditions. Rods shall be galvanized steel 3/8" diameter minimum. Each conduit shall be clamped to the trapeze hanger with conduit clamps.
- 4.26 All concrete inserts and pipe clamps shall be galvanized. All steel bolts, nuts, washers, and screws shall be galvanized or cadmium plated. Individual hangers, trapeze hangers and rods shall be prime-coated.
- 4.27 Openings through fire rated floors/walls and/or smoke walls through which conduits pass shall be sealed by Fire stopping material to comply with Division 1 to seal off flame, heat, smoke and fire gases. Sleeves shall be provided for power or communication system cables which are not installed in conduits, and shall be sealed inside and out to comply with manufacturers UL system design details. Where multiple conduits and/or cable tray systems pass thru fire-rated walls at one location, the Contractor shall submit copies of the manufacturers UL system design details proposed for use on this project. All Fire stopping material shall have an hourly fire-rating equal to or higher than the fire rating of the floor or wall through which the conduit, cables, or cable trays pass.
- 4.28 Provide cap or other sealing type fitting on all spare conduits. Conduits stubbed into buildings from underground where cable only extends to equipment, the conduit/cable end shall be sealed to prevent moisture from entering the room or space.
- 4.29 All conduits which are part of a paralleled feeder or branch circuit shall be installed underground.
- 4.30 All conduits which are required as a part of systems specified in Divisions 27 or 28, or any other low voltage communication systems, shall be furnished and installed by the Division 26 Contractor.

- 4.30.1 The Contractor shall coordinate all conduit requirements with each system supplier prior to bid to determine special conduit system requirements.
- 4.30.2 The Contractor shall provide a pull rope in all conduits for these systems.
- 4.30.3 The Contractor shall provide conduit sleeves for all open cable installations thru rated walls or block walls. Provide conduit from each building main termination cabinet or backboard to the nearest accessible ceiling for access into all electrical or communications rooms.
- 4.31 In addition to the above requirements, the following requirements shall apply to all data networking conduits:
  - 4.31.1 Flexible metal conduit may only be used where required at building seismic and/or expansion joints.
  - 4.31.2 All underground conduits shall be provided with minimum 24" radius elbows (vertical) and 60" (horizontal).
  - 4.31.3 No length of conduit above grade shall be installed to exceed 150 feet between pull boxes, or points of connection, unless where specifically detailed on the drawings.
  - 4.31.4 No length of conduit shall be installed to exceed two 90 degree bends between pull boxes, or points of connection, unless where specifically detailed on the drawings.
- 4.32 Where surface raceways are installed in interior spaces, the Contractor shall take care to route in straight lines at right angles to or parallel with walls, beams, or columns. All raceways and device boxes shall be securely screwed to the finish surface with zinc screw "Auger" anchors Stk #ZSA1K by Gray Bar Electric or equal. Tape adhesive application will not be permitted.
- 4.33 The Contractor who installs surface raceway systems shall provide and install complete with wire retention clips, one for every (8) vertical feet or (5) horizontal feet or portion thereof. This Contractor shall also provide each raceway channel with pull strings.
- 4.34 It shall be the responsibility of the Contractor installing the raceway to coordinate the installation of raceway device plates and inserts with the communications or data contractors.
- 4.35 MC or MC-PCS cable shall be cut using a specific metallic sheath armor stripping tool. The use of hacksaws, dikes or any other tools not specifically designed to remove the armor sheath will not be permitted.

- 4.36 MC or MC-PCS cables installed in attic spaces or above lay-in ceilings shall be installed to be protected from physical damage. The cable shall be mounted along the sides or bottom of joists, rafters or studs.
- 4.37 Support wires used for supporting ceilings, lighting fixtures or other equipment items shall **not** be used to support MC or MC-PCS cables. Conduits, duct work, piping or any other equipment shall not be used to support or mount MC cables.
- 4.38 MC or MC-PCS cable supports, fasteners and clips shall be designed specifically for use with MC cables. Standard conduit supports, fasteners and clips, nails or other items are not permitted for installing MC cables.

END OF SECTION

**SECTION 26 05 34**  
**OUTLET AND JUNCTION BOXES**

**PART 1 – GENERAL**

- 1.1 Furnish and install electrical wiring boxes as specified and as shown on the electrical drawings.
- 1.2 Submit manufacturer's data for all items.
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
  - 1.3.1 Not including all items listed in the above itemized description.
  - 1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
  - 1.3.3 Not including actual manufacturer's catalog information of proposed products.
  - 1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.

**PART 2 – PRODUCTS**

- 2.1 Boxes shall be as manufactured by Steel City, Appleton, Raco, or approved equal.
- 2.2 All boxes must conform to the provisions of Article 370 of the CEC. All boxes shall be of the proper size to accommodate the quantity of conductors enclosed in the box. Minimum box size shall be 4" square x 1-½" deep.
- 2.3 Boxes generally shall be hot dipped galvanized steel with knockouts. Boxes on exterior surfaces or in damp locations shall be corrosion resistant, cast ferrous and shall have threaded hubs for rigid conduit and neoprene gaskets for their covers. Boxes shall be Appleton Type FS, Crouse-Hinds, or the approved equal. Conduit bodies shall be corrosion resistant, cast malleable iron. Conduit bodies shall have threaded hubs for rigid conduit and neoprene gaskets for their covers. Conduit bodies shall be Appleton Unilets, Crouse-Hinds, or the approved equal. Where recessed, boxes shall have square cut corners.
- 2.4 Deep boxes shall be used in wall covered by wainscot or paneling and in walls or glazed tile, brick, or other masonry which will not be covered with plaster. Through the wall type boxes shall not be used unless specifically called for. All boxes shall be nongangable. Boxes in concrete shall be of a type to allow the placing of conduit

without displacing the reinforcing bars. All lighting fixture outlet boxes shall be equipped with the proper fittings to support and attach a light fixture.

- 2.5 All light, switch, receptacle, fire alarm devices and similar outlets shall be provided with approved boxes, suitable for their function. Back boxes shall be furnished and installed as required for the equipment and/or systems under this contract.
- 2.6 Pull and junction boxes shall be code gauge boxes with screw covers. Boxes shall be rigid under torsional and deflecting forces and shall be provided with angle from framing where required. Boxes shall be 4" square with a blank cover in unfinished areas and with a plaster ring and blank cover in finished areas. Covers for flush mounted oversize boxes shall extend  $\frac{3}{4}$ " past boxes all around. Covers for 4" square boxes shall extend  $\frac{1}{4}$ " past box all around.
- 2.7 All terminal cabinets and junction boxes or equipment back boxes which are required as a part of systems specified in Divisions 27 or 28, or any other low voltage communication systems, shall be furnished and installed by the Division 26 Contractor.
  - 2.7.1 The Division 26 Contractor shall coordinate all box requirements with each system supplier prior to bid to determine special cabinet or back box requirements. The Contractor shall also provide stainless steel blank cover plates for all low voltage systems installed for future equipment.
  - 2.7.2 The Contractor shall provide all plywood backboards indicated on walls or inside equipment enclosures. All backboards shall be a minimum of  $\frac{3}{4}$ " thick fire rated type plywood.
  - 2.7.3 The Contractor shall coordinate exact rough in locations and requirements with each system supplier.
- 2.8 In addition to the above requirements, boxes for data networking wiring and equipment shall comply with the following:
  - 2.8.1 All boxes shall be a minimum of 4-11/16" square x 2-1/8" deep.
  - 2.8.2 Where pull boxes are required on individual conduits 1- $\frac{1}{4}$ " or smaller, provide 4-11/16" square x 2-1/8" deep boxes. Where pull boxes are required on conduits larger than 1- $\frac{1}{4}$ " for straight pull through, provide eight times the conduit trade size for box length. Where pull boxes are required on conduits larger than 1- $\frac{1}{4}$ " for an angle or a U-pull through installation, provide a minimum distance of six times the conduit trade size between the entering and exiting conduit run for each cable.
- 2.9 Recessed boxes installed in fire rated floors/walls and /or smoke walls shall be sealed by Fire stopping material to comply with Division 1 to seal off flame, heat, smoke and fire gases. The Contractor shall submit copies of the manufacturers UL system design details pr

oposed for use on this project. All Fire stopping material shall have an hourly fire-rating equal to or higher than the fire rating of the floor or wall through which the conduit, cables, or cable trays pass.

### **PART 3 – EXECUTION**

- 3.1 Boxes shall be installed where required to pull cable or wire, but in finished areas only by approval of the Architect. Boxes shall be rigidly attached to the structure, independent of any conduit support. Boxes shall have their covers accessible. Covers shall be fastened to boxes with machine screws to ensure continuous contact all around. Covers for surface mounted boxes shall line up evenly with the edges of the boxes.
- 3.2 Outlets are only approximately located on the plans and great care must be used in the actual location of the outlets by consulting the various detailed drawings and specifications. Outlets shall be flush with finished wall or ceiling, boxes installed symmetrically on such trim or fixture. Refer to drawings for location and orientation of all outlet boxes.
- 3.3 Furnish and install all plaster rings as may be required. Plaster rings shall be installed on all boxes where the boxes are recessed. Plaster rings shall be of a depth to reach the finished surface. Where required, extension rings shall be installed so that the plaster ring is flush with the finished surface.
- 3.4 All cabinets and boxes shall be secured by means of toggle bolts on hollow masonry; expansion shields and machine screws or standard precast inserts on concrete or solid masonry; machine screws or bolts on metal surfaces and wood screws on wood construction. All wall and ceiling mounted outlet boxes shall be supported by bar supports extending from the studs or channels on either side of the box. Boxes mounted on drywall or plaster shall be secured to wall studs or adequate internal structure.
- 3.5 Boxes with unused punched-out openings shall have the openings filled with factory-made knockout seals.
- 3.6 Where standby power and normal power are to be located in the same outlet box or 480V in a switch box, install partition barriers to separate the various systems.
- 3.7 All device boxes and junction boxes for fire alarm system shall be painted red and shall be 4-11/16" square by 2-1/8" deep. No exceptions.

END OF SECTION



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**SECTION 26 27 26**  
**SWITCHES AND RECEPTACLES**

**PART 1 – GENERAL**

- 1.1 Furnish and install all wiring devices as shown on drawings and as herein specified. Unless otherwise noted, device and plate numbers shown are Hubbell and shall be considered the minimum standard acceptable. Other acceptable manufacturers are Pass and Seymour, Leviton, General Electric and Bryant.
- 1.2 Submit manufacturers' data on all items.
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
  - 1.3.1 Not correctly indicating ampacity rating of proposed devices.
  - 1.3.2 Not including all items listed in the above itemized description.
  - 1.3.3 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
  - 1.3.4 Not including actual manufacturer's catalog information of proposed products.
  - 1.3.5 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements or "to be determined later" statements. The products being submitted must be the products installed.

**PART 2 – PRODUCTS**

- 2.1 All switches shall be of the quiet mechanical type, Specification Grade, 20 amp, 120/277 volt AC as follows:

	<u>HUBBELL</u>	<u>LEVITON</u>	<u>PASS &amp; SEYMOUR</u>
Single Pole	CS120	CS1202	CS20AC1
Two Pole	CS1222	CS2202	CSB20AC2
Three-way	CS320	CS3202	CS20AC3
Key Switch	HBL1221L	1221-2L	PS20AC1-L
- 2.2 All switches shall have the "on" and the "off" position indicated on the handle. If switches of higher ampere ratings are required, they shall be of similar type and quality as those shown above. Groups of switches shown at one location shall be installed under a single plate up to a maximum of six where more than six switches are shown coordinate arrangement with the Architect.
- 2.3 Dimmer switches for incandescent lamp loads shall be square-law type, slide control dimmer with OFF position, Lutron or Hubbell "Nova-T" Series NT-600 (0-500 watt load), NT-1000 (501-900 watt load), NT-1500 (901-1500 watt load), or equal (no known equal).

- 2.4 All convenience receptacles and special outlets throughout shall be grounding type. Convenience receptacles shall be side wired, parallel slot, two pole, three wire, 20 amp as follows:

	<u>HUBBELL</u>	<u>LEVITON</u>	<u>PASS &amp; SEYMOUR</u>
Duplex	5352	5362	PS5362
GFCI	GFR5362	7899	2097
Isolated Ground	IG5362	5362IG	IG6300
Tamper Proof		8300SG	TR63H

- 2.5 All safety or tamper proof receptacles shall have no exposed external current carrying metal parts and shall have integral wiring leads suitable for two or three wire installations.
- 2.6 Special receptacles shall be as noted on the drawings.
- 2.7 Weatherproof plates shall be designed to meet CEC Article 410-57, wet location listed with cover "open." Where weatherproof receptacles have been identified to be provided with locking covers, the cover shall be as manufactured by Pass & Seymour #4600-8 or Cole Lighting 310 Series. Rough-in requirements vary between manufacturers. Contractor to field verify requirements prior to installation.
- 2.8 All plates throughout shall be stainless steel. Where wiring devices are installed in concrete block walls, provide oversized 3-1/2" x 5" coverplates.
- 2.9 All devices shall be white unless otherwise noted or a special purpose outlet.
- 2.10 Unless where specifically detailed on the drawings, floor boxes shall be PVC suitable for concrete poured floors of minimum 3-1/2" depth, with a modular design to gang two or three sections together.
- 2.10.1 Carlon #E976 series or approved equal
- 2.10.2 Provide brass cover with brass carpet flange unless otherwise detailed.

### **PART 3 – EXECUTION**

- 3.1 Switches for room lighting shall be located no more than 12" center line from door jamb at plus 48" center line above finished floor or +46" to top of devices where located over casework, reference CBC Figure 11B-5D.
- 3.2 All receptacles shall be mounted at plus 18" to center line above finished floor unless noted or shown otherwise. All receptacles shall be installed with the ground pin up, at the top of the receptacle to comply with IEEE 602-1986.
- 3.3 Furnish and install wall plates for all wiring devices, and outlet boxes, including special outlets, sound, communication, signal, and telephone outlets, etc. as required. All cover plates shall be appropriate for type of device.

END OF SECTION

## SECTION 26 28 16

### DISCONNECTS

#### PART 1 – GENERAL

- 1.1 Furnish and install all disconnect switches as shown on the drawings and as required by the CEC.
- 1.2 Submit manufacturers' data for all disconnects and fuses.
  - 1.2.1 Disconnects
  - 1.2.2 Fuses
- 1.3 **Common submittal mistakes which will result in the submittals being rejected:**
  - 1.3.1 Not including all items listed in the above itemized description.
  - 1.3.2 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
  - 1.3.3 Not including actual manufacturer's catalog information of proposed products.
  - 1.3.4 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.

#### PART 2 – PRODUCTS

- 2.1 Acceptable manufacturers shall be Square D, Cutler Hammer, Siemens or General Electric.
- 2.2 Equipment manufactured by any other manufacturers not specifically listed in Section 2.1 are not considered equal, or approved for use on this project.
- 2.3 All switches shall be heavy-duty type, externally operated, quick-make, quick-break, rated 600 volts or 240 volts as required, with the number of poles and ampacity as noted. All switches for motors shall be HP rated. Switches shall have NEMA-Type 1 enclosures, except switches located where exposed to outdoor conditions shall have NEMA Type 3R enclosure. Switches generally shall be fused except where noted to be non-fused on the drawings.
- 2.4 Where fuses are indicated, fuses shall be Bussman or Littlefuse (no known equal). Fuses shall be current limiting type with time delay characteristics to suit the equipment served.

### **PART 3 – EXECUTION**

- 3.1 Mount all switches to structure or U-channel support. U-channel supports shall be cleaned and painted to prevent rust.
- 3.2 Switches shall be accessible with proper clearances in front per CEC 110-16.
- 3.3 All lugs shall be torque tested in the presence of the inspector of record.
- 3.4 Arc Flash and Shock Hazard
  - 3.4.1 The contractor is to provide, and submit to the engineer for approval, incident energy level calculations as determined using the methodologies described in NFPA 70E or IEEE standard 1584-2002.
  - 3.4.2 A warning label, as specified in the above standard, shall be placed on each switchboard, panelboard, and safety switch indicating the incident energy levels on the equipment to warn qualified personnel in accordance with NFPA 70E, section 110.16 Labels shall be laminated white micarta with black lettering on each. Letters shall be no less than 3/8" high.
  - 3.4.3 The incident level calculations for each piece of equipment shall be given to the owner and maintained on file by the maintenance department.
  - 3.4.4 The design goal is to minimize the incident energy to which a maintenance employee may be exposed and in no case more than 8 cal./cm<sup>2</sup>.

END OF SECTION

**SECTION 26 33 23**  
**EMERGENCY LIGHTING EQUIPMENT**

**PART 1 – GENERAL**

- 1.1 Install an uninterruptible emergency lighting Inverter System and Emergency Power Control Relays to provide a reliable source of emergency power, designed to operate during periods of utility line deficiencies without any interruption in power supplied to the connected load. The system shall provide and be capable of powering any combination of electronic, power factor corrected, fluorescent, LED, incandescent or HID lighting. Other connected loads shall include but not be limited to building management systems, motors, security systems and other critical voltage or frequency-sensitive electronic loads. The system shall operate from 0-100% loading and be rated to deliver full KVA rated output at unity power factor for a minimum of 90 minutes. Upon return to normal AC utility line power, the system shall recharge the batteries without any interruption of power supplied to the load.
- 1.1 Submit manufacturer's data for each type including the following:
  - 1.1.1 catalog data
  - 1.1.2 warranty documentation.
- 1.2 **Common submittal mistakes which will result in the submittal being rejected:**
  - 1.2.1 Not including information for each type.
  - 1.2.2 Not including all items listed in the above itemized description.
  - 1.2.3 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlighting, underlining or clouding the items to be reviewed, or crossing out the items which are not applicable.
  - 1.2.4 Not including actual manufacturer's catalog information of proposed products.
  - 1.2.5 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.

**PART 2 - PRODUCTS**

- 2.1 The Central Inverter System specified herein shall be:
  - 2.1.1 Myers Power Products Illuminator "CIII" series.
  - 2.1.2 **Alternate manufacturers shall comply with these specifications and shall not exceed the physical dimensions and weights indicated on the drawing schedule. Maximum size shall be 44" wide x 72" high x 31" high 1460 lbs.**

**Electronics Module and (2) 48" wide x 72" high x 31" high 1400 lbs. battery cabinets.**

**2.1.3 All substitutions or alternates to those indicated shall be submitted for approval (7) days prior to the project bid date. Approvals when accepted will be issued in the form of an addendum. No consideration for substitutions will be provided after the award of the contract.**

**2.1.4 The substitution request must include a statement indicating the difference in price of both the specified and alternate product, both contractor and list price. The substitution request must include a comparison of the features and capabilities between the specified and proposed systems, software and all components and warranty comparison.**

**2.1.5 Equipment as manufactured by Digital Signal Power Manufacturer (DSPM) has been reviewed and is not an approved alternate for this project.**

2.2 System operation shall be fully automatic. The charging system will maintain the batteries at full capacity at all times. On-board microprocessors will continuously monitor charger settings and the system's overall readiness. Diagnostic circuitry shall include a software-controlled charger, continuous monitoring of operating parameters, and programmable system testing capabilities. Individual alarms and system logs shall be provided. All alarms and logs shall be automatically recorded and readily displayed via the User Interface Display (UID). The system shall also include one RS232 serial port for remote communications.

2.3 Automatic overload and short circuit protection in normal and emergency mode shall consist of 150% momentary surge capability, 120% overload for 5 minutes, and 110% overload for 10 minutes. Protection shall also include a low battery voltage disconnect, AC input circuit breaker, a DC input breaker or Fuse, and an AC output fuse. A digitally generated sinusoidal output waveform (PWM) with less than 5% total harmonic distortion at rated linear load shall be provided to the connected load.

2.4 Available input voltage shall be as indicated on the drawings, with a frequency of 60Hz. The AIC rating shall be a minimum of 42,000 RMS symmetrical amperes.

2.5 Available output voltage shall be as indicated on the drawings, with a frequency of 60Hz + 0.05Hz.

2.6 The user interface display (UID) shall include an array of LED's, a 2-line, 40-character LCD display, and a keypad for system input. The UID shall be menu-driven and display individual system parameters using a numbered code (Hot Key). The LED array shall indicate, by color code, the following status modes:

2.6.1 AC output presence (green)

2.6.2 System ready (green)

- 2.6.3 Battery charging (red)
- 2.6.4 Inverter “ON” (amber)
- 2.6.5 Alarm functions (red)
- 2.7 To ensure only authorized personnel have system access, a multi-level password shall be required to change all functions and operating parameters. A continuous scrolling display of the following metered functions shall be provided:
  - 2.7.1 AC input voltage, AC output voltage, AC output amps
  - 2.7.2 Battery voltage, Battery charging amps, Battery discharge amps
  - 2.7.3 Output volt-amps (VA), Output power (watts)
  - 2.7.4 Ambient temperature
  - 2.7.5 Last inverter run time, Total inverter run time, System run time, Date Time.
- 2.8 Audible and visual alarms shall be provided, with automatic logging of the twenty-five most recent events. An alarm acknowledgment feature shall be provided, which will allow the user to silence only the current audible alarm without silencing other alarms or clearing the alarm condition until the fault has been addressed. An alarm shall be sounded if any of the following operating conditions occur:
  - 2.8.1 Low battery voltage, Near low battery voltage, High battery voltage
  - 2.8.2 High AC input voltage, High AC output voltage, Low AC output voltage Output, overload (VA), Low remaining run time
  - 2.8.3 High ambient temperature
  - 2.8.4 Tripped circuit breaker
- 2.9 Manual and automatic test modes shall be provided.
  - 2.9.1 Manual user-initiated system test at any time.
  - 2.9.2 Automatic monthly and annual self-diagnostic tests.
  - 2.9.3 Automatic recording of the last twenty events in a Test Results log.
- 2.10 A three-step float charger shall be software controlled and temperatures compensated and charge the batteries continuously while in normal “standby” condition (non-emergency mode). Following a power failure, the constant current charger mode shall be initiated until battery voltage reaches the equalize stage. Equalize stage shall be maintained until the charging current drops to .5 amps, or 0.3% of the battery amp/hour rating. Battery voltage shall then enter the float stage.



- 2.11 Batteries shall be designed to provide a minimum 1.5 hours rated output voltage to the connected load in emergency mode without dropping below 87.5% of nominal battery voltage.
  - 2.11.1 The batteries shall be encased in an enclosure that permits easy maintenance without requiring removal.
  - 2.11.2 Sealed Lead Calcium: Maintenance Free Construction requires no addition of water over its useful. Life expectancy is **20-years, 1 year full 19 years prorated** at 77F (25C) ambient temperature.
- 2.12 The following optional factory-installed equipment shall be provided:
  - 2.12.1 Normally-On Output Circuit Breaker Options:
    - 2.12.1.1 A maximum of fourteen monitored positions are available. Single pole 120V and 277V breakers occupy one position each, while double pole 240V breakers occupy two positions. Reference drawings for required number of output breakers required.
  - 2.12.2 Provide Universal cabinet locks for all electronic and battery cabinets.
  - 2.12.3 Provide using the system's IP interface, an operating status reports is transmitted over a customer-supplied dedicated data IP connection to up to six locations. Phone numbers can be programmed locally using the unit keypad or computer terminal, or remotely via a modem. The automatically receives a unit status report following monthly and annual tests, or when an alarm condition is detected. Status reports include readings on key operating parameters, as well as complete alarm and inverter log printouts, in uncoded, user-friendly descriptions.
  - 2.12.4 Provide a factory-installed, internally mounted two-position "make before break" switch. Compatible with all input/output combinations and any combination or quantity of output circuit breakers. Allows connecting the utility power supply to the load without placing the inverter in emergency mode.
- 2.13 Maintenance, Service and Enhanced Warranty Plans. The following shall be provided to assure initial and long-term viability of the system through additional maintenance and service plans and/or through enhancements to the standard two-year electronics limited warranty.
  - 2.13.1 Factory Start-Up shall be supplied as a service to the installing contractor. The Factory Start-Up process shall verify correct installation and operation of the inverter system. Trained, factory authorized technicians shall administer an on-site, point-by-point check of the system to include:
    - 2.13.1.1 Internal electrical connections

- 2.13.1.2 AC input and Battery connections
  - 2.13.1.3 System operating voltages
  - 2.13.1.4 System operating parameters
  - 2.13.1.5 Initial system “power-up
  - 2.13.1.6 Battery discharge test
  - 2.13.1.7 Correction of existing deficiencies
  - 2.13.1.8 Final testing, calibration and recording
  - 2.13.1.9 Training of available operating personnel
- 2.13.2 A Monitoring Program shall provide for the continuous monitoring of the inverter system by the Factory Technical Support Group. All monthly and annual system tests shall be reviewed and analyzed for early warning signs of system malfunction. Any failures shall be automatically relayed to the service department where corrective action can be recommended to the owner/operator. For activation, a user IP interface must be available.
- 2.13.3 Provide a **minimum 2-year** factory start up and training program.
- 2.13.4 In addition to the factory start up and training program. Provide a Preventive Maintenance Plan (PMP) - The Preventive Maintenance Plan shall provide system coverage for **MINIMUM OF 5 YEARS Bi-Annual**. PMP warranty service excludes the batteries, which are covered under a separate warranty plan.
- 2.14 The system shall be contained in a code gauge, steel NEMA 1 enclosure, finished in a scratch resistant, powder coat finish, with a key lock, conduit knockouts at the top and sides, and front opening doors. Enclosures shall be designed to allow stacking to minimize the overall system’s footprint. All components shall be front accessible and incorporate a modular design and a quick disconnect means to facilitate servicing.
- 2.15 The Module has a full 5-year replacement warranty.
- 2.16 Provide (1) 80amp 3 pole normally on output circuit breaker.
- 2.17 Provide Category III/ Site Class D seismic bracing.
- 2.18 Provide battery temperature monitor.

### **PART 3 - EXECUTION**

- 3.1 Input and output conductors shall be enclosed in separate conduits. All load side wiring shall be sized as required for voltage drop conditions to assure proper operation of connected loads.
- 3.2 All free-standing electrical equipment or enclosures shall be anchored to the floor and braced at the top of the equipment to the structure. Where details have not been provided on the drawings, anchorage shall comply with CBC Section 1632A and Table 16-A0. The Contractor shall submit drawings signed by the Contractor's registered structural Engineer indicating method of compliance prior installation.
- 3.3 The system shall allow connection of both "normally on" and "normally off" (optional) loads. Connected loads shall receive utility power during normal operation, and 'no break' system inverter power during utility interruptions.
- 3.4 In emergency mode, the inverter system shall supply true digitally generated AC sinusoidal output. Refer to plans for type and location of loads served by the system.
- 3.5 Provide (1) on site owners training by factory representative minimum 4 hours.

END OF SECTION

## **SECTION 26 90 90**

### **ELECTRICAL CLOSEOUT**

#### **PART 1 – GENERAL**

- 1.1 Upon completion of the electrical work, the entire installation shall be tested by the Contractor, and demonstrated to be operating satisfactorily to the Architect, Engineer, Inspector and Owner.
- 1.2 All testing and corrections shall be made prior to demonstration of operation to the Architect, Engineer, Inspector and Owner.
- 1.3 In addition to the demonstration of operation, the Contractor is also required to review the content and quality of instructions provided on items demonstrated with the Architect, Engineer, Inspector and Owner.

#### **PART 2 – EXECUTION**

- 2.1 Wiring shall be tested for continuity, short circuits and/or accidental grounds. All systems shall be entirely free from “grounds,” “short circuits,” and any or all defects.
- 2.2 Motors shall be operating in proper rotations, and control devices functioning properly. Check all motor controllers to determine that properly sized overload devices are installed, and all other electrical equipment for proper operation.
- 2.3 Tests and adjustments shall be made prior to acceptance of the electrical installation by the Architect, and a certificate of inspection and acceptance of the electrical installation by local inspection authorities shall be provided.
- 2.4 All equipment or wiring provided which tests prove to be defective or operating improperly shall be corrected or replaced promptly, at no additional cost to the Owner.
- 2.5 Test all motor and feeder circuits with a “megger” tester to determine that insulation values conform to Section 110-20, California Electrical Code (CED). Test reports must be submitted and approved by the engineer before final acceptance.
- 2.6 Test all grounding electrode connections to assure a resistance of no more than 10 ohms is achieved. Augment grounding until the ohmic value stated above is achieved. Provide certified test results to the Architect, Engineer and Inspector.

END OF SECTION

**SECTION 27 01 00**  
**COMMUNICATIONS GENERAL PROVISIONS**

**PART 1 - SUMMARY**

- 1.1 This Division of the specifications outlines the provisions of the contract work to be performed as a sub contract under the Division 26 scope of work. Reference the Division 26 Electrical General Provisions for scope of work and general requirements.
- 1.2 In addition, work in this Division is governed by the provisions of the bidding requirements, contract forms, general conditions and all sections under Division 1 requirements.

END OF SECTION

**SECTION 27 10 00**  
**VOICE / DATA/ IP INFRASTRUCTURE**

**PART 1 – GENERAL**

- 1.1 Include all labor, equipment and materials necessary for providing a complete networking infrastructure system as described herein and/or as indicated on the drawings.
- 1.2 Related specification sections:
  - 1.2.1 Section 26 01 00 – General Provisions
  - 1.2.2 Section 26 05 19 – Conductors
  - 1.2.3 Section 26 05 33 – Conduit and Fittings
  - 1.2.4 Section 26 05 34 – Outlet and Junction Boxes
- 1.3 Approved minimum Product and Contractor Extended Warranty Certifications;
  - 1.3.1 All components shall be manufactured by one of approved manufacturers, the installing Contractor must have the accompanying certification from the product manufacturer(s) for installation of an “Extended Warranted System” as required by each manufacturer and as indicated in these specifications.
    - 1.3.1.1 Specified system warranties are to be established between the component and cable manufacturers and the District, warranties between the cable manufacturer only or installing Contractor and the District are not considered equal.
    - 1.3.1.2 Warranty shall be a full “Performance Warranty” installed by a “Certified Contractor” as specified by one of the approved manufacturers. A “Component Warranty” will not be considered equal. All components, labor, and “Performance Criteria” shall be warranted by one of the approved manufacturers.
- 1.4 Acceptable manufacturers are:
  - 1.4.1 **LEVITON / BERK-TEK**
    - 1.4.1.1 Installing Contractor must be LEVITON Network Solutions Premier certified to install this system.
    - 1.4.1.2 Warranty provision and training must be for the Leviton/Berk-Tek – Limited Lifetime Premium Performance Warranty program.
  - 1.4.2 **COMMSCOPE**

1.4.2.1 Commscope's Training and Warranty programs encompass the brand names known as AMP Netconnect, Systimax, ADC/Krone and Uniprise.

1.4.2.2 Installing Contractor must be PartnerPro certified to install any of the systems under the Commscope Family of brand names. Alternate certifications that apply as well are AMP ND&I Premier Certification for products installed with the AMP Netconnect brand name. ADC Krone TrueNet Premium for products installed with the ADC Krone brand name and Systimax Premier Certification for products installed with the Systimax brand name.

1.4.2.3 Warranty provision and training must be for the Commscope (AMP Netconnect, Uniprise and Systimax) – 25-Year Premium Performance Warranty program.

**1.4.3 ORTRONICS (Legrand) /Superior Essex**

1.4.3.1 Installing Contractor must be CIP-ESP or IP certified to install this system.

1.4.3.2 Warranty provision and training must be for the nCompass – Lifetime Premium Performance program.

**1.4.4 Panduit/General Cable**

1.4.4.1 Installing Contractor must be PanGen certified to install this system.

1.4.4.2 Warranty provision and training must be for the PanGen Certification Plus – 25-Year Siemon Premium Performance program.

**1.4.5 Siemon**

1.4.5.1 Installing Contractor must be Siemon Certified Installers (CI) certified to install this system.

1.4.5.2 Warranty provision and training must be for the Premium 6 Certification – 20-Year Premium Performance program.

1.4.6 Warranty shall be to the District, for the period as defined by the Network Infrastructure System selected for installation, after District acceptance and sign-off of the completed system. The Contractor must provide documentation from one of the approved manufacturers, as indicated in Section 1.3, indicating their qualifications for installation of this system in compliance with the manufacturer/s warranty period requirements as warranted Contractor.

- 1.4.7 Equipment qualifications: It is the intent of these specifications that each bidder provides all hardware, components and installation services that are necessary to ensure a fully operational wiring system including warranties, as shown in the EIA/TIA Category-6 guidelines.
- 1.4.8 All components, parts, infrastructure, patch cables, termination panels and cables must be classified by the manufacturer or manufacturers as a part of the "Extended Warranty" program. Contractor may not mix in components from other certified programs or materials that are not considered part of the "Lifetime" warranty.
- 1.4.9 Systems or components as manufactured by any other manufacturer which, are not specifically listed in 1.3 are **not** approved for use on this project.
- 1.5 **Installing Contractor qualifications:** Firms and their personnel must be regularly engaged in the installation of data networking cabling and equipment for systems of similar type and scope. The Contractor must have a full-service office able to respond to emergency callouts during the warranty period. The Contractor must also provide complete installation of all wiring and devices or equipment. **Subcontractors with Electrical Contractors or other warranted or non-warranted Contractors for supervised installation of any part of this system are not approved.**
  - 1.5.1 The successful Contractor shall be a California licensed C7 or C10 Premise Wiring Contractor as defined in this specification.
  - 1.5.2 All work shall be performed under the supervision of a company accredited and trained by the Manufacturer of the components and cable and such accreditation must be presented with the bid submittal. All personnel performing work on this project must have successfully completed the manufacturer's training courses to completely comply with the extended warranty requirements prior to performance of any work on this project. Accreditation will consist of individual employee certifications issued by the manufacturer or manufacturers.
  - 1.5.3 All personnel engaged in the testing of premises fiber optic and copper UTP cable systems must have successfully completed the test equipment manufacturer's training courses. Certification of such training must be presented with the bid submittal. Cut sheets of the test equipment to be utilized shall be provided with Phase I project material submittals.
  - 1.5.4 This project shall employ Category-6 and Augmented Category-6 cabling. The Contractor shall install the related components in relation to the performance requirements for the type of cable installed.



- 1.5.5 If Contractor routes cable and/or associated pathways in another route than indicated on the drawings, they shall maintain all maximum cable installation distances as required by the manufacturer's distance limitations.
- 1.6 In order to ensure project cohesion, a single point of contact is required to provide a "TURNKEY" solution. The work covered under this section of the specification consists of furnishing all: labor, cabling, equipment, supplies, materials, and training.
- 1.7 The drawings indicate a schematic routing of cables above-ceiling cable prior to bid. Where cables penetrate through walls a conduit sleeve shall be provided. Where cables pass through fire rated walls, the conduit sleeve shall be sealed to maintain the rating of wall assembly.
- 1.8 Unless otherwise noted in the project drawings or these specifications, the Division 26 Contractor shall provide the installation of all conduits, outlet and junction boxes, trenching and pull box installation.
- 1.9 General Submittal Requirements
  - 1.9.1 **Phase I Submittal** shall be made in electronic format within (20) working days after the award of the contract by the District. This submittal shall include the following:
    - 1.9.1.1 Complete Bill of Materials in Excel Spreadsheet format with bills of quantities, including all materials, components, devices, and equipment required for the work. The bills of quantities shall be tabulated respective of each and every system as specified, and shall contain the following information for each Section listed:
    - 1.9.1.2 Description and quantity of each product.
    - 1.9.1.3 Manufacturer's Name and Model Number.
    - 1.9.1.4 Manufacturer's Specification Sheet or Cut Sheet.
    - 1.9.1.5 Specification Item Number reference for each required product or if not shown in the specification, Drawing Detail Number being referenced (i.e. Spec 2710000 Item 2.1 or DWG E4.15/#1).
    - 1.9.1.6 Include with submittals all warranty information and a description of support and maintenance services to be provided. Also include all licenses and maintenance agreements required for continued operation of the equipment.
  - 1.9.2 Common submittal mistakes which will result in submittals being rejected:

- 1.9.2.1 Not including the qualifications of the installing Contractor Company and Contractor's Staff.
- 1.9.2.2 Not including all items listed in the above itemized description.
- 1.9.2.3 Including catalog cut sheets which have several items on a page, and not clearly identifying by highlights, underlining or clouding the items to be reviewed (provided for the project) or crossing out the items which are not applicable.
- 1.9.2.4 Not including actual manufacturer's cut sheets or catalog information of proposed products.
- 1.9.2.5 Do not include multiple manufacturers for similar products and do not indicate "or approved equal" statements, or "to be determined later" statements. The products being submitted must be the products installed.

## **PART 2 – PRODUCTS**

### **IDF Location Requirements**

- 2.1 The Intermediate Distribution Frame (IDF) Room is existing, The Contractor shall include the following items at this location:

### **Copper Patch Cords**

- 2.2 Copper patch cords shall be furnished and installed by the Contractor.
- 2.3 Provide Category-6 (Patch Panel End) patch cords with pre-molded boot, provide quantity equal to:
  - 2.3.1 Provide 100% of the total Category-6 cable ports provided on the patch panels.
  - 2.3.2 All patch cords to be installed by Contractor. Provide 100% of total copper patch cords required to be (4) feet in length.
- 2.4 Provide Category-6 (Workstation End) patch cords with pre-molded boot provide quantity equal to:
  - 2.4.1 Provide 100% of the total Category-6 cable ports provided on the patch panels.
  - 2.4.2 All patch cords to be installed by Contractor. Provide 100% of total copper patch cords required to be (10) feet in length, unless otherwise noted.

- 2.4.3 Patch cords installed at WAP (Wireless Access Point) locations IP Camera and IP Intercom locations shall be (2) feet in length.
- 2.5 Requirements for all copper patch cords furnished:
  - 2.5.1 Color of patch cords shall be determined by the color code shown in detail drawings.
  - 2.5.2 Patch cords shall as manufactured by Leviton, Commscope, Panduit, Ortronics or Siemon based on the network infrastructure system furnished by the Contractor.
  - 2.5.3 Patch cords furnished must be in compliance with the manufacturer's "Channel" warranty requirements. Patch cords not warranted through the selected manufacturer Channel warranty program will not be approved for use with the network infrastructure.
  - 2.5.4 Provide all other items as detailed on the drawings.

#### **Category-6 Station Cable**

- 2.6 Contractor shall provide Category-6 UTP cable to each Data, Voice, IP Page, Audio-Visual Data Connection, IP Camera or any other location as indicated on the drawings and specifications. Provide quantity of cables as indicated on the drawings at each location.
- 2.7 Provide one Category-6, 4-pair unshielded twisted pair (UTP) cable from the nearest MDF or IDF location to each RJ45 data outlet port indicated on the drawings. Dual port outlets will require two such cables. Four port outlets will require four cables. Refer to the drawing details for jacket color requirements for each type of connection. Color of cable jacket for each type of connection shall be determined by the drawing details. Confirm color of cable jacket prior to ordering with the District IT Director. Contractor shall be responsible for providing the correct jacket color per the drawings per District Standards.
- 2.8 Unless otherwise shown in drawing details, the color of the Category 6 UTP cables shall be blue, shall be copper wire, individually insulated and color coded.
- 2.9 The cable shall be UL or ETL rated and UL verified in compliance Category-6 EIA/TIA standards. Approved cables for Network Infrastructure System:
 

Commscope (Systimax)	–	GigaSpeed XL – 1071E Series
Commscope (AMP Netscope)	–	TE620R
Commscope (Uniprise/Krone)	–	UltraMedia 75N4

- |  |                |   |                               |
|--|----------------|---|-------------------------------|
|  | Superior Essex | – | NextGain Cat 6eX - #54-246-xA |
|  | Berk-Tek       | – | LANMARK 2000 – 10167477       |
|  | General Cable  | – | GigaSpeed 6500 71339XX–       |
|  | Siemon         | – | 9C6R4-E4-XX-RBA               |
- 2.10 On projects requiring plenum rated cabling, provide the plenum jacketed version of the type of cable shown in the specifications. Refer to the contract drawing for areas requiring plenum rated cabling.
- 2.11 Where data cables are indicated to run underground, Contractor shall use a Category-6 OSP-rated cable. Approved cables for Network Infrastructure System:
- 2.12 Manufacturer names and part numbers are shown as a point of reference and do not specifically designate required packaging or color for the cable. Contractor shall verify colors and packaging options shall be determined by Contractor preferences.
- 2.13 Where data cables are indicated to run underground, Contractor shall use an Augmented Category-6 OSP-rated cable. Approved cables for Network Infrastructure System:
- |  |           |   |                        |
|--|-----------|---|------------------------|
|  | Commscope | – | Category-6A OSP –1592A |
|--|-----------|---|------------------------|
- 2.14 Superior Essex, General Cable and Siemon do not offer an OSP Rated Augmented Cat-6 product. Contractor shall provide the Commscope/Systimax OSP shielded cable for a Siemon or Levitor Network infrastructure solution. Contractor shall provide shielded termination products for all drop locations and terminations panels and shall ground all products per manufacturer’s instructions and warranty requirements.
- 2.15 Commscope Brand Names (Systimax, AMP NetConnect, Uniprise and Krone) – Cabling installed for Outside Plant applications is available in shielded type construction only for these structured cabling systems. Contractor shall provide shielded termination products for all drop locations and termination panels and shall ground all products per manufacturer’s instructions and warranty requirements.

### Category-6 Outlets

- 2.16 Unshielded twisted pair Category-6 outlets shall be an RJ45 Enhanced performance type 8-position / 8 conductor modular jacks, and shall comply with Category-6 performance requirements. Provide single port, dual port, four port or quantity as indicated on the floor plans at each outlet location. All outlets shall be wired in an EIA/TIA 568B configuration.

- 2.17 Provide Category-6 inserts, wired for EIA 568B. Provide installation kits for all locations furnished with Category-6 UTP cabling.
- 2.18 Refer to the detail drawings for color of the Category-6 outlets required. Contractor shall be responsible for confirming all color requirements prior to ordering.
- 2.19 Provide the following Category-6 UTP data connector per Network infrastructure warranty requirements:
  - 2.19.1 Leviton eXtreme Cat6+ Quick Port Series 61110-R
  - 2.19.2 Systimax (Commscope) GigaSpeed XL Series MGS400
  - 2.19.3 AMP NetConnect (Commscope) SL 110 Series 1-1375055
  - 2.19.4 Uniprise (Commscope) UNJ 600 Series UNJ600
  - 2.19.5 Ortronics Clarity 6 Tracjack Series OR-TJ600
  - 2.19.6 Panduit MiniCom TX6 Plus Series CJ688TG
  - 2.19.7 Siemon MAX-6 Series MX6-F
- 2.20 For outlet locations cabled with OSP-rated Augmented Category-6 wire, , wired for EIA 568B. Provide shielded installation kits for all locations furnished with OSP-rated Augmented Category-6 UTP cabling. Cable connections must be grounded at the patch panel location.
- 2.21 Refer to the detail drawings for color of the Category-6 outlets required. Contractor shall be responsible for confirming all color requirements prior to ordering.

#### **Outlet Faceplates**

- 2.22 Provide a two-port faceplate for all one and two part outle locations. Provide blanks for all unused openings.
- 2.23 All faceplates and surface mount outlet boxes shall be furnished with label windows. All labeling shall be installed within the label window.
- 2.24 Confirm color of all faceplates prior to ordering. All data outlet faceplates shall have a unique sequential identification number applied to faceplate. Hand written labels are not permitted. All color schemes shall be approved by the customer prior to installation.
- 2.25 Colored inserts are required for this project. Refer to the detail drawings for the exact color scheme to be provided. Inserts submitted that do not follow the color and

identification requirements will be rejected. Inserts installed that do not follow the color coding as shown in the detail drawings will be replaced at the Contractor's expense.

2.26 All labels will be installed under label window. Labels adhered to the surface of the faceplate will not be accepted. Contractor must provide clear laminating type of cover material over the surface mounted labels where used.

2.27 Reference the drawings for special outlet configurations or plate requirements.

### **PART 3 – INSTALLATION**

3.1 Pull strings shall be provided with all cable runs including but not limited to: conduit stub ups, conduit sleeves, cable trays, open wiring routes, innerduct and point-to-point conduits. Pull strings shall be free from cable bundles in open wiring routes. Pull strings shall not be substituted for pull ropes for the exterior site conduits.

3.2 Velcro cable management straps are required on all Category-6 cable bundles, the last 20 feet or upon entry into equipment closet, a maximum of 12" apart. Cable bundles shall also be routed through cable managements or "D" rings in the equipment closet.

3.3 Data Contractor shall supply protective bushings or slide on rings at the ends of all exposed conduits used for data system cabling. This is to include all conduits installed for any future data cabling requirements. Contractor shall submit planned protection bushings prior to installation of cabling for approval.

3.4 Velcro cable management straps are required on the cabling in the rear section of the vertical managers in the equipment racks. Straps shall be a maximum of 12" apart. At a minimum, Velcro straps shall be provided at each point the cables are routed to the patch panels from the main bundle.

3.5 Labeling

3.5.1 Each cable run shall be permanently labeled at each end with a unique sequential number which corresponds to a similar number provided for each data outlet and patch panel point. A printed label shall be placed at each of the following locations:

3.5.1.1 On the cable at the rear of the patch panel or termination block. Requires the use of a self-laminating wrap around label. Brady Label self-laminating 1.2" by 1.5" wrap around label Part #29689 (NO ACCEPTABLE EQUAL).

3.5.1.2 On each cable in the j-box behind the faceplate location. Requires the use of a self-laminating wrap around label. Brady Label self-laminating 1.2" by 1.5" wrap around label Part #29689 (NO ACCEPTABLE EQUAL).

- 3.5.1.3 On the cable at the terminal strip prior to termination point. Requires the use of a self-laminating wrap around label. Brady Label self-laminating 1.2" by 1.5" wrap around label Part #29689 (NO ACCEPTABLE EQUAL).
- 3.5.1.4 On the face of the patch panel, provide a ¾" by ¾" label with a letter or number identifying the patch panel designation. For special purpose data connections such as WAP, Audio-Visual, IP Page and IP Camera ports, the label shall be designated with colored label icon or marker.
- 3.5.1.5 On the face of the faceplate in the label holder window. The label shall be clearly defined with a minimum #10 font size.
- 3.5.2 Handwritten labels are not permitted. Where cable ID includes room number identification, the Contractor shall obtain written verification of final room numbers prior to beginning labeling (numbers on plans do not always match final room numbers). Cable pulling cross reference lists will not be accepted with final documentation.
- 3.5.3 Each patch panel port shall be identified with a unique sequential labeling scheme. Port identification labeling pattern shall be consistent throughout the project.
- 3.5.4 All faceplates shall be identified with permanent printed labels. Labels must not be subject to removal by incidental contact. Contractor shall be responsible for replacing defective labeling for a period of one year from date of final sign-off of project.
- 3.5.5 Refer to detail drawings for additional labeling requirements.
- 3.6 Where open wiring cables are run through the ceiling space (only permitted where specifically noted on the drawings), the wire shall be bundled together and supported above the ceiling.
- 3.7 All cables must be fastened to the building structure via "j-hooks" or an approved Category 6 suspension system, and not directly in contact with ceiling system. For "j-hooks" maximum fill capacity is as follows: 1-5/16" hooks – 35 cables; 2" hooks – 60 cables; 4" hooks – 120 cables. For quantities beyond 120 cables, use a sling support system such as "Erico Cable Cat" or equal. Maximum fill capacity 200 cables. D-rings, "Caddy #WMX cable hangar", "Caddy Bridle Rings", drive rings or any other type of wire ring support is not allowed.
- 3.8 Where cables pass through a fire-resistant portion of the structure, conduit sleeves shall be provided to maintain the rating of wall penetrated. Sealing of all penetrations with an approved fire barrier is required. Conduits and sleeves must remain accessible for future use. Permanent sealants may not be used to seal sleeves and conduits.

- 3.8.1 The 27 10 00 Contractor shall be responsible for fire-stopping all unused conduit sleeves in the ceiling or through rated walls. The Electrical Contractor shall be responsible for fire-stopping around the conduit or sleeve, unless the sleeve is installed by the 27 10 00 Contractor, in which case, the 27 10 00 Contractor shall be responsible for all fire-stopping requirements.
- 3.8.2 Expanding foam is not an acceptable sealant for any conduit opening. Contractor shall be responsible for complete replacement of the conduit and cabling in any conduit filled with expanding foam used as a sealant.
- 3.9 Fiber optic feed cables connecting to equipment racks from the MDF Room or from an adjacent IDF location, shall be installed with not less than a 20-foot service loop between the rack and mounted on the backboard. See drawings for fiber optic service loop requirements.
- 3.10 Provide 6 inches of cable slack at computer data system outlets inside conduit box.
- 3.11 In an accessible ceiling area, provide a 10-foot (stored in a Figure-8 configuration) service loop above the all data/voice outlet locations. Service loop must be securely tied up off of ceiling tiles or ceiling surface and supported at two opposite points. Neatly coil cable without exceeding minimum bend radius limitations. Do not provide length in excess of 15 feet, as it may cause improper test results and errors.
- 3.12 The minimum bending radius for all cables and the maximum pulling tension shall not exceed manufacturer's recommendations.
- 3.13 Cables installed in manholes and pullboxes shall be supported with Velcro ties or loosely fitted UV rated tie wraps, on wall mounted cable support racks. The cables shall be clearly labeled in the manhole or pullbox.
- 3.14 Provide a full 360-degree loop of slack cable around manhole and pullbox interiors. Cables entering handholes from the bottom, shall not be allowed to touch the bottom of the cover when closed and shall not be pinched or crushed in any way.
- 3.15 Cable pulling shall use a split mesh grip over the cable jacket. Connection directly to optical fibers and copper wire conductors shall not occur.
- 3.16 When pulled through conduits, cable pulling lubricants shall be continuously applied to all cables and be specifically approved by the manufacturer.
- 3.17 Where cables are pulled through or pulled from a center run, pull without splices or terminations, lead out the cables at all manholes, pullboxes, and conduits, taking care to feed them in again by hand for the next run.
- 3.18 For each cable pull where a cable direction change is required, flexible feed-in tubes, pullout devices, multi-segmented sheaves, etc., shall be used to ensure proper cable



pulling tension and side wall pressures. Cables shall not be pulled directly around a short right-angle bend. Any device or surface the cable comes in contact with when under pull-in tension shall have a minimum radius 50% greater than the final specified minimum installed cable bending radius. The maximum possible size radius sheaves and feed-in tubes, usable in the available working space shall be provided in all situations, to ensure the minimum possible cable sidewall pulling pressure. Do not use devices with multi-segment "roller" type sheaves.

- 3.19 Cable lengths over 250 feet shall be machine pulled, not hand pulled. Cables shall be pulled in a continuous, smooth operation without jerking or stop-start motion after initiation of pull. Maximum cable pulling speed shall be less than 50 feet per minute. Minimum pulling speed shall be greater than 15 feet per minute.
- 3.20 A pull string shall be placed with all UTP and paging station cables at the time of installation. Conduit runs and surface raceway for station cabling shall be furnished with a minimum 2-Ply spiral wrap style, pull string rated for 240 ft/lbs. pulling strength, such as manufactured by Greelee #431 or approved equal. Includes all conduit stubs and cables routed through open ceiling and cable trays. Pull strings shall be tied off in the junction box and in the ceiling. Provision for the installation of the pulls string shall apply to all empty and spare conduits as well. Single ply type pull string will not be accepted as a substitute for the 2-ply pull string.
- 3.21 A measuring pull tape shall be placed with all feed cables at the time of installation. Indoor riser and outdoor conduit runs between buildings designated for feed cabling, in excess of 150 feet shall be provided with a minimum ½" polyaramid style, measuring true tape pull string annotated with footage increments rated for 2500 ft/lbs. pulling strength, such as manufactured by Greenlee #39245 or approved equal. Conduit runs less than 150 feet shall be furnished with a ¼" polyaramid style, measuring true tape pull string annotated with footage increments rated for 1250 ft/lbs. pulling strength, such as manufactured by Greenlee #39243 or approved equal. Provision for the installation of the measuring pull tape shall apply to all empty and spare conduits as well. Standard twine style pull strings and standard nylon or polypropylene style pull ropes will not be accepted as a substitute for the polyaramid measuring tape pull string.
- 3.22 When pulling cable through conduit, cables shall be pulled straight into or out of the raceway without bends at the raceway entrance or exit. Pull in cable from the end having the sharpest bend (i.e., bend shall be closest to the reel). Keep pulling tension to minimum by liberal use of lubricant, hand turning of reel, and slack feeding of cable into duct entrance. Employ not less than one man at reel and one at manhole or pullbox during this operation. Cables shall be pulled directly from cable reels.
- 3.23 All cables shall be new and extend continuous from each MDF or IDF backboard or rack to all outlet locations.

- 3.24 Where cables are not installed in a conduit or other raceway system, they shall not be routed parallel with other line voltage equipment or wiring (120 volt and above) with 36" or within 12" of line voltage equipment or wiring where crossing.
- 3.25 Where OSP-Rated UTP cables or OSP-Rated fiber optic cables are routed exposed through ceiling for more than 50'-0", Contractor shall install the cable in innerduct or EMT conduit in the ceiling. Innerduct installed in the accessible ceiling space shall be a minimum of riser rated and minimum of 1" in diameter. Innerduct shall be supported minimum of every 3-feet to the structural members.

## TESTING

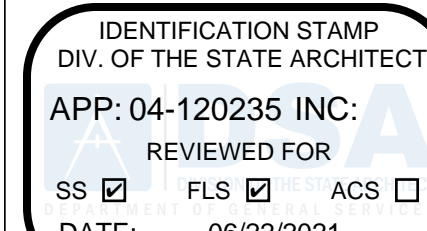
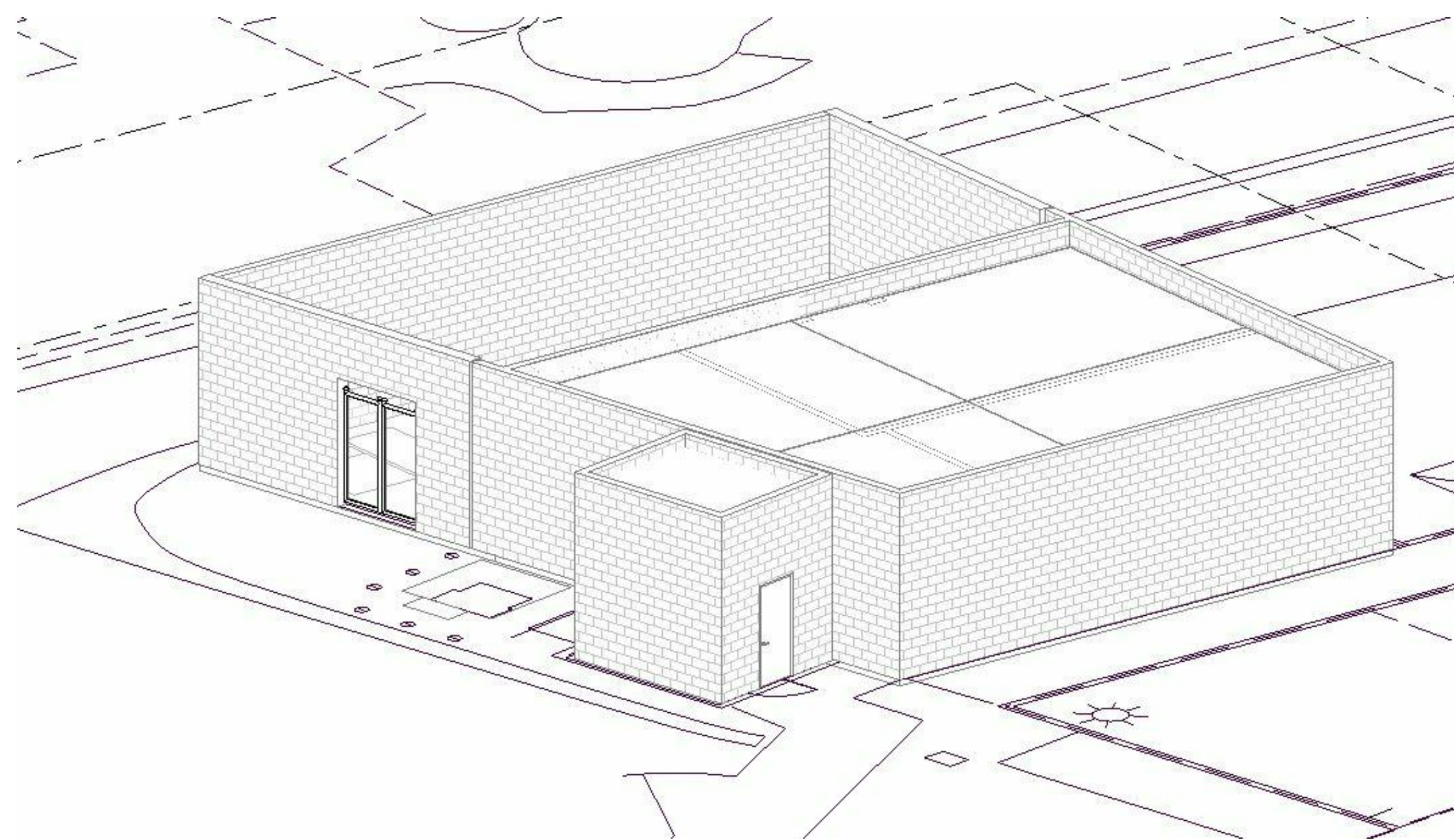
- 3.26 All Category-6 cables shall be point to point (link) tested after installation/termination and verified to operate at minimum 1000Mbps. Performance of installed cables shall satisfy all current addendums to the EIA/TIA 568A standard for Category-6 wiring. In addition, testing shall satisfy all proposed amendments to the existing ISO/IEC requirements. The wiring shall support all specified communication protocols. Testing shall support the Category-6 requirements by the EIA/TIA.
- 3.27 Upon completion of testing cable links for both copper and fiber optic cabling, the Contractor shall supply a copy of the original database files downloaded from the tester in original format on a USB Flash Drive. Contractor shall provide with the testing database files, an original copy of the tester's manufacturer software program (included in original cost) for record management and archiving, in a Windows format (i.e., Fluke Linkware software program).
- 3.27.1 The manufacturer's software program will be used by the Project Engineer to review all test results, and then turned over to the District to keep as their record copy with the final approved test results. Provide (3) copies of tests on USB Flash Drives. Do not submit test results for review in Excel or PDF file formats, as the submittal will be rejected and not reviewed.
- 3.28 Contractor will repair or replace cable runs or connecting hardware that do not meet specified criteria.
- 3.29 Final As-Built Drawing Submittals – Provide (1) hard bound copy of "E-size" As-Built drawings and (3) copies on USB Flash Drive in AutoCad (2014 or newer version) format. A Hand marked-up copy of the original construction drawings will not be accepted as the final As-Built drawing submittal. Final As-Built drawings shall include copies of the floor plan drawings of each building, detailed elevations of each MDF or IDF locating all equipment, quantities outlets and speaker locations, locations of all sleeves and identification of all final cable routes. In addition, the drawings shall include all outlet locations with cable identification numbers.

END OF SECTION



1725 HILLSDALE ROAD, EL CAJON, CA 92019  
GROSSMONT UNION HIGH SCHOOL DISTRICT

3775 TENTH STREET, RIVERSIDE CALIFORNIA 92501 (951) 684 4664 / 5751 PALMER WAY, SUITE C, CARLSBAD CALIFORNIA 92010 (760) 438 5899



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Phone: 909.374.2011  
Contact: Richard Gonser  
specstudio@icloud.com

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IDENTIFICATION STAMP  
DIV. OF THE STATE ARCHITECT  
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DATE: 06/22/2021

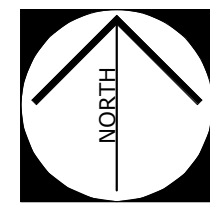
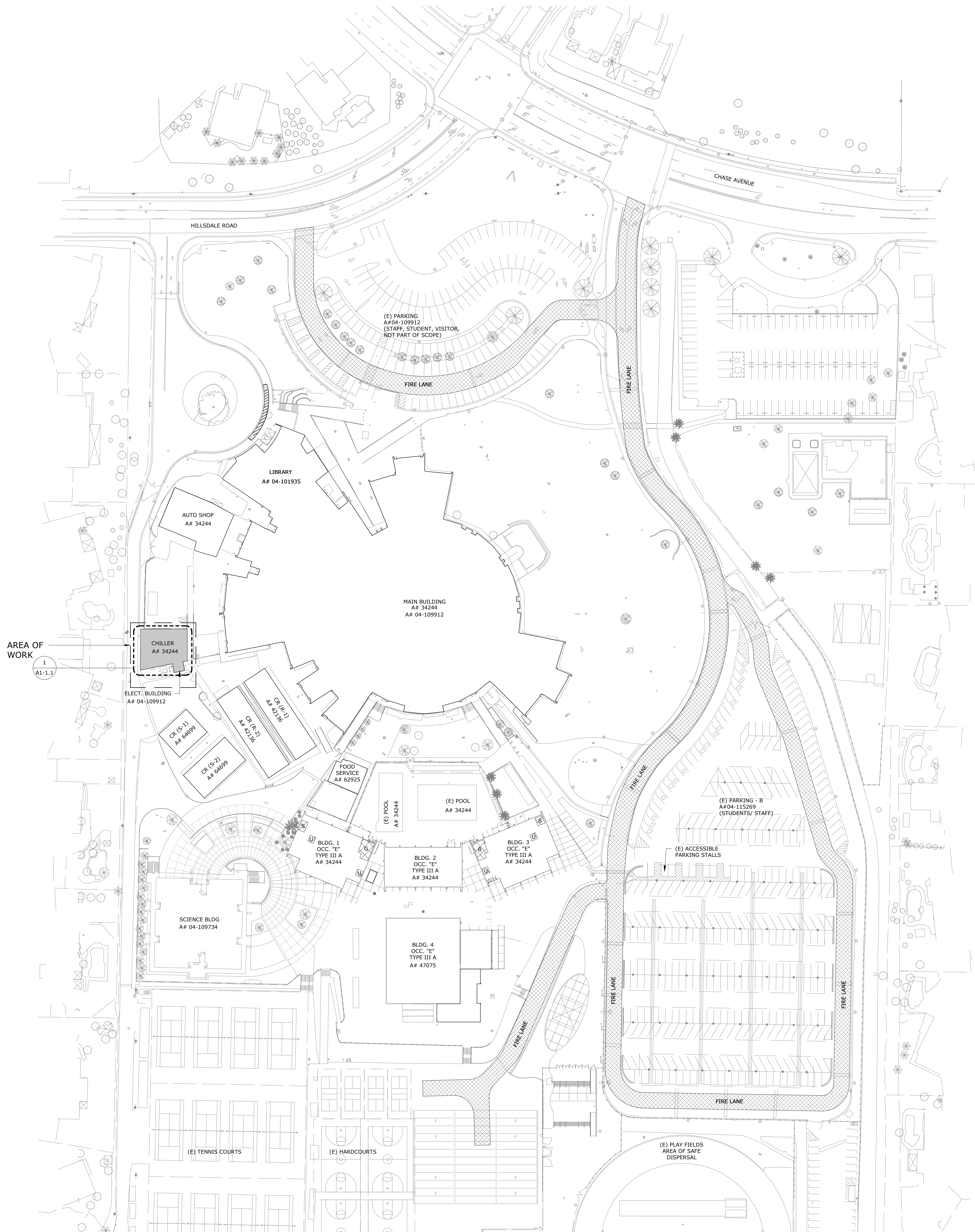
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## GENERAL NOTES

1. VERIFY ALL DIMENSIONS PRIOR TO CONSTRUCTION.

## LEGEND SITE PLAN - MOD.

- EXISTING BUILDING TO REMAIN
- EXISTING BUILDING TO BE MODERNIZED  
SEE FLOOR PLANS
- EXISTING FIRE LANE



OVERALL SITE PLAN 1

PROJECT No. :1-30-56

DRAWN BY:			CHECKED BY:					
ISSUE No.	DATE	DESCRIPTION	REVISION No.	DATE	DESCRIPTION			
ISSUE No.	DATE	DESCRIPTION	REVISION No.	DATE	DESCRIPTION			
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VALHALLA HIGH SCHOOL BATTERY  
REPLACEMENT

VALHALLA HIGH SCHOOL  
1725 HILLSDALE ROAD, EL CAJON, CA 92019  
GROSSMONT UNION HIGH SCHOOL DISTRICT

OVERALL SITE PLAN

AS-2.0

VALHALLA HIGH SCHOOL BATTERY REPLACEMENT: DSA SUBMITTAL MAY 20, 2021





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APP: 04-120235 INC:  
REVIEWED FOR:  
SS ☒ FLS ☒ ACS ☐  
DATE: 06/22/2021

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CONSULTANT BRANDING

### DEMOLITION GENERAL NOTES

- AT LOCATIONS WHERE ANY ITEM IS TO BE REMOVED, PATCH AND REPAIR ALL SURFACES AS NEEDED TO MATCH EXISTING ADJACENT MATERIALS AND FINISHES, UNLESS NOTED OTHERWISE.
- VERIFY WITH ARCHITECT BEFORE ALTERING OR REMOVING ANY STRUCTURAL ITEMS INCLUDING BUT NOT LIMITED TO HOLD DOWNS, SHEAR WALLS, BEARING WALLS UNLESS IDENTIFIED ON THE DRAWINGS AND APPROPRIATE DETAILS ARE APPROVED BY THE DIVISION OF STATE ARCHITECT.
- RESTORE ALL SURROUNDING AREAS AFFECTED BY THE WORK.
- PROTECT ITEMS TO REMAIN.
- CONTRACTOR TO VERIFY EXISTING FOOTINGS, IF PLUMBING OR CONDUIT ROUTING BELOW THE EXISTING FOOTING IS REQUIRED SEE STRUCTURAL.

### LEGEND DEMO. FLOOR PLAN

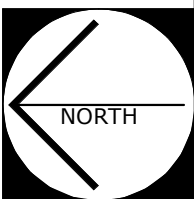
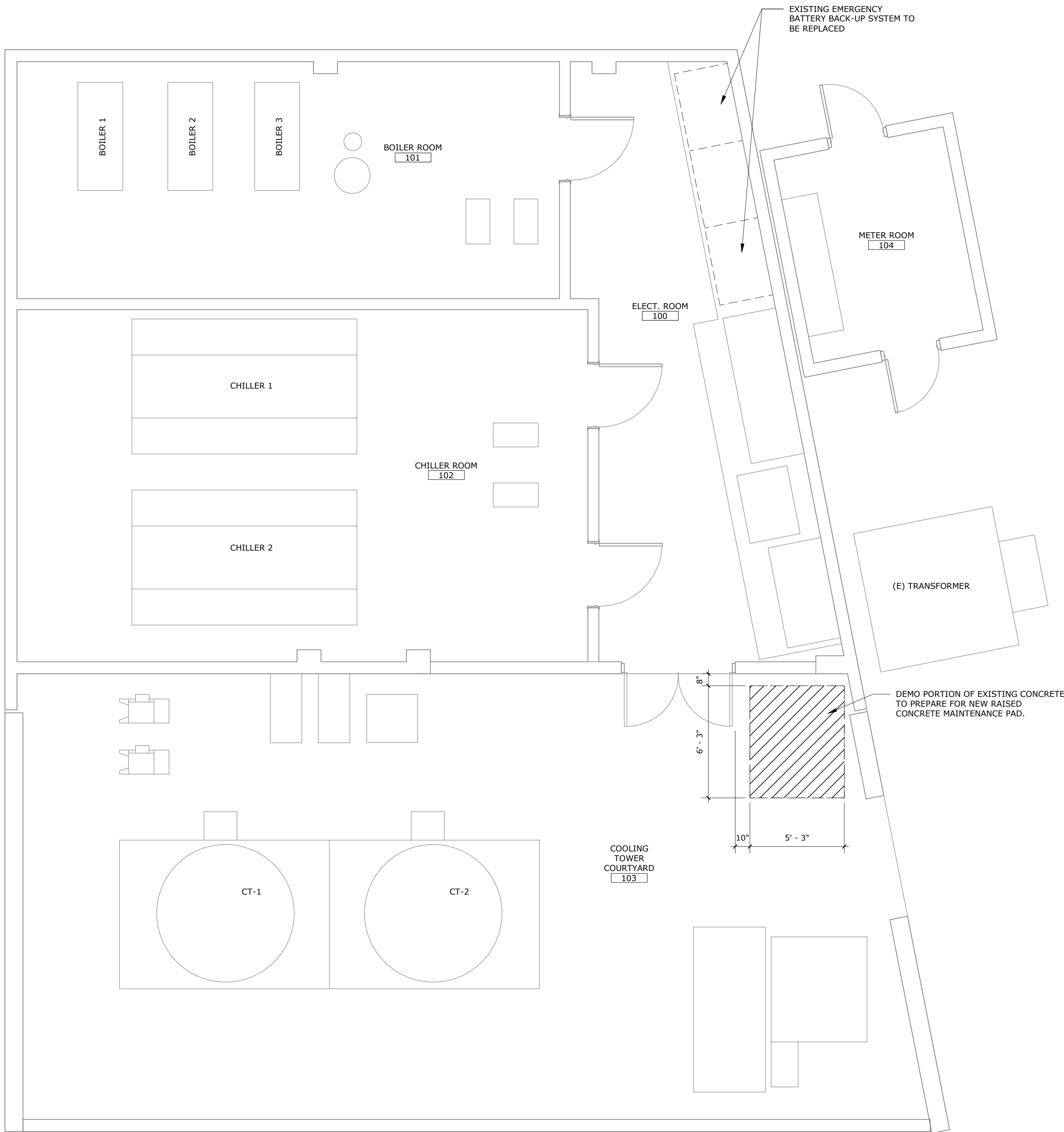
- EXISTING WALL TO REMAIN
- ITEM TO BE REMOVED
- EXISTING CONCRETE SLAB TO BE DEMOLISHED AS REQUIRED
- EXISTING FIXTURE / EQUIPMENT TO BE DEMOLISHED

### GENERAL NOTES

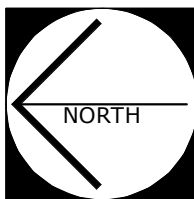
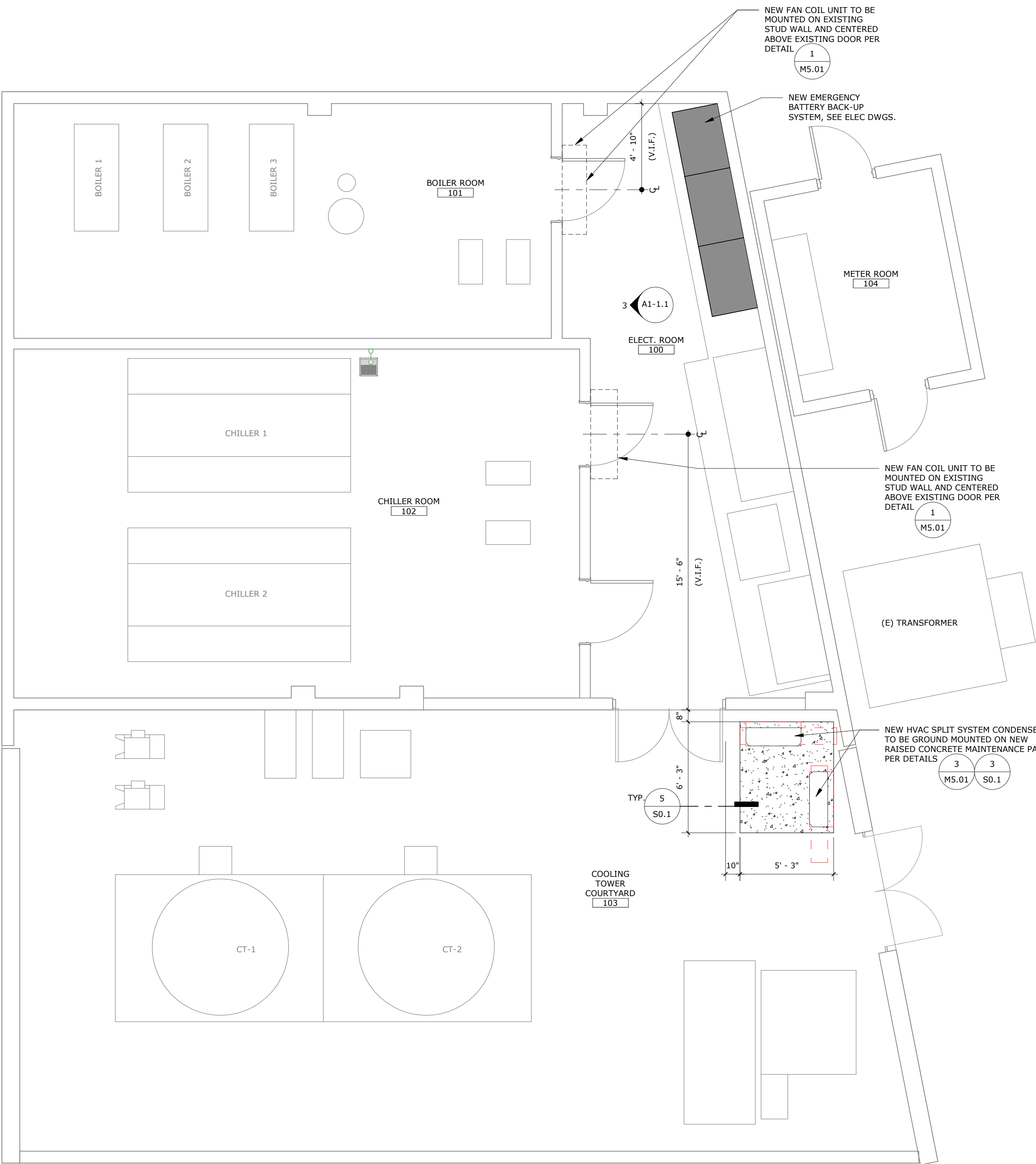
- VERIFY ALL DIMENSIONS PRIOR TO CONSTRUCTION.
- ALL DIMENSIONS ARE TO FACE OF STUD, CENTERLINE OF COLUMN OR EDGE OF SLAB, U.N.O.
- PROVIDE STUD BRACING AND SUPPORT FOR NEW FAN COIL UNIT PER DETAIL <sup>1</sup>MS.01

### LEGEND MOD. FLOOR PLAN

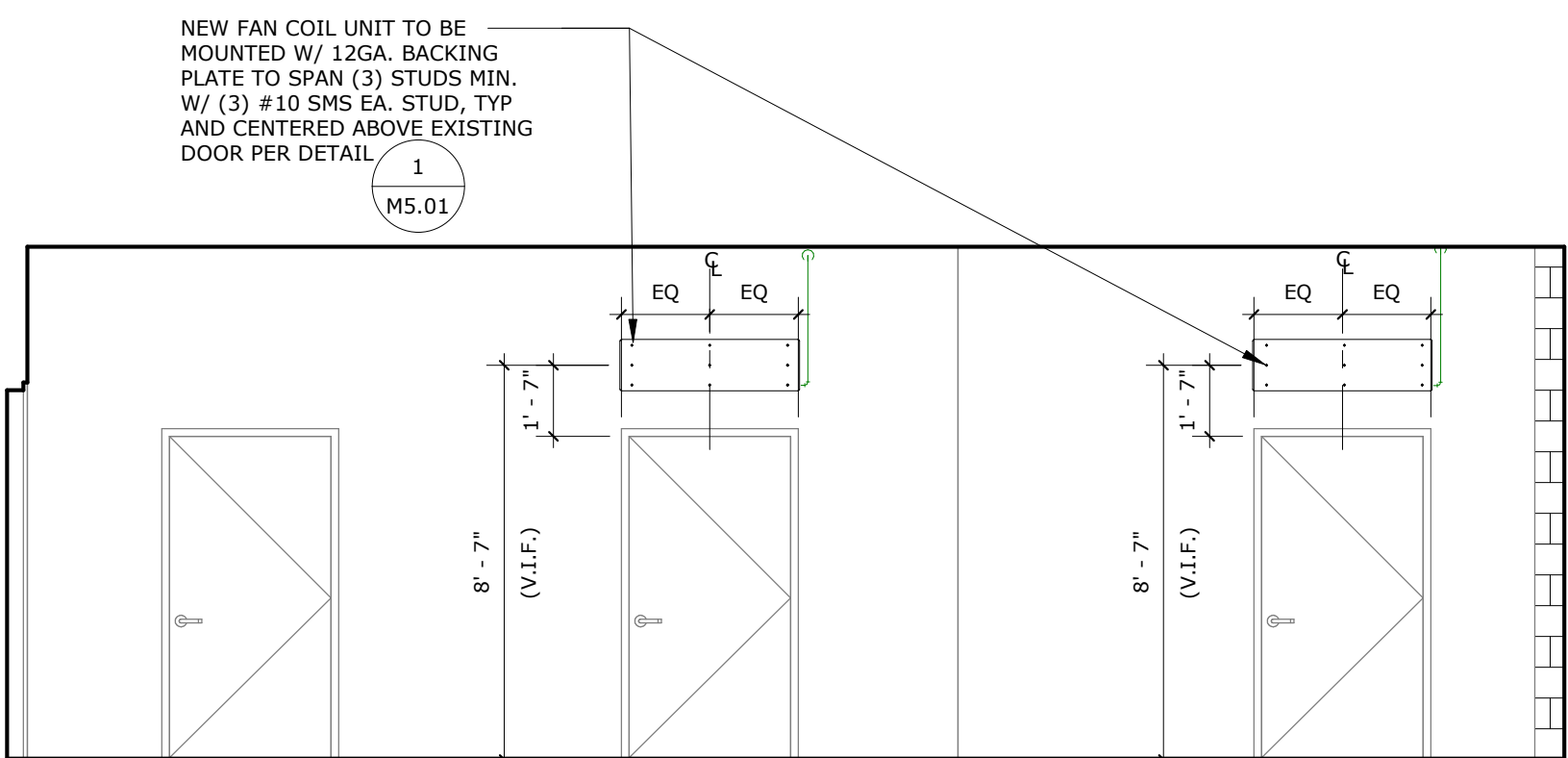
- EXISTING WALL TO REMAIN
- NEW CONCRETE MAINTENANCE PAD SEE STRUCTURAL DETAIL <sup>5</sup>S0.1
- NEW ELECTRICAL EQUIPMENT SEE ELECTRICAL DRAWING <sup>1</sup>EL.1
- NEW FAN COIL UNIT SEE MECHANICAL DRAWING <sup>1</sup>M2.01



DEMO FLOOR PLAN 2



MOD FLOOR PLAN 1



ELECT. ROOM 100 INTERIOR ELEVATION 3

PROJECT No. :1-30-56  
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VALHALLA HIGH SCHOOL BATTERY REPLACEMENT

VALHALLA HIGH SCHOOL  
1725 HILLSDALE ROAD, EL CAJON, CA 92019  
GROSSMONT UNION HIGH SCHOOL DISTRICT

DEMO & MOD FLOOR  
PLANS & INT.ELEV.

A1-1.1

VALHALLA HIGH SCHOOL BATTERY REPLACEMENT: DSA SUBMITTAL MAY 20, 2021



LIST OF ABBREVIATIONS

ADD'L.	ADDITIONAL
ALT.	ALTERNATE
ACI	AMERICAN CONCRETE
INSTITUTE	
ASSOCIATION	
ASTM	AMERICAN SOCIETY FOR
TESTING AND MATERIALS	
AWS	AMERICAN WELDING SOCIETY
A.B.	ANCHOR BOLT(S)
ARCH.	ARCHITECT/ARCHITECTURAL
®	AT
BTWN.	BETWEEN
BOT. OR BOT.	BOTTOM
BLDG.	BUILDING
CBC	CALIFORNIA BUILDING CODE
CIP	CAST IN PLACE
CJP	COMPLETE JOINT
PENETRATION WELD	
¢	CENTER LINE
CLR.	CLEAR
COL.	COLUMN
CONC.	CONCRETE
COND.	CONDITION
CONN.	CONNECTION
CONSTR.	CONSTRUCTION
CONT'D.	CONTINUED
CONT.	CONTINUOUS
CONTR.	CONTRACTOR
DL	DEAD LOAD
DEMO.	DEMOLISH
DTL. OR DET.	DETAIL
DIAG.	DIAGONAL
DIA. OR Ø	DIAMETER
DIM.	DIMENSION
DBL.	DOUBLE
DWL.	DOWEL
DWG.	DRAWING
EA.	EACH
E.F.	EACH FACE
E.S.	EACH SIDE
E.W.	EACH WAY
ELEC.	ELECTRICAL
ELEV.	ELEVATION
EMBED.	EMBEDMENT
ENG.	ENGINEER
EQ.	EQUAL
EQUIP.	EQUIPMENT
EXCAV.	EXCAVATION
(E)	EXISTING
EXT.	EXTERIOR
F.O.C.	FACE OF CONCRETE
F.O.S.	FACE OF STUD OR FACE OF
SLAB	
F.S.	FAR SIDE
FIN.	FINISH
F.F.	FINISHED FLOOR
FLR.	FLOOR
FTG.	FOOTING
FNDN.	FOUNDATION
GALV.	GALVANIZE
GA.	GAUGE
GR.	GRADE
HGR.	HANGER
HDR.	HEADER
HT.	HEIGHT
HSS	HOLLOW STRUCTURAL
SECTION	
HORIZ.	HORIZONTAL
INFO.	INFORMATION
I.D.	INSIDE DIAMETER
INT.	INTERIOR
IBC	INTERNATIONAL BUILDING
CODE	
ICC	INTERNATIONAL CODE
COUNCIL	
INV.	INVERT
KSI	KIPS PER SQUARE INCH
LDGR.	LEDGER
LT. WT. OR LW	LIGHT WEIGHT
LL	LIVE LOAD
LG.	LONG OR LENGTH
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LO-HY	LOW HYDROGEN
M.B.	MACHINE BOLT(S)
MFR.	MANUFACTURER
MATL.	MATERIAL
MAX.	MAXIMUM
MECH.	MECHANICAL
MTL.	METAL
MIN.	MINIMUM
MISC.	MISCELLANEOUS
MU	MECHANICAL UNIT
N.F.	NEAR FACE
N.S.	NEAR SIDE
NSA	NELSON STUD ANCHOR
(N)	NEW
NIC.	NOT IN CONTRACT
NTS.	NOT TO SCALE
NO. OR #	NUMBER
O.C.	ON CENTER
OPNG.	OPENING
OPP.	OPPOSITE
O.H.	OPPOSITE HAND
O.D.	OUTSIDE DIAMETER
PCF	POUNDS PER CUBIC FOOT
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PL	PROPERTY LINE
RAD.	RADIUS
REF.	REFERENCE
REINF.	REINFORCING
REQ'D	REQUIRED
REQMT.	REQUIREMENT
SCHED.	SCHEDULE
SEC.	SECTION
SHT.	SHEET
SMS	SHEET METAL SCREWS
SIM.	SIMILAR
SIMP.	SIMPSON
SPCC.	SPACING
SPECS.	SPECIFICATION
SQ.	SQUARE
STGR.	STAGGER
S.S.	STAINLESS STEEL
STD.	STANDARD
STL.	STEEL
STIFF.	STIFFENER
STRUCT.	STRUCTURAL
SYM.	SYMMETRICAL
THK.	THICK
K OR KIP	1,000 POUNDS
THRU	THROUGH
TAB	TOP AND BOTTOM
T.O.F.	TOP OF FOOTING
TYP.	TYPICAL
U.N.O.	UNLESS NOTED OTHERWISE
VIF	VERIFY IN FIELD
VERT.	VERTICAL
WT.	WEIGHT
W/	WITH
W/O	WITHOUT

GENERAL

- THESE STRUCTURAL DRAWINGS AND SPECIFICATIONS, INCLUDING ANY ADDENDA (COLLECTIVELY "THE PLANS") INCORPORATE ALL LEGAL AND INDUSTRY REQUIREMENTS AND STANDARDS INCLUDING WITHOUT LIMITATION THE FOLLOWING:
  - THE CALIFORNIA CODE OF REGULATIONS, TITLE 24, PART 1 (CALIFORNIA ADMINISTRATIVE CODE), 2019 EDITION.
  - THE CALIFORNIA CODE OF REGULATIONS, TITLE 24, PART 2 (CALIFORNIA BUILDING CODE), 2019 EDITION.
  - OTHER REGULATING AGENCIES WHICH MAY HAVE AUTHORITY OVER ANY PORTION OF THE WORK, INCLUDING THE STATE OF CALIFORNIA DIVISION OF INDUSTRIAL SAFETY, AND THOSE CODES AND STANDARDS LISTED IN THESE NOTES AND SPECIFICATIONS.
  - THE FUNCTIONALITY STANDARDS SET FORTH IN TITLE 7 OF THE CALIFORNIA CIVIL CODE (THE "RIGHT TO REPAIR ACT").
  - THE MANUFACTURER'S REQUIREMENTS OR RECOMMENDATIONS FOR ANY INCORPORATED PRODUCTS.
  - THE MOST CURRENT APPROVED ISSUES OF ANY NOTED SPECIFICATIONS, CODES AND STANDARDS, INCLUDING SUPPLEMENTS, UNLESS NOTED OTHERWISE.
- THE PLANS REPRESENT ONLY THE FINISHED STRUCTURE, AND THEY ARE NOT INTENDED TO INDICATE OR REQUIRE ANY CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES. IN PARTICULAR AND WITHOUT LIMITATION, THE CONTRACTOR SHALL BE FULLY AND SOLELY RESPONSIBLE FOR ANY AND ALL EXCAVATION, DEMOLITION, SHORING AND ERECTION PROCEDURES AND FOR ANY AND ALL SAFETY PROGRAMS AND PRECAUTIONS.
- IN USING THE PLANS FOR BIDDING OR CONSTRUCTION PURPOSES, THE CONTRACTOR IS REQUIRED TO REVIEW ALL OF THE PROJECT'S CONSTRUCTION DOCUMENTS AS A WHOLE IN ORDER TO IDENTIFY ALL REQUIREMENTS THAT DIRECTLY OR INDIRECTLY AFFECT ITS PORTION OF THE STRUCTURAL WORK, EVEN REQUIREMENTS LOCATED IN SECTIONS DESIGNATED AS APPLICABLE TO OTHER TRADES. IN CASE OF CONFLICTS, THE CONTRACTOR SHALL EITHER OBTAIN DIRECTION FROM AN APPROPRIATE OWNER REPRESENTATIVE OR OTHERWISE APPLY THE MORE STRINGENT REQUIREMENT.
- IN INTERPRETING THE PLANS, THE FOLLOWING GENERAL RULES APPLY:
  - WRITTEN DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALED DRAWINGS.
  - SPECIFIC NOTES AND DETAILS SHALL TAKE PRECEDENCE OVER GENERAL NOTES AND TYPICAL DETAILS.
  - WORK NOT PARTICULARLY SHOWN OR SPECIFIED SHALL BE THE SAME AS SIMILAR PARTS THAT ARE SHOWN OR SPECIFIED.
  - SCALED DIMENSIONS AND GRAPHICALLY SHOWN LOCATIONS ARE TO BE CONSIDERED ONLY APPROXIMATE.
- IN IMPLEMENTING THE PLANS, THE FOLLOWING GENERAL RULES APPLY:
  - BECAUSE THE PLANS ARE INTENDED TO SET FORTH THE REQUIREMENTS FOR CONSTRUCTION IN ONLY AN INDUSTRY-STANDARD LEVEL OF QUALITY AND DETAIL, AND THEREFORE ARE INTENDED TO BE SUPPLEMENTED BY APPROPRIATE REQUESTS FOR CLARIFICATION AND INFORMATION, ERRORS AND OMISSIONS ARE TO BE EXPECTED AND ANTICIPATED; AND THE CONTRACTOR IS REQUIRED TO CAREFULLY REVIEW THE PLANS FOR ERRORS AND OMISSIONS AND TO BRING THESE ERRORS AND OMISSIONS TO THE ATTENTION OF AN APPROPRIATE OWNER REPRESENTATIVE IN A TIMELY MANNER AND ASSUMES THE RISK OF THE SEQUENCES OF FAILING TO DO SO BEFORE BIDDING OR OTHERWISE PROCEEDING.
  - THE CONTRACTOR SHALL REVIEW AND VERIFY ALL DIMENSIONS PRIOR TO STARTING CONSTRUCTION, AND NOTIFY THE ARCHITECT IMMEDIATELY OF ANY DISCREPANCIES OR INCONSISTENCIES.
- SUBMITTALS WILL BE REVIEWED BY THE STRUCTURAL ENGINEER, IF AT ALL, ONLY PURSUANT TO THE INDUSTRY-STANDARD PROTOCOL SET FORTH IN AIA DOCUMENT A201, AND IN NO EVENT WILL THE SUBMITTAL REVIEW PROCESS RELIEVE OR LESSEN THE SUBMITTING CONTRACTOR'S RESPONSIBILITY FOR AN INAPPROPRIATE SUBMITTAL.
- IN NO EVENT WILL ANY SITE VISITS BY THE STRUCTURAL ENGINEER CONCERN CONSTRUCTION MEANS AND METHODS OR CONSTRUCTION SAFETY, AND ALL SUCH MATTERS SHALL REMAIN THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
- COPIES OF THE PLANS PROVIDED IN ANY ELECTRONIC FORM ARE SUBJECT TO THE SAME PROVISIONS AS THE OTHER INSTRUMENTS OF SERVICE PREPARED BY OR ON BEHALF OF STRUCTURAL ENGINEER FOR THE PROJECT, INCLUDING WITHOUT LIMITATION THE ENGINEER'S COMMON LAW, STATUTORY OR OTHER RESERVED RIGHTS, INCLUDING COPYRIGHTS. A RECIPIENT IS GRANTED AT MOST A TRANSFERABLE NONEXCLUSIVE LICENSE TO REUSE THE PLANS SOLELY FOR PROJECT PURPOSES, AND NO RECIPIENT IS AUTHORIZED TO USE OR TO ALLOW THE USE OF ALL OR ANY PORTION OF THESE PLANS FOR ANY OTHER PURPOSE, AND ANY USE FOR ANY OTHER PURPOSE WOULD CONSTITUTE ACTIONABLE PLAGIARISM. STRUCTURAL ENGINEER PROVIDES DOCUMENTS IN AN ELECTRONIC FORM ONLY IN ITS STANDARD FORMATS AND CONVENTIONS AND WITH NO GUARANTEE OF COMPATIBILITY WITH ANY RECIPIENT'S SOFTWARE OR HARDWARE, AND ANY USE WITH OR CONVERSION TO OTHER FORMATS OR CONVENTIONS, OR THE USE WITH ANY PARTICULAR SOFTWARE OR HARDWARE, IS AT THE RECIPIENT'S SOLE RISK.

PROJECT DESIGN CRITERIA

- WIND LOADS
  - RISK CATEGORY: III
  - EXPOSURE CATEGORY: C
  - BASIC DESIGN WIND SPEED (3-SECOND GUST),  $V = 103$  MPH
  - ALLOWABLE STRESS DESIGN WIND SPEED,  $V_{ASD} = 80$  MPH
  - VELOCITY PRESSURE EXPOSURE COEFFICIENT,  $K_z = 0.85$  (0-15 FT)
  - TOPOGRAPHIC FACTOR,  $K_{zt} = 1.0$
  - WIND DIRECTIONALITY FACTOR,  $K_d = 0.85$
  - GROUND ELEVATION FACTOR,  $K_e = 1.00$
  - GUST EFFECT FACTOR,  $G = 0.85$
- EARTHQUAKE LOADS
  - SEISMIC DESIGN CRITERIA
    - $S_s = 0.742$
    - $S_1 = 0.274$
    - SITE CLASS: D
    - $F_A = 1.206$
    - $F_v = 2.1$
    - $S_{DS} = 0.597$
    - $S_{D1} = 0.383$
    - RISK CATEGORY: III
    - SEISMIC DESIGN CATEGORY: D
    - SEISMIC DESIGN REQUIREMENTS
      - SEISMIC HORIZONTAL FORCE FOR EQUIPMENT
        - $F_p = 0.4(AP)(S_{DS})(b_p) \frac{(1+2(Z/h)W_p)}{R_p}$
      - DESIGN HORIZONTAL FORCE FOR TANKS
        - $V = C_s W$
        - WHERE
          - $C_s = \frac{S_{DS}}{R_p(R/h)}$
        - BUT SHALL NOT BE LESS THAN  $0.3(S_{DS})(b_p)(W_p)$
        - BUT NEED NOT EXCEED  $1.6(S_{DS})(b_p)(W_p)$
      - WHERE:
        - $R_p = 1.0$
        - $R_p = 2.5$
        - $Z/h = 0$
        - $R_o = 2.0$

DIMENSIONS

- DIMENSIONS SHALL BE DEFINED TO INCLUDE BOTH HORIZONTAL DIMENSIONS AND VERTICAL DIMENSIONS (ELEVATIONS).
- WRITTEN DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALED DRAWINGS.
- SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS NOT NOTED ON STRUCTURAL DRAWINGS.
- THE CONTRACTOR SHALL REVIEW AND VERIFY ALL DIMENSIONS PRIOR TO STARTING CONSTRUCTION. THE ARCHITECT SHALL BE NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES OR INCONSISTENCIES.

POST-INSTALLED ANCHORS

- ACCEPTABLE EQUIVALENT MANUFACTURERS OF POST-INSTALLED EXPANSION ANCHORS AND SCREW ANCHORS SHALL BE HILTI INC., SIMPSON STRONG-TIE COMPANY INC., OR DEWALT, UNO.
- TESTS FOR POST-INSTALLED ANCHORS IN HARDENED CONCRETE SHALL CONFORM TO TITLE 24, PART 2, CHAPTER 19A, SECTION 1910A.5.
- POST-INSTALLED ANCHOR INSTALLATION SHALL BE INSPECTED BY A SPECIAL INSPECTOR SPECIFICALLY APPROVED BY THE ENFORCEMENT AGENCY FOR THAT PURPOSE.
- POST-INSTALLED ANCHOR TESTING SHALL BE DONE IN THE PRESENCE OF THE PROJECT INSPECTOR.
- TEST QUANTITY OF POST-INSTALLED ANCHORS AS NOTED BELOW:

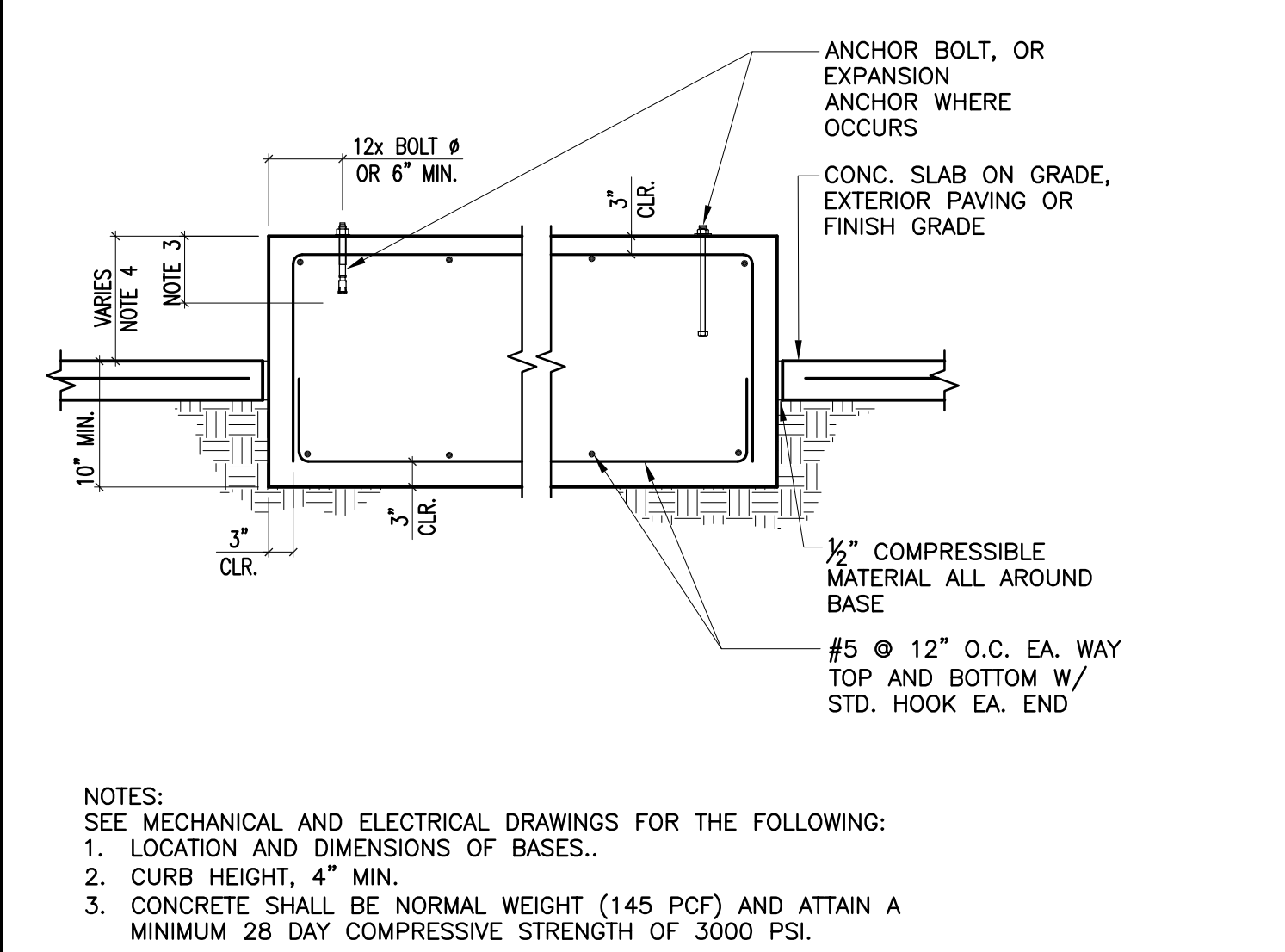
APPLICATION	QUANTITY
NON-STRUCTURAL (EQUIP. ANCHORAGE, ETC.)	50% OF BOLTS
- IF ANY ANCHOR FAILS TESTING, TEST ALL ANCHORS OF THE SAME CATEGORY NOT PREVIOUSLY TESTED UNTIL TWENTY (20) CONSECUTIVE ANCHORS PASS, THEN RESUME INITIAL TESTING FREQUENCY.
- TORQUE TESTING SHALL BE APPLIED BY CALIBRATED WRENCH. TENSION TESTING (WHERE INDICATED) SHALL BE APPLIED BY HYDRAULIC JACK OR CALIBRATED SPRING LOADING DEVICE.
- THE FOLLOWING CRITERIA SHALL APPLY FOR THE ACCEPTANCE OF INSTALLED POST-INSTALLED ANCHORS:
  - TORQUE WRENCH METHOD: THE APPLICABLE TEST TORQUE MUST BE ATTAINED WITHIN ONE-HALF ( $\frac{1}{2}$ ) TURN OF THE NUT. SLEEVE ANCHORS  $\frac{3}{8}$  INCH DIAMETER OR LESS MUST ATTAIN THE SPECIFIED TEST TORQUE WITHIN ONE-QUARTER ( $\frac{1}{4}$ ) TURN OF THE NUT, AND THREADED ANCHORS MUST ATTAIN THE SPECIFIED TEST TORQUE WITHIN ONE-QUARTER ( $\frac{1}{4}$ ) TURN OF THE SCREW AFTER INITIAL SEATING OF THE SCREW HEAD.
  - HYDRAULIC RAM METHOD: (FOR TENSION TESTING WHERE INDICATED) ANCHORS SHALL MAINTAIN THE TENSION TEST LOAD FOR A MINIMUM OF 15 SECONDS AND SHALL EXHIBIT NO DISCERNABLE MOVEMENT DURING THE TENSION TEST. (AN EXAMPLE OF DISCERNABLE MOVEMENT WOULD BE LOOSENING OF THE WASHER UNDER THE NUT).
- TEST LOADS 1(1)2(3)

TORQUE TEST VALUES – EXPANSION ANCHORS NORMAL WEIGHT CONCRETE		
ANCHOR DIAMETER (INCH)	ANCHOR DEPTH (INCHES)	TORQUE (FT-LBF)
$\frac{3}{8}$	2	25
	2	40
$\frac{1}{2}$	$3\frac{1}{4}$	40
	$3\frac{3}{8}$	60
$\frac{5}{8}$	4	60
	$3\frac{3}{4}$	110
$\frac{3}{4}$	$4\frac{3}{4}$	110

- TEST VALUES ARE BASED ON KWIK BOLT T22 (KB-T22) EXPANSION ANCHORS BY HILTI, INC. (ICC EVALUATION REPORT NUMBER ESR-4266).
- TEST VALUES ARE BASED ON CARBON STEEL ANCHORS.
- VERIFY TORQUE VALUES WITH MANUFACTURER FOR SIMPSON STRONG-BOLT 2 (ICC ESR-3037) OR DEWALT POWER-STUD+SD2 (ICC ESR-2502)
- PORTLAND CEMENT SHALL CONFORM TO ASTM C-150, TYPE II. CEMENT USED FOR CONCRETE IN CONTACT WITH SOIL SHALL CONFORM TO ASTM C-150, TYPE V.
- AGGREGATE FOR NORMALWEIGHT CONCRETE SHALL CONFORM TO ASTM C-33. COMBINED AGGREGATE GRADATION OF  $\frac{3}{8}$ " MAXIMUM (PEA GRAVEL) SHALL NOT BE USED.
- READY MIXED CONCRETE SHALL CONFORM TO ASTM C-94.
- PLACEMENT OF CONCRETE SHALL CONFORM TO ACI 304. CLEAN AND ROUGHEN TO  $\frac{1}{4}$ " AMPLITUDE ALL CONCRETE SURFACES AGAINST WHICH CONCRETE IS TO BE PLACED.
- ALL REINFORCING BARS, ANCHOR BOLTS AND OTHER CONCRETE INSERTS SHALL BE SECURED IN POSITION PRIOR TO PLACING CONCRETE.
- IF APPROVED BY DIVISION OF THE STATE ARCHITECT, BATCH PLANT INSPECTION MAY BE REDUCED TO PERIODIC SUBJECT TO THE REQUIREMENTS OF CBC SEC. 1705A.3.3.1.

CONCRETE

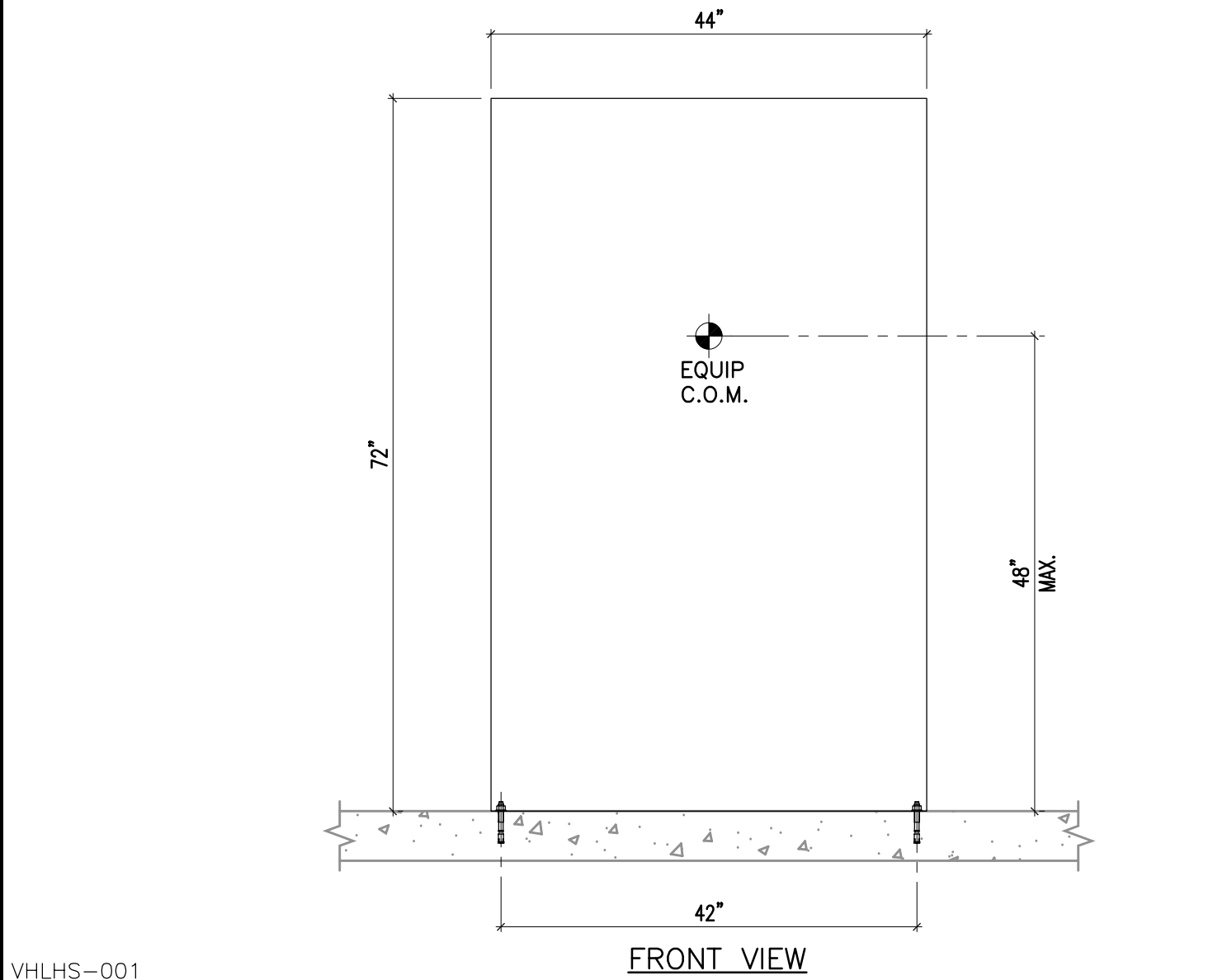
- ALL PORTIONS OF WORK PERTAINING TO CONCRETE CONSTRUCTION SHALL CONFORM TO TITLE 24, PART 2, CHAPTER 19A.
- CONCRETE MIXES SHALL BE DESIGNED BY A QUALIFIED TESTING LABORATORY. MIX DESIGNS SHALL CONFORM TO ACI 318, SEC. 26.4, CBC SEC.1903A AND 1904A. MIX DESIGNS SHALL INCORPORATE THE FOLLOWING CRITERIA:
  - MINIMUM OF 5 SACKS OF CEMENT PER CUBIC YARD OF CONCRETE. MAXIMUM OF 7 SACKS OF CEMENT PER YARD OF CONCRETE.
  - MAXIMUM WATER/CEMENT RATIO (BY WEIGHT) OF CONCRETE IN CONTACT WITH SOIL SHALL BE 0.45.
  - MAXIMUM SLUMP SHALL NOT EXCEED  $4" \pm 1"$ . SLUMP LIMITATIONS NOTED SHALL APPLY TO CONCRETE MIX PRIOR TO THE ADDITION OF ANY WATER-REDUCING ADMIXTURES OR SUPER-PLASTICIZERS. MAXIMUM SLUMP MAY BE INCREASED TO  $5 + / - 1"$  FOR MIX INCLUDING WATER-REDUCING ADMIXTURES OR SUPER-PLASTICIZERS.
  - CALCIUM CHLORIDE OR ADMIXTURES CONTAINING CHLORIDE(S) SHALL NOT BE USED.



C209-0 SCALE: NO SCALE

CONCRETE BASE FOR EQUIPMENT

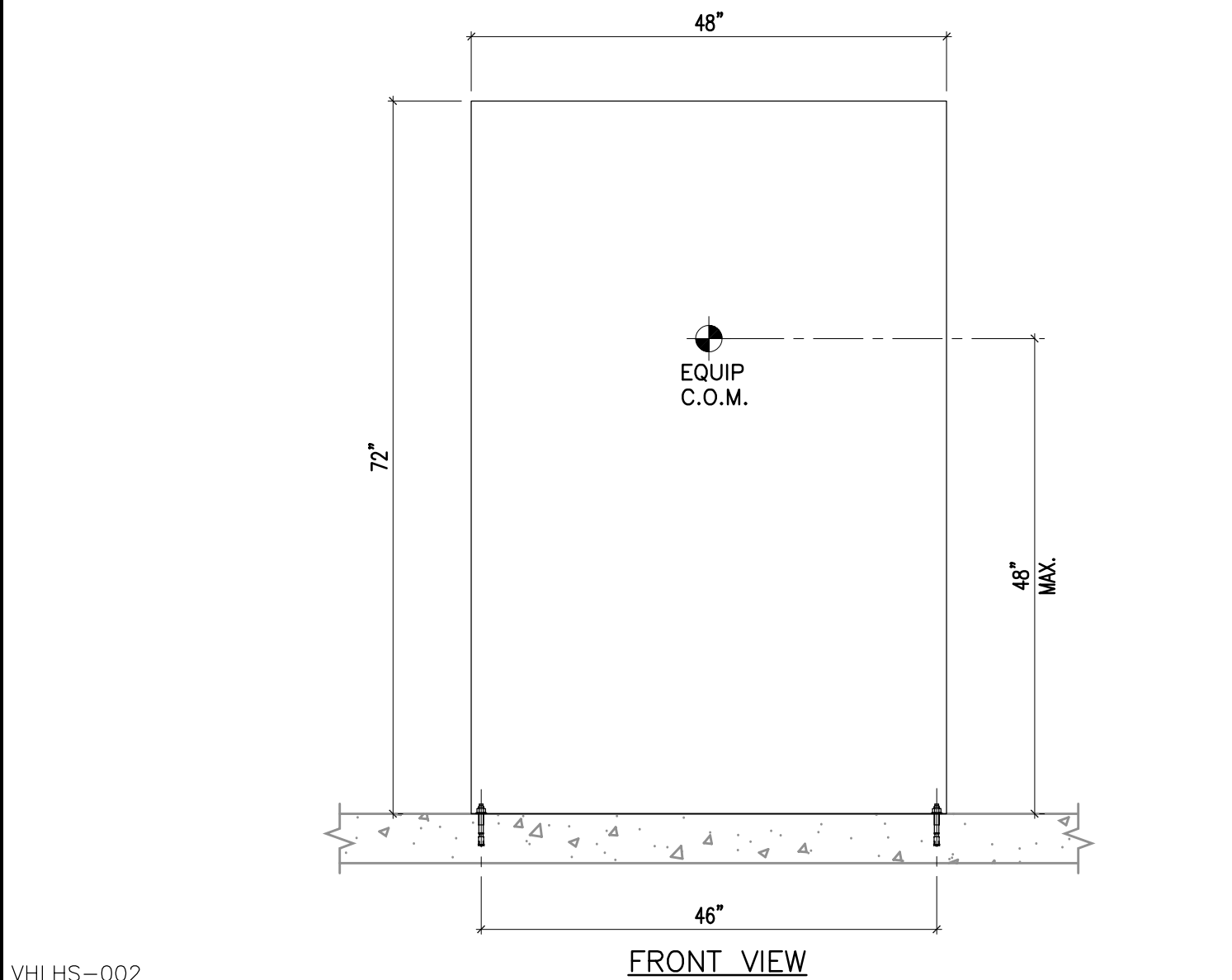
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VHLHS-001

UPS ELECTRONICS MODULE CABINET ANCHORAGE (CONTROL)

1



VHLHS-002

BATTERY MODULE CABINET ANCHORAGE (BATTERY)

2



VHLHS-003

CONDENSING UNIT ANCHORAGE

3

PROJECT No. : 6/8/2021 12:06 PM

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ISSUE No.	DATE	DESCRIPTION	REVISION No.
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VALHALLA HIGH SCHOOL BATTERY REPLACEMENT

VALHALLA HIGH SCHOOL 1725 HILLSDALE ROAD, EL CAJON, CA 92019 GROSSMONT UNION HIGH SCHOOL DISTRICT

GENERAL NOTES AND DETAILS

S0.1



MECHANICAL LEGEND					
SYMBOL	ABBREV	DESCRIPTION	SYMBOL	ABBREV	DESCRIPTION
		REMOVE EXISTING EQUIPMENT OR PIPING SHOWN DASHED		CD	DUCT TRANSITION
	POC	POINT OF CONNECTION		RR	RETURN REGISTER
	POD	POINT OF DISCONNECT		ER	EXHAUST REGISTER
		COORDINATE WITH ELECTRICAL		T'STAT	THERMOSTAT OR TEMPERATURE SENSOR (NUMBER INDICATES EQUIPMENT ZONE SERVED)
	HHWS	HEATING HOT WATER SUPPLY		H'STAT	HUMIDISTAT
	HHWR	HEATING HOT WATER RETURN		SENSOR	OCCUPANCY SENSOR
	CHW	CHILLED WATER		SWITCH	CONTROL SWITCH
	CHWR	CHILLED WATER RETURN		CFM	CARBON DIOXIDE SENSOR
	CHWS	CHILLED WATER SUPPLY			SYMBOL SEE EQUIPMENT SCHEDULE
	CD	CONDENSATE DRAIN (A.C.)		ADAP	ACCESS DOOR / ACCESS PANEL
	CWR	CONDENSER WATER RETURN		AFF	ABOVE FINISHED FLOOR
	CWS	CONDENSER WATER SUPPLY		BDD	BACK DRAFT DAMPER
	D	DRAIN		BOD	BOTTOM OF DUCT
	ST	STEAM		BOP	BOTTOM OF PIPE (ABOVE FIN. FLR.)
	LPS	LOW PRESSURE STEAM		CD	CEILING DIFFUSER
	MPS	MEDIUM PRESSURE STEAM		CLG	CEILING
	HPS	HIGH PRESSURE STEAM		CFM	CUBIC FEET PER MINUTE
	CR	STEAM CONDENSATE RETURN		CONC.	CONCRETE
	RD	REFRIGERANT DISCHARGE		CONT.	CONTINUATION
	RL	REFRIGERANT LIQUID		F	DEGREES FAHRENHEIT
	RS	REFRIGERANT SUCTION		DIA	DIAMETER
		PIPE DOWN		DN	DOWN
		PIPE UP		DWGS	DRAWINGS
		PIPE RISE (OR DN. FOR DROP)		DB	DRY BULB
		DIRECTION OF FLOW IN PIPE		DTR	DUCT THRU ROOF
	AV	AIR VENT (VALVE)		(E)	EXISTING
	CHV	CHECK VALVE		EA	EXHAUST AIR
	SD	SUCTION DIFFUSER		ER	EXHAUST REGISTER
	CV (2W)	CONTROL VALVE (2-WAY)		EFF.	EFFICIENCY
	CV (3W)	CONTROL VALVE (3-WAY)		ELEV.	ELEVATION
	FCD	AUTOMATIC FLOW CONTROL DEVICE		ENT.	ENTERING
	GV	GATE VALVE		EWT	ENTERING WATER TEMPERATURE
		GLOBE/BALL/BUTTERFLY VALVE		EXH.	EXHAUST
	BV	COMBINATION BALANCING & SHUT-OFF VALVE		EXIST.	EXISTING
	FEV	FLOW ELEMENT VENTURI		FF	FINISHED FLOOR
		VALVE ON RISE OR DROP		FIN	FINISH
	STR.	STRAINER		FLR	FLOOR
	CL	CAPPED LINE		GPM	GALLONS PER MINUTE
	DN.	DOWN OR DROP		IN.	INCH
	UP	RISE OR RISER		HD	HEAD
	RV	PRESSURE RELIEF VALVE		HOA	HAND-OFF-AUTOMATIC
	PG	PRESSURE GAUGE WITH BALL VALVE		HP	HORSEPOWER
	R	ECCENTRIC REDUCER		LD	LINEAR DIFFUSER
	R	CONCENTRIC REDUCER		LVG	LEAVING
	FC	FLEXIBLE CONNECTION (PIPE)		LWT	LEAVING WATER TEMPERATURE
	TW	TEST WELL (PETE'S PLUG) - PRESSURE AND/OR TEMPERATURE		MAX.	MAXIMUM
	TI	THERMOMETER		MBH	ONE THOUSAND B.T.U.'s PER HOUR
	PA	PIPE ANCHOR		MECH.	MECHANICAL
	U	UNION		MIN.	MINIMUM
		DUCTWORK (1ST NUMBER INDICATES WIDTH SHOWN), NET INSIDE DIMENSION		MTD.	MOUNTED
	TV	SQUARE ELBOW WITH TURNING VANES		MTG.	MOUNTING
		RADIUS ELBOW		NC	NORMALLY CLOSED
	MVD	MANUAL VOLUME DAMPER		NO	NORMALLY OPEN
	MOD	MOTOR OPERATED DAMPER		OBD	OPPOSED BLADE DAMPER
	BDD	BACKDRAFT DAMPER		OA	OUTSIDE AIR
	FD	FIRE DAMPER		PD	PRESSURE DROP
	SD	DUCT MOUNTED SMOKE DETECTOR		PSIG	POUNDS PER SQUARE INCH GAUGE
	SFD	AUTOMATIC SMOKE AND FIRE DAMPER		RA	RETURN AIR
	FLEX	FLEXIBLE CONNECTION (DUCTWORK)		REG.	REGISTER
		LINED DUCTWORK (OR FLENUM)		RR	RETURN REGISTER
		DUCT RISE IN DIRECTION OF FLOW		SA	SUPPLY AIR
		DUCT DROP IN DIRECTION OF FLOW		SF	SQUARE FEET
		ROUND DUCT UP		SS	STAINLESS STEEL
		ROUND DUCT DOWN		ST	STEAM
		SUPPLY DUCT UP		TYP.	TYPICAL
		SUPPLY DUCT DOWN		UNC	UNDER CUT
		RETURN AIR DUCT/OUTSIDE AIR DUCT UP		UNO	UNLESS NOTED OTHERWISE
		EXHAUST AIR DUCT UP		UOS	UNLESS OTHERWISE SPECIFIED
		EXHAUST AIR DUCT DOWN		UTR	UP THRU ROOF
		WATER GAUGE		VAV	VARIABLE AIR VOLUME
		WET BULB		VFD	VARIABLE FREQUENCY DRIVE
		WITH		VTR	VENT THRU ROOF
		WITH		WG	WATER GAUGE
		WITH		WB	WET BULB
		WITH		WI	WITH

## PLAN CHECK NOTES

- CERTIFICATE OF ACCEPTANCE (MECH-2A AND ENV-2A) AND ALL RELATED ACCEPTANCE DOCUMENTS SHALL BE SUBMITTED TO THE FIELD INSPECTOR DURING CONSTRUCTION. CERTIFICATE OF OCCUPANCY WILL NOT BE ISSUED UNTIL THESE FORMS ARE REVIEWED AND APPROVED.
- ALL PIPING AND DUCT WORK SHALL BE INSULATED CONSISTENT WITH THE REQUIREMENTS OF SECTIONS 118, 123, 124 TITLE 24 ENERGY STANDARDS AND CHAPTER 6 OF CMC.
- ALL HVAC SYSTEMS SHALL MEET THE CONTROL REQUIREMENTS PER SECTION 112 AND 122 E.E.S.
- ALL HVAC EQUIPMENT AND APPLIANCES SHALL MET THE REQUIREMENTS PER SECTION 111-113, 115, 120-124 TITLE 24 ENERGY STANDARDS.
- PROVIDE SMOKE DETECTORS IN MAIN SUPPLY AIR DUCTS OF AIR MOVING SYSTEMS EXCEEDING 2000 CFM PER SECTION 909.0 CMC.

## TITLE 24 NOTES

- HVAC SYSTEMS SHALL MEET THE LATEST CONTROL REQUIREMENTS OF SECTIONS 112 & 122 ENERGY EFFICIENCY STANDARDS.
- DOORS AND WINDOWS SHALL MEET MINIMUM INFILTRATION REQUIREMENTS OF SECTION 116 ENERGY EFFICIENCY STANDARDS.
- INSULATION AND FLEXIBLE DUCT SHALL COMPLY WITH STATE FIRE MARSHAL CRITERIA AND SHALL NOT EXCEED FLAME SPREAD OF 25 AND SMOKE DEVELOPED OF 50 PER ASTM-84, NFPA-225, AND U.L. 723.
- ALL WORK SHALL BE IN ACCORDANCE WITH CITY CODES, CALIFORNIA ENERGY CONSERVATION STANDARDS, TITLE - 24, AND ALL OTHER APPLICABLE CODES.
- ALL PIPING AND DUCT WORK SHALL BE INSULATED CONSISTENT WITH THE REQUIREMENTS OF SECTIONS 118, 123, 124 TITLE 24 ENERGY STANDARDS AND CHAPTER 6 OF CALIFORNIA MECHANICAL CODE.

## CA GREEN BUILDING NOTES

- IN MECHANICALLY VENTILATED BUILDINGS, PROVIDE OCCUPIED AREAS OF BUILDING WITH AIR FILTRATION MEDIA FOR OUTSIDE AND RETURN AIR PRIOR TO OCCUPANCY THAT PROVIDES AT LEAST MERV OF 8 (REF. SECTION 5.504.5.3).
- PROVIDE TESTING AND ADJUSTING OF HVAC SYSTEMS AND CONTROLS PER 5.713.10.4.
- IF THE HVAC SYSTEM IS USED DURING CONSTRUCTION, RETURN AIR FILTERS WITH A MERV 8 RATING SHALL BE USED PER 5.714.4.1.
- INSTALLED HVAC EQUIPMENT SHALL NOT CONTAIN CFC'S OR HALONS PER 5.714.8.1.

## ANCHORAGE NOTES:

### MEP COMPONENT ANCHORAGE NOTE

ALL MECHANICAL, PLUMBING, AND ELECTRICAL COMPONENTS SHALL BE ANCHORED AND INSTALLED PER THE DETAILS ON THE DSA APPROVED CONSTRUCTION DOCUMENTS. WHERE NO DETAIL IS INDICATED THE FOLLOWING COMPONENTS SHALL BE ANCHORED OR BRACED TO MEET THE FORCE AND DISPLACEMENT REQUIREMENTS PRESCRIBED IN THE 2019 CBC, SECTIONS 1617A.1.18 THROUGH 1617A.1.26 AND ASCE 7-16 CHAPTER 13, 26 AND 30.

- ALL PERMANENT EQUIPMENT AND COMPONENTS.
- TEMPORARY OR MOVABLE OR MOBILE EQUIPMENT THAT IS PERMANENTLY ATTACHED (E.G.: HARD-WIRED) TO THE BUILDING UTILITY SERVICES SUCH AS ELECTRICITY, GAS, OR WATER, "PERMANENTLY ATTACHED" SHALL INCLUDE ALL ELECTRICAL CONNECTIONS EXCEPT PLUGS FOR 110/220 VOLT RECEPTACLES HAVING A FLEXIBLE CABLE.
- TEMPORARY, MOVABLE OR MOBILE EQUIPMENT THAT IS HEAVIER THAN 400 POUNDS OR HAS A CENTER OF MASS LOCATED 4 FEET OR MORE ABOVE THE ADJACENT FLOOR OR ROOF LEVEL THAT DIRECTLY SUPPORT THE COMPONENT IS REQUIRED TO BE RESTRAINED IN A MANNER APPROVED BY DSA.

THE FOLLOWING MECHANICAL AND ELECTRICAL COMPONENTS SHALL BE POSITIVELY ATTACHED TO THE STRUCTURE BUT NEED NOT DEMONSTRATE DESIGN COMPLIANCE WITH THE REFERENCES NOTED ABOVE. THESE COMPONENTS SHALL HAVE FLEXIBLE CONNECTIONS PROVIDED BETWEEN THE COMPONENT AND ASSOCIATED DUCTWORK, PIPING, AND CONDUIT. FLEXIBLE CONNECTIONS MUST ALLOW MOVEMENT IN BOTH TRANSVERSE AND LONGITUDINAL DIRECTIONS:

- COMPONENTS WEIGHING LESS THAN 400 POUNDS AND HAVING A CENTER OF MASS LOCATED 4 FEET OR LESS ABOVE THE ADJACENT FLOOR OR ROOF LEVEL THAT DIRECTLY SUPPORT THE COMPONENT.
- COMPONENTS WEIGHING LESS THAN 20 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS LESS THAN 5 POUNDS PER FOOT, WHICH ARE SUSPENDED FROM A ROOF OR FLOOR OR HUNG FROM A WALL.

THE ANCHORAGE OF ALL MECHANICAL, ELECTRICAL AND PLUMBING COMPONENTS SHALL BE SUBJECT TO THE APPROVAL OF THE DESIGN PROFESSIONAL IN GENERAL RESPONSIBLE CHARGE OR STRUCTURAL ENGINEER DELEGATED RESPONSIBILITY AND ACCEPTANCE BY DSA. THE PROJECT INSPECTOR WILL VERIFY THAT ALL COMPONENTS AND EQUIPMENT HAVE BEEN ANCHORED IN ACCORDANCE WITH THE ABOVE REQUIREMENTS.

### PIPING, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEM BRACING NOTE

PIPING, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEMS SHALL BE BRACED TO COMPLY WITH THE FORCES AND DISPLACEMENTS PRESCRIBED IN ASCE 7-16 SECTION 13.3 AS DEFINED IN ASCE 7-16 SECTIONS 13.6.5, 13.6.6, 13.6.7, 13.6.8, AND 2019 CBC, SECTIONS 1617A.1.24, 1617A.1.25 AND 1617A.1.26.

THE METHOD OF SHOWING BRACING AND ATTACHMENTS TO THE STRUCTURE FOR THE IDENTIFIED DISTRIBUTION SYSTEM ARE AS NOTED BELOW. WHEN BRACING AND ATTACHMENTS ARE BASED ON A PREAPPROVED INSTALLATION GUIDE (E.G., OSHPD OPM FOR 2013 CBC OR LATER), COPIES OF THE BRACING SYSTEM INSTALLATION GUIDE OR MANUAL SHALL BE AVAILABLE ON THE JOB SITE PRIOR TO THE START OF AND DURING THE HANGING AND BRACING OF THE DISTRIBUTION SYSTEMS. THE STRUCTURAL ENGINEER OF RECORD SHALL VERIFY THE ADEQUACY OF THE STRUCTURE TO SUPPORT THE HANGING AND BRACE LOADS.

MECHANICAL PIPING (MP), MECHANICAL DUCTS (MD), PLUMBING PIPING (PP), ELECTRICAL DISTRIBUTION SYSTEMS (E):

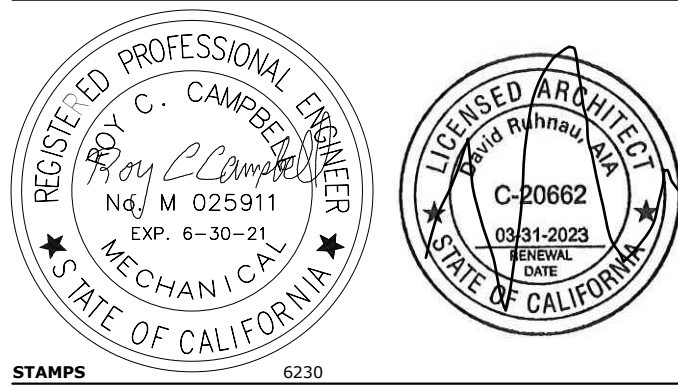
- MP( ) MD( ) PP( ) E( ) - OPTION 1: DETAILED ON THE APPROVED DRAWINGS WITH PROJECT SPECIFIC NOTES AND DETAILS.  
MP( X ) MD( X ) PP( ) E( ) - OPTION 2: SHALL COMPLY WITH THE APPLICABLE OSHPD PRE-APPROVAL (OPM #) # OPM-0043-13.

## GENERAL NOTES:

- THESE DRAWINGS ARE A GENERAL GRAPHIC PRESENTATION OF THE WORK. DUCTWORK, PIPING, AND EQUIPMENT AS SHOWN ARE SCHEMATIC. FABRICATE AND INSTALL BASED ON ACTUAL FIELD MEASUREMENT. COORDINATE WITH OTHER TRADES. PROVIDE A COMPLETE SET OF SHOP DRAWINGS REFLECTING ACTUAL DIMENSIONS, ACCESS REQUIREMENTS, AND DETAILS BASED UPON THE ACTUAL EQUIPMENT PROCURED. MAINTAIN AN UP TO DATE SET OF AS-BUILT DRAWINGS AT THE JOB SITE.
- THESE DRAWINGS ARE TO BE CONSIDERED NOT FOR CONSTRUCTION UNTIL THEY ARE STAMPED, SIGNED, AND PERMITTED. UNTIL THEN THEY ARE SUBJECT TO CHANGE WITHOUT NOTICE.
- COMPLY WITH CALIFORNIA MECHANICAL CODE (CMC), CALIFORNIA PLUMBING CODE (CPC), AND NATIONAL FIRE PROTECTION AGENCY (NFPA) AND GOVERNING CODES. THERE SHALL BE NO EXCEPTION. REPORT DEFICIENCIES WITHIN THIRTY (30) DAYS UPON AUTHORIZATION TO PROCEED.
- REVIEW ALL DRAWINGS AND SPECIFICATIONS INCLUDING ARCHITECTURAL, STRUCTURAL, CIVIL, MECHANICAL, PLUMBING, AND ELECTRICAL. ANY QUESTIONS SHALL BE BROUGHT UP, IN WRITING, TO THE ATTENTION OF THE ENGINEER BEFORE THE START OF CONSTRUCTION.
- PROVIDE ACCESS AND CLEARANCE FOR MAINTENANCE FOR MECHANICAL EQUIPMENT AND COMPONENTS AS RECOMMENDED BY EQUIPMENT MANUFACTURER AND APPLICABLE CODES.
- HANDLE, STORE AND INSTALL EQUIPMENT PER MANUFACTURER'S INSTRUCTIONS.
- INSTALL VALVES WITH UNIONS OR FLANGES AT EACH PIECE OF EQUIPMENT ARRANGED TO ALLOW SERVICE MAINTENANCE, AND EQUIPMENT REMOVAL WITHOUT SYSTEM SHUT-DOWN.
- BRACE AND SUPPORT PIPES, CONDUIT, AND DUCTWORK IN ACCORDANCE WITH SMACNA GUIDELINES FOR SEISMIC RESTRAINTS OF MECHANICAL AND PLUMBING PIPING SYSTEM. REFERENCE ANCHORAGE NOTES OPM 0043-13 FOR ANCHORAGE.
- REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR EXACT LOCATION OF DIFFUSERS, REGISTERS, GRILLES, AND ACCESS PANELS.
- ALL DUCT DIMENSIONS, AS SHOWN ON MECHANICAL DRAWINGS ARE CLEAR INSIDE DIMENSIONS.
- INSULATION AND FLEXIBLE DUCT SHALL COMPLY WITH STATE FIRE MARSHAL CRITERIA AND SHALL NOT EXCEED FLAME SPREAD OF 25 AND SMOKE DEVELOPED OF 50 PER ASTM-84, NFPA-223, AND UL 723.
- INSULATE PIPING AND DUCTWORK IN ACCORDANCE WITH THE GOVERNING CODES.
- COMMISSION AND START-UP THE MECHANICAL SYSTEMS TO ASSURE A COMPLETE AND OPERATIONAL HVAC SYSTEM IN ACCORDANCE WITH ASHRAE AND NEBB.
- ALL SQUARE ELBOWS IN DUCTWORK SHALL HAVE DOUBLE THICKNESS TURNING VANES. ALL RADIUS ELBOWS IN DUCTWORK SHALL BE MINIMUM 1.5W (1.5x WIDTH) AND HAVE 3 SPLITTER VANES. PROVIDE MANUAL VOLUME DAMPER AT EACH BRANCH DUCT TAKE-OFF SERVING EACH AIR TERMINAL DEVICE. PROVIDE BALANCING DAMPERS FOR EACH MAIN DUCT TAKE-OFF IN ACCORDANCE WITH SMACNA IN ORDER TO ASSURE A COMPLETELY BALANCED SYSTEM.
- FIRE DAMPER ASSEMBLIES, INCLUDING LOCATION, SLEEVES, AND INSTALLATION PROCEDURES SHALL BE APPROVED BY THE BUILDING INSPECTOR PRIOR TO PROCUREMENT AND INSTALLATION. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATION OF FIRE RATED WALLS AND SMOKE SEPARATIONS.
- COORDINATE WITH ELECTRICAL AND CONTROL CONTRACTORS FOR ALL POWER REQUIREMENTS PRIOR TO BID.
- COORDINATE WITH ELECTRICAL AND CONTROL CONTRACTORS FOR ALL POWER REQUIREMENTS PRIOR TO ORDERING ANY EQUIPMENT.
- UPON INSTALLATION OF ALL EQUIPMENT, DEVICES, VIBRATION ISOLATION, ETC., PROVIDE WRITTEN CONFIRMATION BY EQUIPMENT MANUFACTURER'S REPRESENTATIVES TO ENSURE COMPLIANCE WITH MANUFACTURER'S REQUIREMENTS.
- PROVIDE DETAILS AND SEISMIC CALCULATIONS FOR ALL EQUIPMENT ON VIBRATION ISOLATION. ALL DETAILS SHALL BE STAMPED BY A STRUCTURE ENGINEER FROM VIBRATION ISOLATION MANUFACTURER.

## PROJECT NOTES

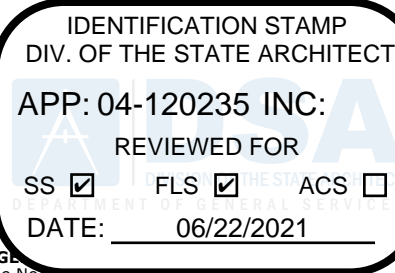
- CONTRACTOR SHALL COORDINATE ARCHITECTURAL, REFLECTED CEILINGS PLANS WITH ALL DISCIPLINES TO VERIFY CLEARANCES BETWEEN HVAC DUCTS, HVAC PIPING, LIGHT FIXTURES, ELECTRICAL DATA CONDUITS, PLUMBING LINES, FIRE PROTECTION LINES, STRUCTURAL MEMBERS, ETC. SPECIAL ATTENTION IS REQUIRED ALONG THE LENGTH OF MAIN MECHANICAL SUPPLY AND RETURN AIR DUCTS WHERE THERE IS LIMITED CLEARANCE FOR PASSAGE OR ROUTING OF UTILITIES.
- THE SPACE FOR DUCT WORK & MECHANICAL EQUIPMENT FOR THIS PROJECT IS LIMITED. COORDINATION WITH OTHER TRADES IS CRITICAL. PROCEED WITH PREPARATION OF SHOP DRAWINGS IMMEDIATELY UPON RECEIVING AN AUTHORIZATION TO PROCEED FOR THE PROJECT. COMPLETE SHOP DRAWINGS PRIOR TO MATERIAL FABRICATION AND INSTALLATION. SHOP DRAWINGS SHALL BE REVIEWED BY COMMISSIONING AGENT PRIOR TO SUBMITTAL.
- PROVIDE ORIGINALLY PREPARED CONTRACTOR'S SHOP DRAWINGS IN ELECTRONIC FORMAT. IN ADDITION TO THE REQUIREMENTS SPECIFIED ELSEWHERE, THE SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING:
  - DUCT, PIPE AND PLUMBING ELEVATIONS.
  - DOUBLE LINE DUCTWORK AND PIPING (6" AND LARGER).
  - ACTUAL SIZE OF PURCHASED EQUIPMENT. PER APPROVED CONTRACTOR'S SHOP DRAWINGS.
  - ACCESS PANELS INCLUDING CEILING PANELS.
  - ACCESS CLEARANCES FOR EQUIPMENT.
  - ACTUAL LOCATIONS OF CEILING DIFFUSERS, REGISTERS, AND RETURN REGISTERS.
  - LOCATIONS OF STRUCTURAL MEMBERS SUCH AS BEAMS.
  - ACTUAL LOCATIONS OF CONTROL PANELS AND POWER CONNECTIONS TO EQUIPMENT.
  - COLOR CODED DUCT AND PIPING BASED ON MATERIAL USED.
  - MINIMUM 1/4"=1" SCALE DRAWINGS.
  - LABEL AND TAG SCHEDULE FOR EQUIPMENT.
  - DUCT TRANSITIONS TO CLEAR BEAMS OR TIGHT AREAS.
  - ROOM TEMPERATURE SENSOR LOCATIONS.
  - POINT OF CONNECTION TO UTILITIES OUTSIDE THE BUILDING.
  - SECTIONS OR 3-D DRAWINGS OF CONGESTED AREAS.
  - GRID LINES.
  - UTILITY PROFILES FOR UNDERGROUND PIPING.
- DO NOT COMMENCE WITH ANY INSTALLATION, ORDERING OF ANY EQUIPMENT OR MATERIAL FABRICATION WITHOUT AN APPROVED SHOP DRAWING SUBMITTAL.
- FOR EACH SUBMITTAL, THE CONTRACTOR SHALL PROVIDE A LETTER (ON COMPANY LETTERHEAD) AND SIGNED BY THE PROJECT MANAGER INDICATING THE SUBMITTAL HAS BEEN FULLY IN HOUSE REVIEWED TO ENSURE FULL COMPLIANCE WITH THE CONTRACT DOCUMENTS AND COORDINATION WITH OTHER TRADES. ANY EXCEPTIONS TO THE CONTRACT DOCUMENTS SHALL BE CLEARLY INDICATED ON THIS LETTER. ANY DISCREPANCIES/EXCEPTIONS NOT IDENTIFIED IN WRITING SHALL BE CORRECTED AT THE SOLE EXPENSE OF THE CONTRACTOR AND AT NO EXPENSE TO THE OWNER AND ENGINEER.
- CONDENSATE DRAIN PIPING SHALL BE TYPE L COPPER WITH SOLDERED JOINTS.



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CONSULTANT BRANDING

RUHNAU  
CLARKE  
ARCHITECTS



## SPLIT SYSTEM HEAT PUMP & COOLING ONLY SCHEDULE

SYMBOL	DESCRIPTION	SERVES	INDOOR FAN SECTION												SYMBOL	DESCRIPTION	OUTDOOR SECTION										COMBINED CAPACITY										REMARKS
			INDOOR FAN MOTOR														ELECTRICAL DATA										COMBINED CAPACITY										
			CFM	E.S.P.	H.P.	DRIVE	V	PH	Hz	MCA	FLA	MOCP	TK	MIN. A FT <sup>1</sup>			OPER WT. LBS.	RLA	MCA	MOCP	V	PH	Hz	OPER WT. LBS.	TOTAL CAP MBH	SENSIBLE CAP. MBH	COOLING			HEATING			MIN. OSA CFM				
																							AMB °F	ENT DB °F	ENT WB °F	SEER	AMB °F	OUTPUT MBH	HSPF								
	CARRIER 40MAQB36B-3	ELECTRICAL ROOM - 100	870	--	--	DIRECT	208	1	60	0.40	--	--	--	50		CARRIER 38MAQB36R-3	--	25.0	35.0	208	1	60	175	36.0	27.0	95	80	67	16.0	--	--	--	①②③				
	CARRIER 40MAQB36B-3	ELECTRICAL ROOM - 100	870	--	--	DIRECT	208	1	60	0.40	--	--	--	50		CARRIER 38MAQB36R-3	--	25.0	35.0	208	1	60	175	36.0	27.0	95	80	67	16.0	--	--	--	①②③				

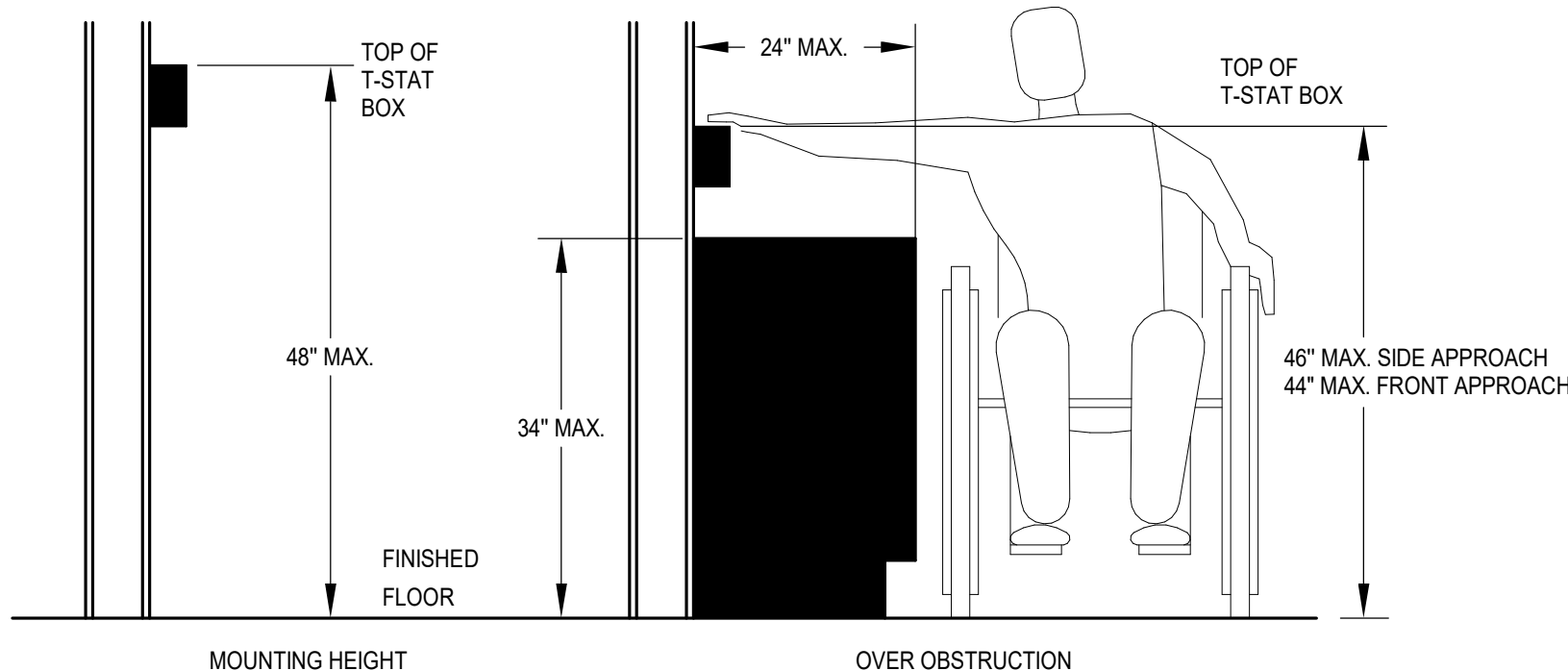
\* 100% EQUIPMENT PROCESS LOAD (NO OCCUPANTS)

① CONTROLS CONTRACTOR SHALL PROVIDE AND INSTALL EMS DDC ROOM TEMPERATURE SENSOR FOR MONITORING, TRENDING AND ALARMING.

② FC SHALL BE CONTROLLED BY FC UNIT MANUFACTURER PROVIDE HARD WIRED CONTROLS. LOW VOLTAGE CONTROLS ARE TO BE WIRED AND INSTALLED BY THE CONTROLS CONTRACTOR.

③ FC UNIT POWERED BY CU.

④ REFER TO DETAIL 1 AND 3 ON SHEET M5.01 FOR ANCHORAGE.



① MOUNTING HEIGHT OVER OBSTRUCTION  
NO SCALE

PROJECT No. :5003  
6/16/2021 8:01:39 AM

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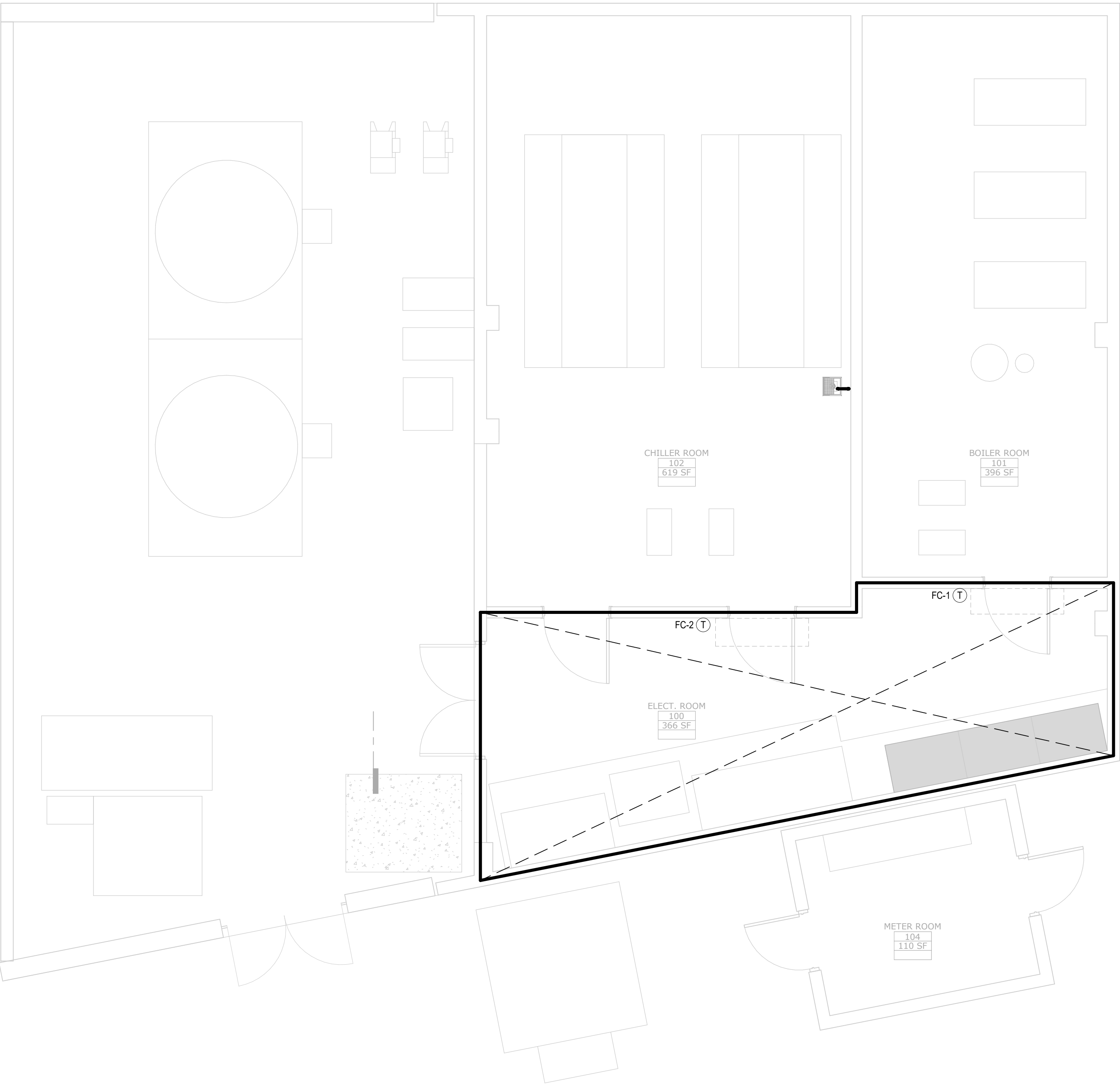
3775 TENTH STREET, RIVERSIDE CALIFORNIA 92505(951) 684-4664 / 5751 PALMER WAY, SUITE C, CARLSBAD CALIFORNIA 92008(619) 438-5899

VALHALLA HIGH SCHOOL BATTERY  
REPLACEMENT  
VALHALLA HIGH SCHOOL  
1725 HILLSDALE ROAD, EL CAJON, CA 92019  
GROSSMONT UNION HIGH SCHOOL DISTRICT

MECHANICAL LEGEND  
AND GENERAL NOTES

M0.01





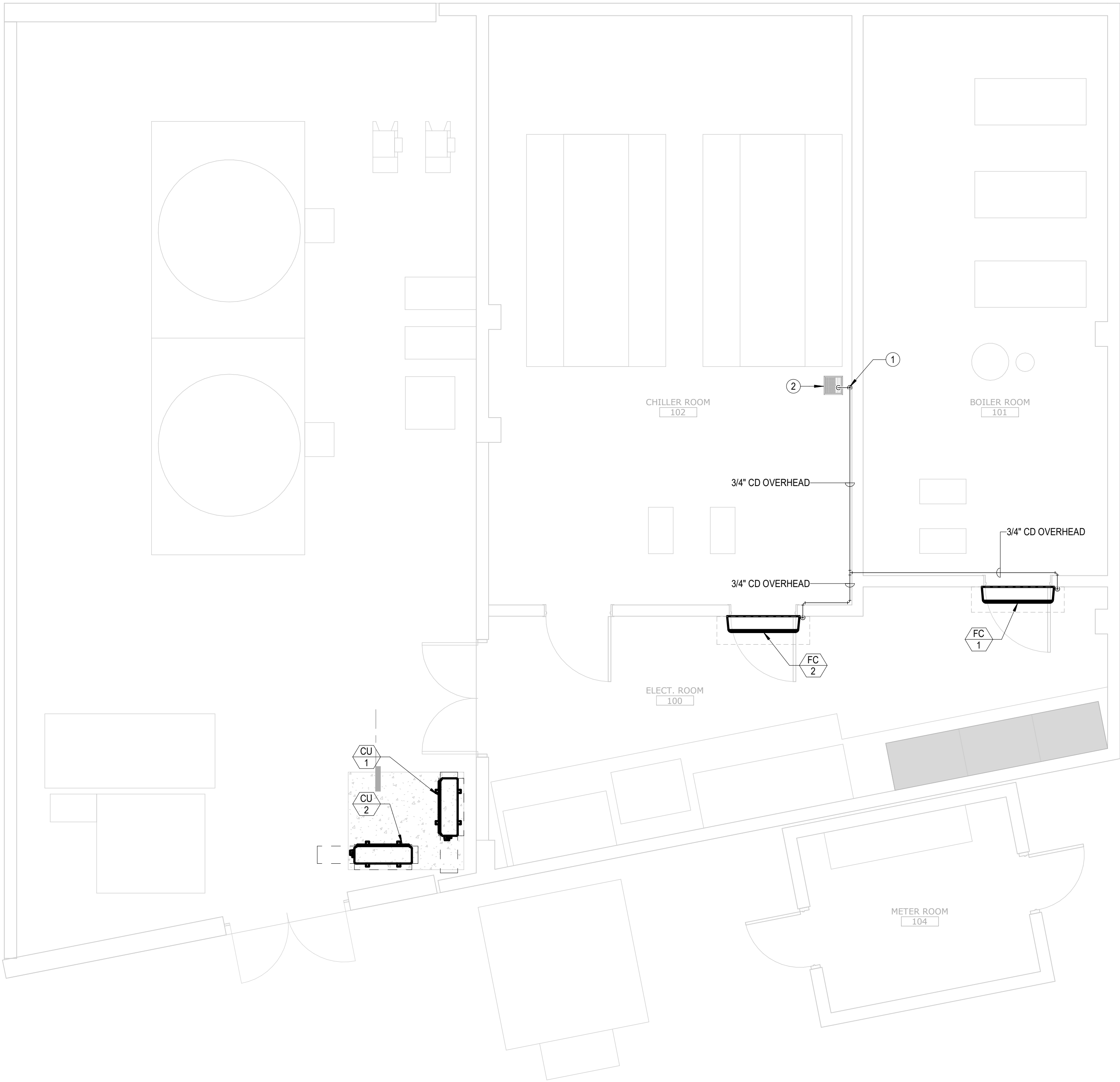
1 MECH ZONING PLAN  
1/4" = 1'-0"



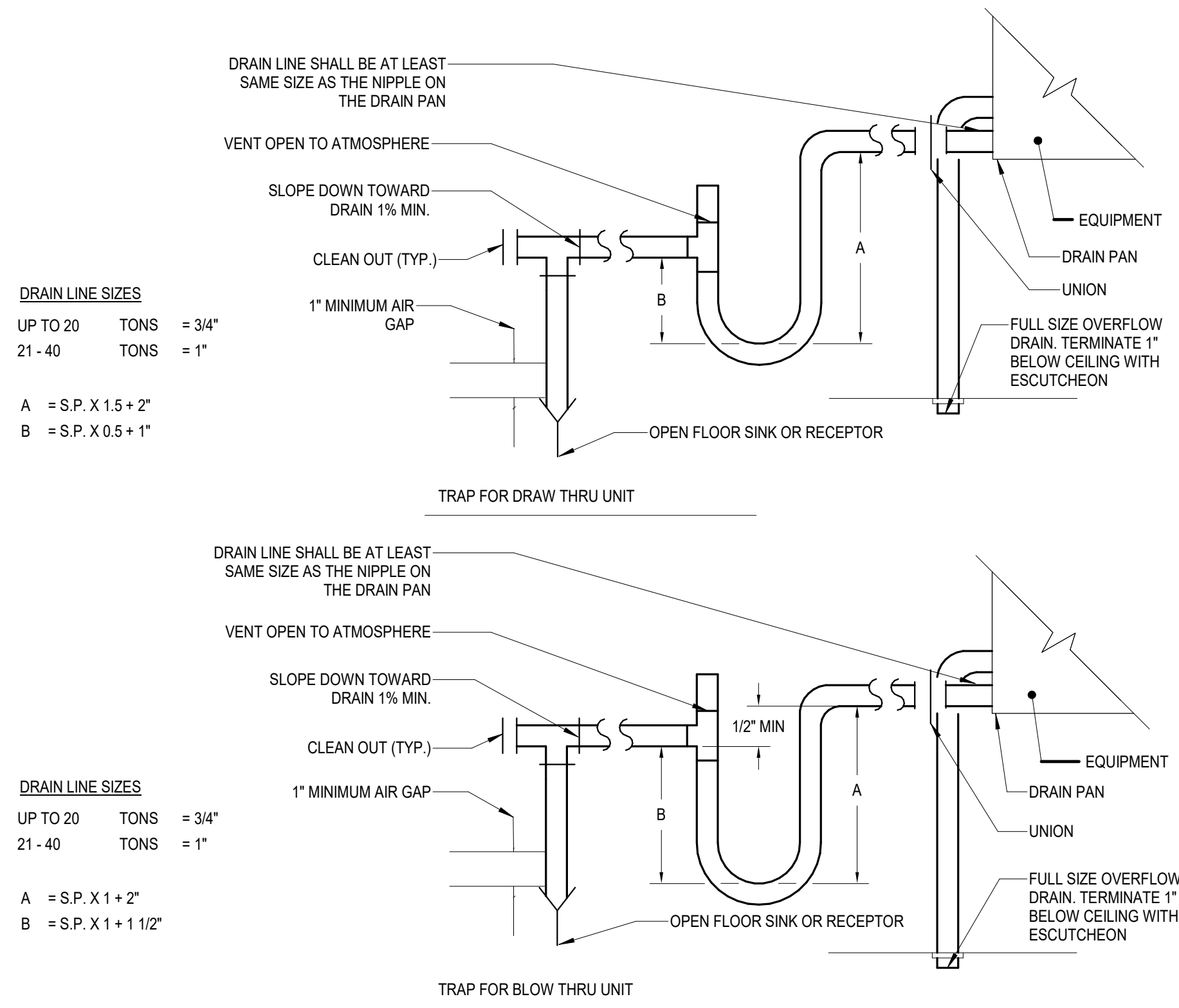
- ⊖
- KEYNOTES
- 1

3/4" CONDENSATE DRAIN DOWN WALL AND DRAIN INDIRECT TO FLOOR SINK.
- 2

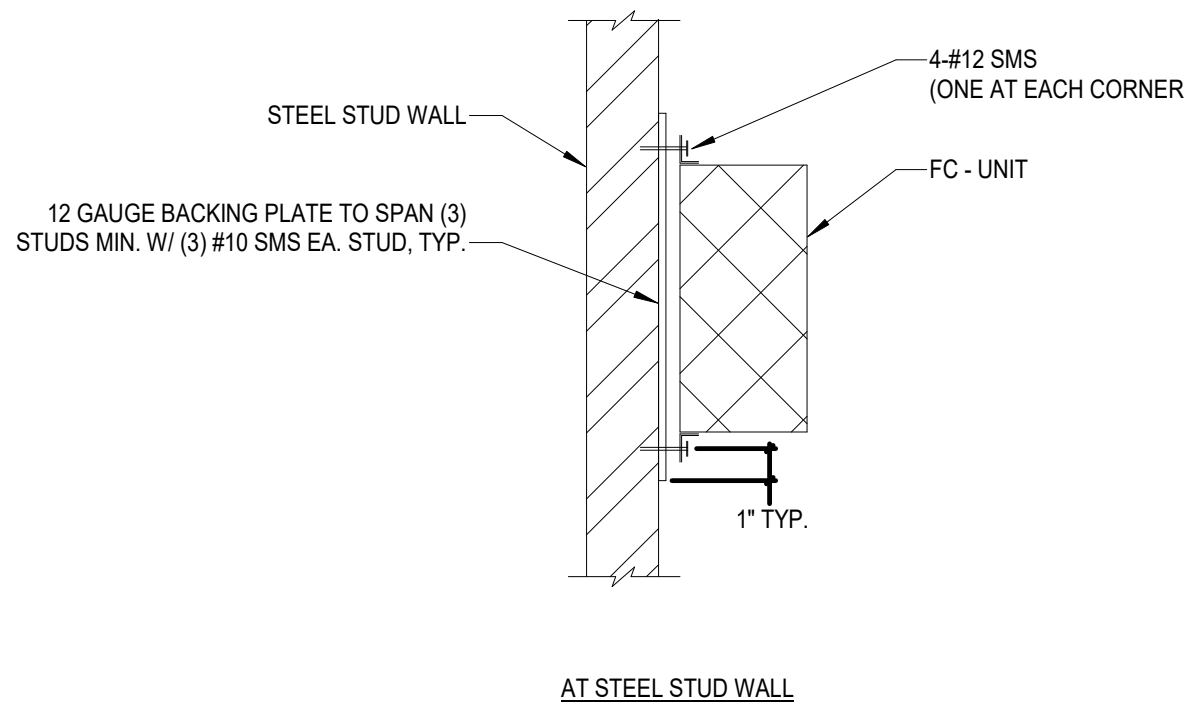
EXISTING FLOOR SINK.



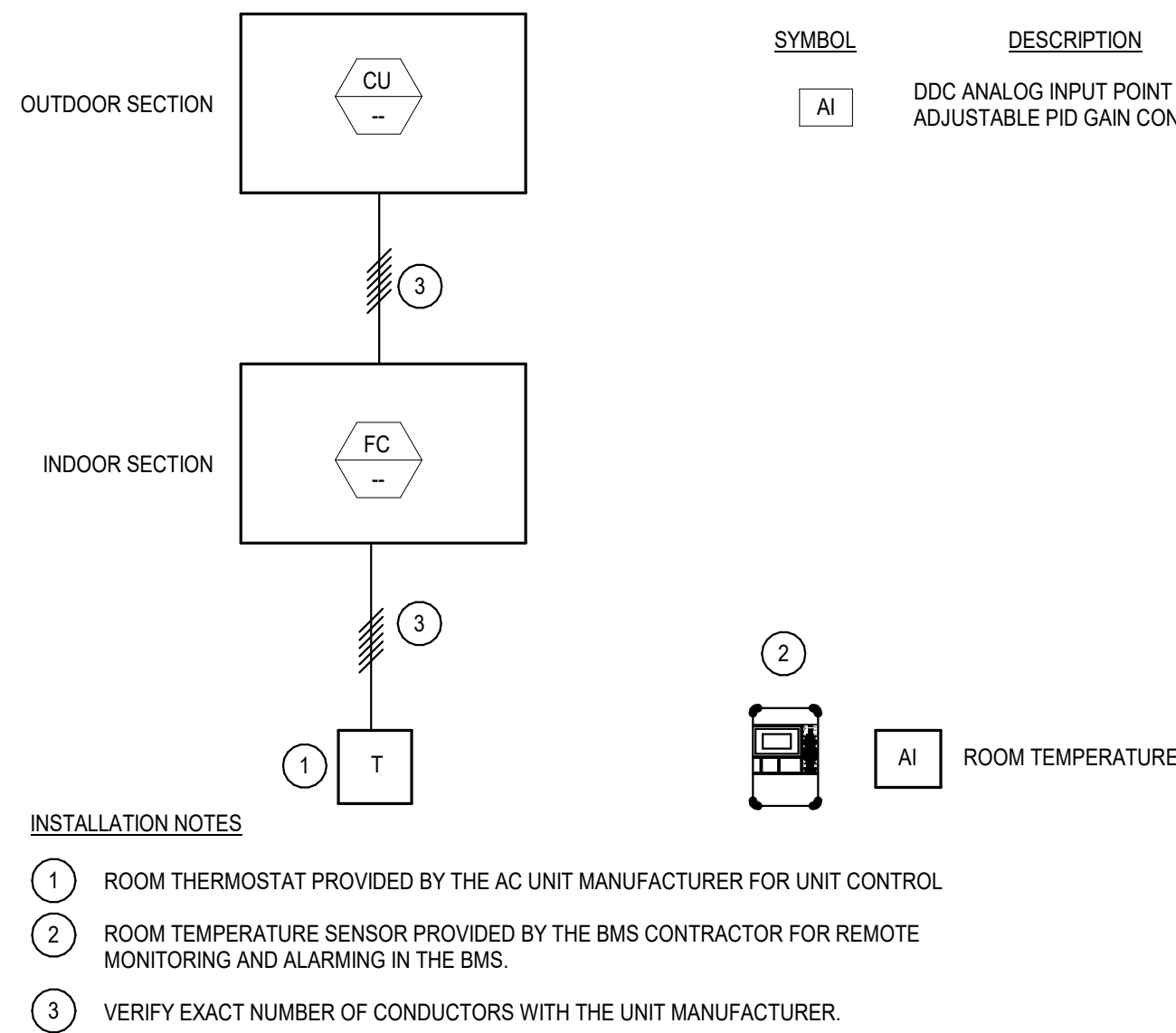
1 MECH FLOOR PLAN  
1/4" = 1'-0"



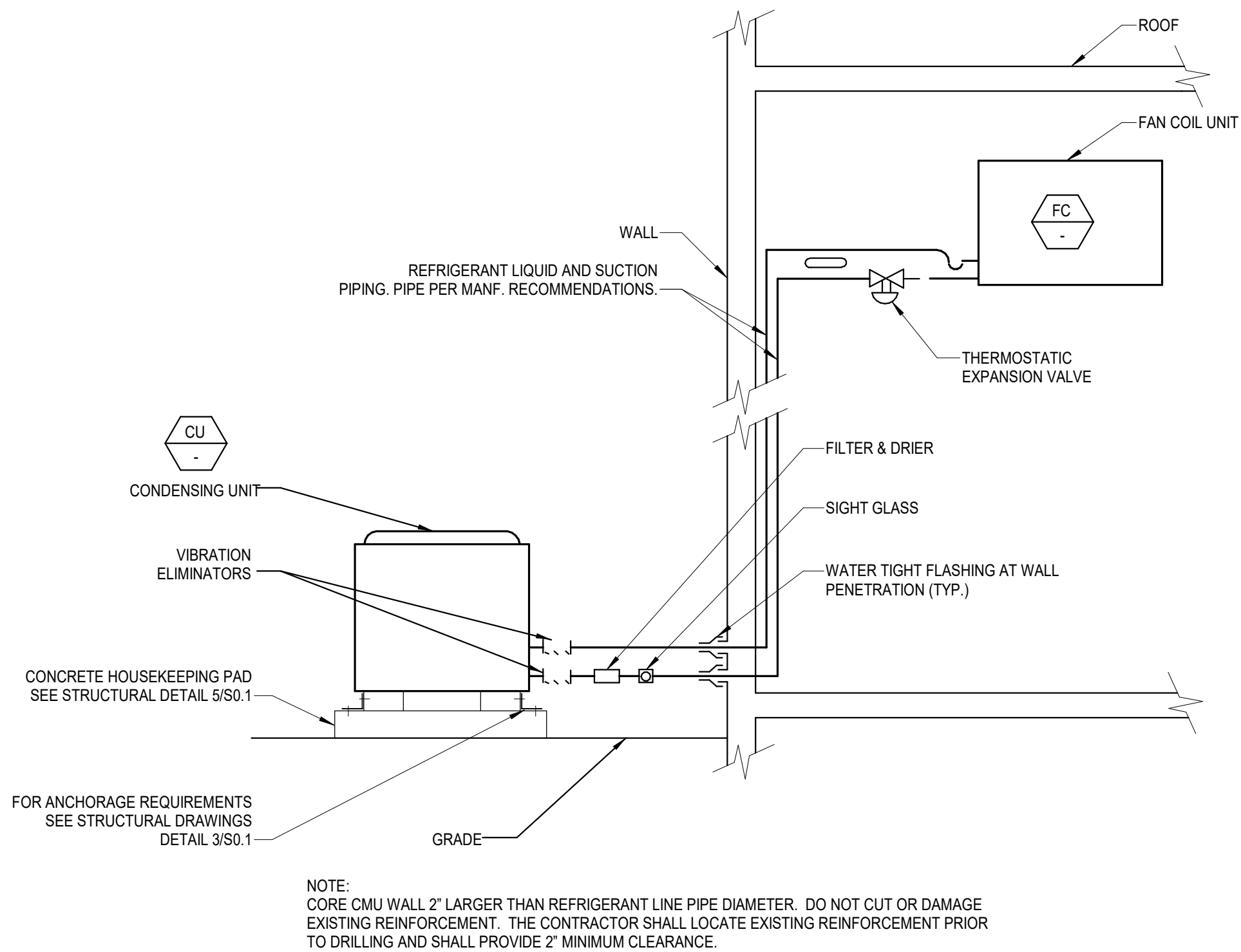
4 TYPICAL CONDENSATE DRAIN DETAIL  
NO SCALE



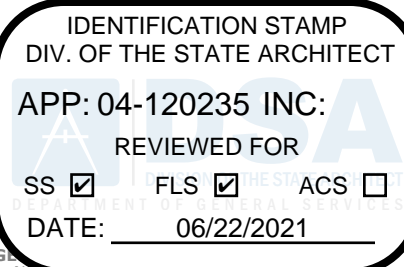
1 DUCTLESS FC MOUNT DETAIL  
NO SCALE



2 SPLIT SYSTEM UNIT TEMP CONTROL DETAIL  
NO SCALE



3 DUCTLESS SPLIT SYSTEM REFRIGERANT PIPING AND CU MOUNTING DETAIL  
NO SCALE



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PROJECT No. :5003

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VALHALLA HIGH SCHOOL BATTERY  
REPLACEMENT

VALHALLA HIGH SCHOOL  
1725 HILLSDALE ROAD, EL CAJON, CA 92019  
GROSSMONT UNION HIGH SCHOOL DISTRICT

MECHANICAL DETAILS

M5.01

VALHALLA HIGH SCHOOL BATTERY REPLACEMENT:



ABBREVIATIONS

A	AMPERE (AMPS)
AC	ALTERNATING CURRENT
AF	AMPS-FRAME (RATING)
AG	AMP INTERRUPTING CURRENT
AM	ANMMETER
AS	AMP SWITCH (FUSED SWITCH RATING)
AT	AMPS-TRIP (RATING)
AWG	AMERICAN WIRE GAUGE
BO	BAKE OFFER
BLDG	BUILDING
C	CONDUIT
CB	CIRCUIT BREAKER
CO	CONDUIT ONLY
CT	CURRENT TRANSFORMER
CU	COPPER
CFOI	CONTRACTOR FURNISHED OWNER INSTALLED
CFOI	CONTRACTOR FURNISHED CONTRACTOR INSTALLED
DPST	DOUBLE POLE DOUBLE THROWN
DPST	DOUBLE POLE SINGLE THROWN
DWG	DRAWING
EX	EXISTING
FLA	FULL LOAD AMPS
FVR	FULL VOLTAGE REVERSING
FVNR	FULL VOLTAGE NON-REVERSING
GFI	GROUND FAULT INTERRUPTER
GRD/GND	GROUND
HID	HIGH INTENSITY DISCHARGE
HOA	HAND-OFF-AUTOMATIC
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIUM
HZ	HERTZ
KM	KILOWATT
LCL	LONG CONTINUOUS LOAD
LRA	LOCKED ROTOR AMPS
LTS	LIGHTING
MCC	MOTOR CONTROL CENTER
MCM (KCM)	THOUSAND CIRCULAR MILS
MECH	MECHANICAL
NG	NORMALLY CLOSED
NF	NON-FUSED
NO	NORMALLY OPEN/NUMBER
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
OFCI	OWNER FURNISHED OWNER INSTALLED
P	POLE
PH	PHASE
POC	POINT OF CONNECTION
PRS	PVC COATED RIGID STEEL (CONDUIT)
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE DUCT
SMBD	SWITCHBOARD
TYP	TYPICAL
UG	UNDERGROUND
UON	UNLESS OTHERWISE NOTED
V	VOLT
VA	VOLT-AMPERES
VM	VOLTMETER
VL	VERIFY LOCATION
N	WIRE/WATTS
NP	WEATHER-PROOF (NEMA TYPE 3R)
NT	WATERTIGHT
XP	EXPLOSION PROOF (RATED FOR AREA HAZARD)

ELECTRICAL SYMBOL LEGEND

POWER CONTINUED

	DUPLEX RECEPTACLE, FLOOR MOUNTED
	DUPLEX RECEPTACLE, WALL MOUNTED, +18" A.F.F. (U.O.N.)
	RECEPTACLE, WALL MOUNTED HORIZONTALLY, +18" A.F.F. (U.O.N.)
	FOURPLEX RECEPTACLE, WALL MOUNTED, +18" A.F.F. (U.O.N.)
	RECEPTACLE MOUNTED +6" ABOVE COUNTER BACKSPLASH. SEE ARCHITECTURAL PLANS FOR REQUIRED MOUNTING HEIGHT PRIOR TO ROUGH-IN.
	PROVIDE (2) DUPLEX RECEPTACLE CEILING MOUNTED LOCATE ADJACENT TO PROJECTOR. FIELD VERIFY EXACT LOCATION PRIOR TO ROUGH-IN.
	RECEPTACLE WITH (2) USB PORTS MOUNTED +6" ABOVE COUNTER BACKSPLASH. SEE ARCHITECTURAL PLANS FOR REQUIRED MOUNTING HEIGHT PRIOR TO ROUGH-IN. EATON #TR1756.
	SINGLE RECEPTACLE, WALL MOUNTED +18" A.F.F. (U.O.N.)
	SINGLE RECEPTACLE (CLOCK HANGER TYPE) WALL MOUNTED +7'-0" A.F.F. (U.O.N.)
	SWITCH CONTROLLED DUPLEX RECEPTACLE +18" U.O.N.
	CONTROLLED FOURPLEX RECEPTACLE +18" U.O.N. (1) DUPLEX, (1) HALF HOT CONTROLLED DUPLEX. SEE LIGHTING CONTROL DIAGRAMS FOR FURTHER INFO.
	DUPLEX GROUND FAULT INTERRUPTING RECEPTACLE +18" A.F.F. (U.O.N.)
	DUPLEX RECEPTACLE ON EMERGENCY CIRCUIT +18" A.F.F. (U.O.N.)
	DUPLEX RECEPTACLE IN WEATHERPROOF ENCLOSURE +18" A.F.F. (U.O.N.)
	DUPLEX RECEPTACLE IN WEATHERPROOF "LOCKING" ENCLOSURE +18" A.F.F. (U.O.N.) (SEE TYPICAL DETAILS ES SERIES SHEETS AND SPECIFICATIONS FOR REQUIRED TYPE).
	DUPLEX RECEPTACLE (ORANGE) ISOLATED GROUND WALL MOUNTED +18" A.F.F. (U.O.N.)
	FOURPLEX RECEPTACLE (ORANGE) ISOLATED GROUND WALL MOUNTED +18" A.F.F. (U.O.N.)
	DUPLEX RECEPTACLE SAFETY TYPE / TAMPER PROOF WALL MOUNTED +18" A.F.F. (U.O.N.)
	DUPLEX COMPUTER RECEPTACLE (GREY), WALL MOUNTED +18" A.F.F. (U.O.N.)
	JUNCTION BOX, CEILING OR WALL MOUNTED
	HAND DRYER CONNECTION, SEE ARCHITECTURAL FOR MOUNTING HEIGHT.
	FUSED DISCONNECT SWITCH, WHERE SHOWN NF = NON-FUSED.
	MANUAL MOTOR STARTER +48" A.F.F. OR ON EQUIPMENT (U.O.N.)
	MOTOR CONNECTION, NUMERAL INDICATES HORSEPOWER.
	MECHANICAL EQUIPMENT TAG (SEE MECHANICAL DRAWINGS FOR DESCRIPTION)
	CONDUIT AND WIRE, CONCEALED IN CEILING OR WALL
	CONDUIT AND WIRE, CONCEALED IN OR UNDER FINISHED FLOOR OR UNDER FINISHED GRADE.
	FLEXIBLE CONDUIT CONNECTION
	BRANCH CIRCUIT HOMERUN TO PANEL. SLASHES INDICATE NUMBER OF CONDUCTORS, EQUIPMENT GROUND WIRE NOT INDICATED U.O.N. #12 CONDUCTORS ARE MINIMUM, NO HASH MARKS = MIN (2) #12
	3/4" CONDUIT STUBBED FROM DEVICE TO ABOVE ACCESSIBLE CEILING
	BRANCH CIRCUIT HOMERUN, NUMBER INDICATES INCREASED CONDUCTOR SIZE, CONDUCTORS SHALL REMAIN AS INDICATED FOR SIZE THROUGHOUT THE ENTIRE CIRCUIT.
	PANELBOARD, SURFACE MOUNTED.
	PANELBOARD, RECESSED

GENERAL PROJECT NOTES:

- UNLESS WHERE OTHERWISE NOTED, ALL WORK INDICATED ON THESE DRAWINGS SHALL BE CONSIDERED NEW WORK.
- UNLESS WHERE OTHERWISE NOTED, ALL DIMENSIONS ARE TO BE CENTERLINE OF THE DEVICE.
- "GENERAL NOTES" SHOWN ON AN INDIVIDUAL DRAWING APPLY TO ALL WORK SHOWN ON THAT SHEET. "KEY NOTES" ONLY APPLY TO SPECIFIC ITEMS WHERE ANNOTATED AT SPECIFIC LOCATIONS. SOME KEY NOTES MAY NOT APPLY TO ANY SPECIFIC ITEMS.
- UNLESS SPECIFICALLY SHOWN ON THESE PLANS, NO STRUCTURAL MEMBER SHALL BE CUT, NEITHER DRILLED NOR NOTCHED WITHOUT PRIOR WRITTEN AUTHORIZATION FROM THE STRUCTURAL ENGINEER AND THE DIVISION OF THE STATE ARCHITECT.

GENERAL DEMOLITION NOTES:

- ALL ELECTRICAL EQUIPMENT, EXPOSED RACEWAY AND CONDUIT, OUTLET BOXES AND RINGS, AND DEVICES ARE TO BE REMOVED, EXCEPT WHERE SHOWN TO REMAIN. EXISTING WIRING, WHETHER EXPOSED, IN CONDUIT OR RACEWAY IS TO BE REMOVED TO THE GREATEST EXTENT POSSIBLE.
- THE ELECTRICAL CONTRACTOR IS TO DIRECT THE REMOVAL OF THE ABOVE LISTED WORK.

MEP COMPONENT ANCHORAGE NOTE:

ALL MECHANICAL, PLUMBING, AND ELECTRICAL COMPONENTS SHALL BE ANCHORED AND INSTALLED PER THE DETAILS ON THE DSA- APPROVED CONSTRUCTION DOCUMENTS. THE FOLLOWING COMPONENTS SHALL BE ANCHORED OR BRACED TO MEET THE FORCE AND DISPLACEMENT REQUIREMENTS PRESCRIBED IN THE 2019 CBC SECTIONS 1611A.1.15 THROUGH 1611A.1.26 AND ASCE 7-16 CHAPTERS 15, 26, AND 30:

- ALL PERMANENT EQUIPMENT AND COMPONENTS.
- TEMPORARY, MOVABLE OR MOBILE EQUIPMENT THAT IS PERMANENTLY ATTACHED (E.G. HARD WIRED) TO THE BUILDING UTILITY SERVICES SUCH AS ELECTRICITY, GAS OR WATER. "PERMANENTLY ATTACHED" SHALL INCLUDE ALL ELECTRICAL CONNECTIONS EXCEPT PLUGS FOR 110/220 VOLT RECEPTACLES HAVING A FLEXIBLE CABLE.
- TEMPORARY, MOVABLE OR MOBILE EQUIPMENT WHICH IS HEAVIER THAN 400 POUNDS OR HAS A CENTER OF MASS LOCATED 4 FEET OR MORE ABOVE THE ADJACENT FLOOR OR ROOF LEVEL THAT DIRECTLY SUPPORT THE COMPONENT IS REQUIRED TO BE RESTRAINED IN A MANNER APPROVED BY DSA.

THE FOLLOWING MECHANICAL AND ELECTRICAL COMPONENTS SHALL BE POSITIVELY ATTACHED TO THE STRUCTURE BUT NEED NOT DEMONSTRATE DESIGN COMPLIANCE WITH THE REFERENCES NOTED ABOVE. THESE COMPONENTS SHALL HAVE FLEXIBLE CONNECTIONS PROVIDED BETWEEN THE COMPONENT AND ASSOCIATED DUCTWORK, PIPING, AND CONDUIT. FLEXIBLE CONNECTIONS MUST ALLOW MOVEMENT IN BOTH TRANSVERSE AND LONGITUDINAL DIRECTIONS:

- COMPONENTS WEIGHING LESS THAN 400 POUNDS AND HAVING A CENTER OF MASS LOCATED 4 FEET OR LESS ABOVE THE ADJACENT FLOOR OR ROOF LEVEL THAT DIRECTLY SUPPORT THE COMPONENT.
- COMPONENTS WEIGHING LESS THAN 20 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS, LESS THAN 5 POUNDS PER FOOT, WHICH ARE SUSPENDED FROM A ROOF OR FLOOR OR HUNG FROM A WALL.

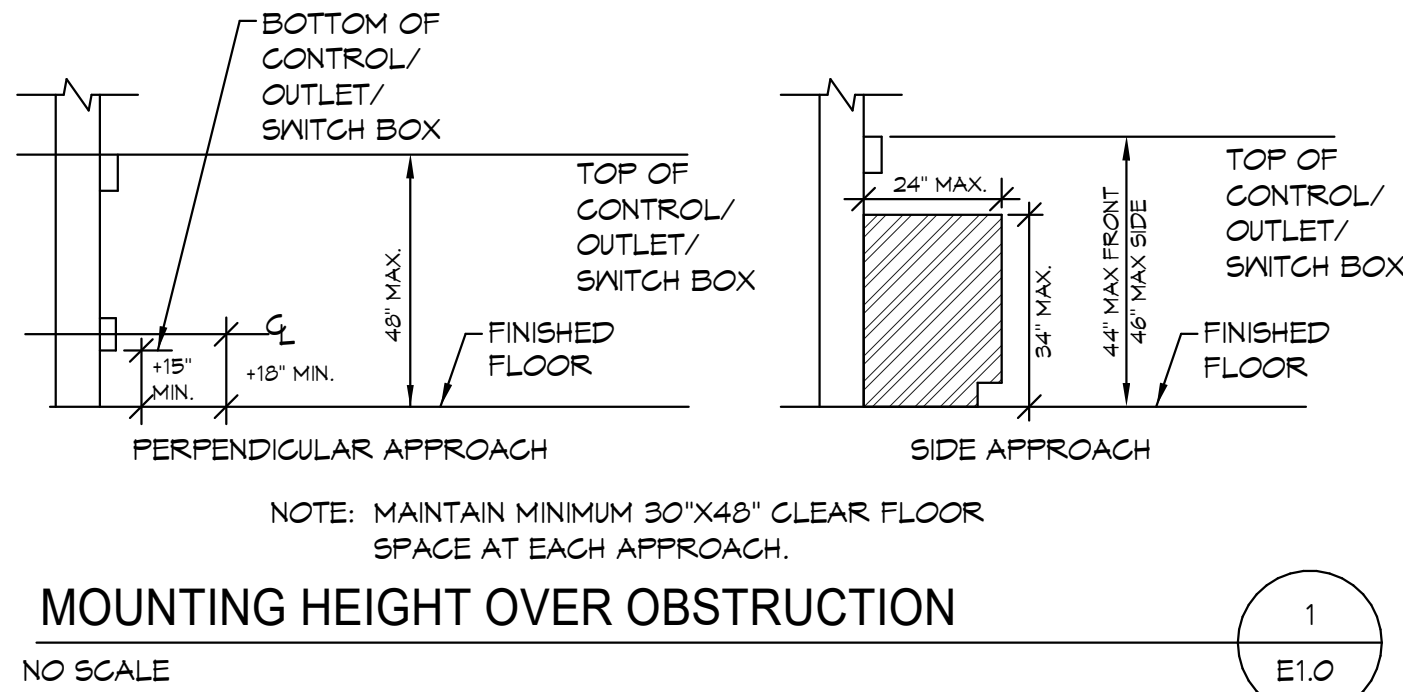
THE ANCHORAGE OF ALL MECHANICAL, ELECTRICAL AND PLUMBING COMPONENTS SHALL BE SUBJECT TO THE APPROVAL OF THE DESIGN PROFESSIONAL IN GENERAL RESPONSIBLE CHARGE OR STRUCTURAL ENGINEER DELEGATED RESPONSIBILITY AND ACCEPTANCE BY DSA. THE PROJECT INSPECTOR WILL VERIFY THAT ALL COMPONENTS AND EQUIPMENT HAVE BEEN ANCHORED IN ACCORDANCE WITH THE ABOVE REQUIREMENTS.

PIPING, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEM BRACING NOTE

PIPING, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEMS SHALL BE BRACED TO COMPLY WITH THE FORCES AND DISPLACEMENTS PRESCRIBED IN ASCE 7-16 SECTION 13.3 AS DEFINED IN ASCE 7-16 SECTIONS 13.6.5, 13.6.6, 13.6.7, 13.6.8, AND 2019 CBC, SECTIONS 1611A.1.24, 1611A.1.25 AND 1611A.1.26. THE METHOD OF SHOWING BRACING AND ATTACHMENTS TO THE STRUCTURE FOR THE IDENTIFIED DISTRIBUTION SYSTEM ARE AS NOTED BELOW, WHEN BRACING AND ATTACHMENTS ARE BASED ON A PREAPPROVED INSTALLATION GUIDE (E.G., OSHPD OPM FOR 2019 CBC OR LATER), COPIES OF THE BRACING SYSTEM INSTALLATION GUIDE OR MANUAL SHALL BE AVAILABLE ON THE JOBSITE PRIOR TO THE START OF AND DURING THE HANGING AND BRACING OF THE DISTRIBUTION SYSTEMS. THE STRUCTURAL ENGINEER OF RECORD SHALL VERIFY THE ADEQUACY OF THE STRUCTURE TO SUPPORT THE HANGER AND BRACE LOADS. MECHANICAL PIPING (MP), MECHANICAL DUCTS (MD), PLUMBING PIPING (PP), ELECTRICAL DISTRIBUTION SYSTEMS (E).

MP ☐ MD ☐ PP ☐ E ☒ - OPTION 1: DETAILED ON THE APPROVED DRAWINGS WITH PROJECT SPECIFIC NOTES AND DETAILS.

MP ☐ MD ☐ PP ☐ E ☐ - OPTION 2: SHALL COMPLY WITH THE APPLICABLE OSHPD PRE-APPROVED (OPM) # \_\_\_\_\_



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PARTIAL SITE PLAN - ELECTRICAL

SCALE: 1" = 20'-0"  
2

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VALHALLA HIGH SCHOOL BATTERY REPLACEMENT  
VALHALLA HIGH SCHOOL  
1725 HILLSDALE ROAD, EL CAJON, CA 92019  
GROSSMONT UNION HIGH SCHOOL DISTRICT

ELECTRICAL SYMBOLS, ABBREVIATIONS, AND NOTES

E1.0

Project Number

VALHALLA HIGH SCHOOL BATTERY REPLACEMENT:



