Date: March 28, 2019

ADDENDUM NO. 1 To Project Bidding Documents for:

CHILLER REPLACEMENT PROJECT GLENDALE HIGH SCHOOL GLENDALE, CA

tBP Proj. No. 20916.02

tBP/ARCHITECTURE 4611 Teller Avenue Newport Beach, CA 92660 949/673-0300

TO: PROSPECTIVE BIDDERS

This Addendum forms a part of the Contract Documents and modifies the original Drawings dated March 6, 2019. Acknowledge receipt of this Addendum in space provided on the Bid Form. Failure to acknowledge may subject Bidder to disqualification.

CHANGES TO SPECIFICATIONS

- SPECIFICATIONS DIVISION 00 PROCUREMENT & CONTRACTION REQUIREMENTS Add Division 00 – Procurement and Contracting Requirements, issued with this addendum.
- 2. SPECIFICATIONS DIVISION 01 GENERAL REQUIREMENTS Add Division 01 – General Requirements, issued with this addendum.
- 3. SPECIFICATIONS Add Division 02 – Existing Conditions in its entirety, issued with this addendum.
- 4. SPECIFICATIONS DIVISION 05 METALS Add Division 05 – Metals, issued with this addendum.
- 5. SPECIFICATIONS DIVISIONI 07 THERMAL & MOISTURE PROTECTION Add Division 07 – Thermal and Moisture Protection, issued with this addendum.
- SPECIFICATIONS DIVISION 26 ELECTRICAL Add Division 26 – Electrical, issued with this addendum.

CHANGES TO DRAWINGS

- 1. SHEET T-2 SHEET INDEX, GENERAL NOTES & SYMBOLS Replace full size sheet Drawing T-2 in its entirety, issued with this addendum.
- SHEET M0-2 MECHANICAL SCHEDULES Replace full size sheet Drawing M0-2 in its entirety, issued with this addendum.

- 3. SHEET M3-1 MECHANICAL DETAILS Replace full size sheet Drawing M3-1 in its entirety, issued with this addendum.
- 4. SHEET M5-1 MECHANICAL CONTROLS DETAILS Replace full size sheet Drawing M5-1 in its entirety, issued with this addendum.
- 5. SHEET E0-1 SYMBOL LIST & GENERAL NOTES Add full size sheet Drawing E0-1, issued with this addendum.
- 6. SHEET E0-2 SINGLE LINE DIAGRAM & DETAILS Add full size sheet Drawing E0-2, issued with this addendum.
- 7. SHEET E1-1 OVERALL SITE ELECTRICAL PLAN Add full size sheet Drawing E1-1, issued with this addendum.
- 8. SHEET ED2-0, ELECTRICAL DEMOLITION PLAN Add full size sheet Drawing ED2-0, issued with this addendum.
- 9. SHEET E2-0 ELECTRICAL PLAN Add full size sheet Drawing E2-0, issued with this addendum.

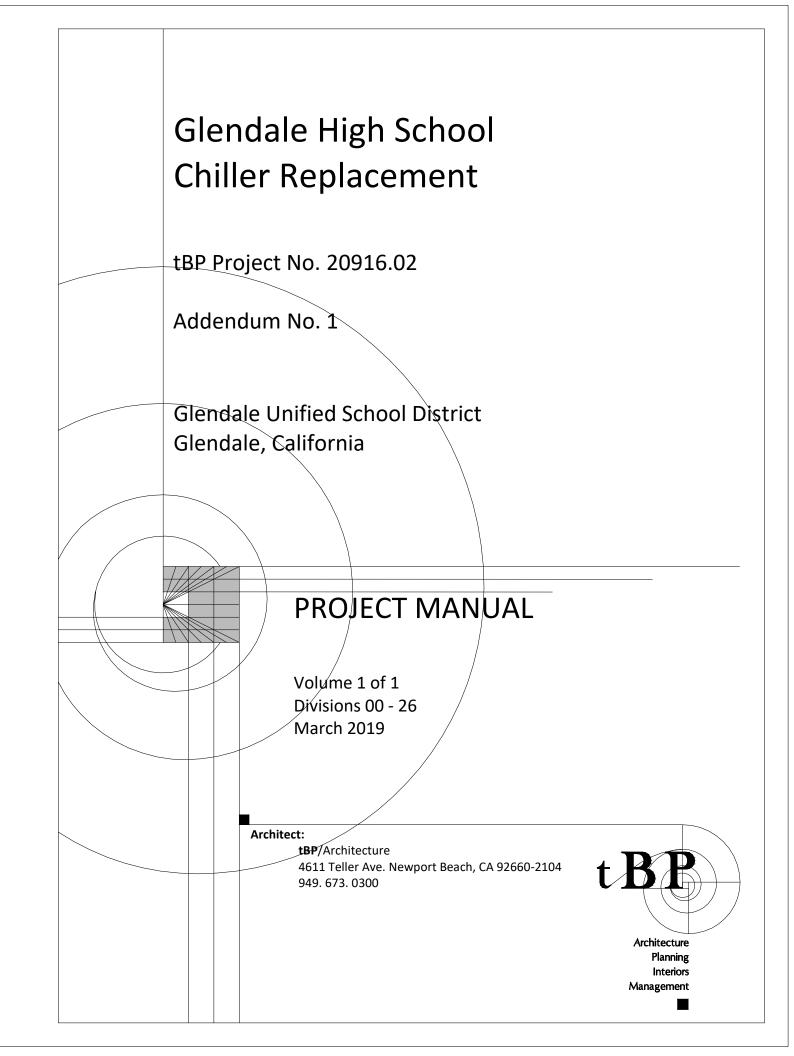
ATTACHMENTS

The following attachments are a part of Addendum No. 1:

- 1. Specification Sections:
 - A. TABLE OF CONTENTS
 - B. DIVISION 00 PROCUREMENT & CONTRACTION REQUIREMENTS
 - C. DIVISION 01 GENERAL CONDITIONS
 - D. DIVISION 02 EXISTING CONDITIONS
 - E. DIVISION 05 METALS
 - F. DIVISION 07 THERMAL & MOISTURE PROTECTION
 - G. DIVISION 26 ELECTRICAL

2. Full Size Sheets (30" x 42"): (Total 9)

T-2 M0-2 M3-1 M5-1 E0-1 E0-2 E1-1 ED2-0 E2-0



SECTION 00 01 01 PROJECT TITLE PAGE

FOR

GLENDALE HS CHILLER REPLACEMENT

PROJECT NUMBER: 20916.02

DISTRICT GLENDALE UNIFIED SCHOOL DISTRICT 349 WEST MAGNOLIA, GLENDALE, CALIFORNIA 91204 WWW.GUSD.NET

PROJECT LOCATION GLENDALE HIGH SCHOOL 1440 E. BROADWAY GLENDALE , CALIFORNIA 91206

PREPARED BY:

ARCHITECT TBP/ARCHITECTURE

4611 Teller Avenue, Newport Beach, California 92660 949.673.0300 www.tbparchitecture.com

Glendale Unified School District Glendale HS Chiller Replacement tBP/Architecture Project 20916.02 PROJECT TITLE PAGE 00 01 01 - 1

Addendum 1

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).

SECTION 00 01 02

PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

A. Project Name: Glendale HS Chiller Replacement, located at:

Project Number: 20916.02.

Glendale High School.

1440 E. Broadway.

Glendale, California 91206.

B. The Owner, hereinafter referred to as District: Glendale Unified School District

Glendale Unified School District

349 West Magnolia, Glendale, California 91204 www.gusd.net 818.507.0201

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: Replacement of the single effect 270 Ton absorption chiller with a 300 Ton direct-fired absorption chiller is projected to yield an estimated gas savings of 85,364 Therms/year based upon a third party ASHRAE Level II audit.
- B. Contract Scope: Construction, demolition, and renovation.
- C. Contract Terms: Lump sum (fixed price, stipulated sum), with incentives.

1.04 PROJECT CONSULTANTS

A. The Architect, hereinafter referred to as Architect: **tBP/Architecture**

4611 Teller Avenue, Newport Beach, California 92660 www.tbparchitecture.com 949.673.0300 Principal-In-Charge: Hung Cheng hcheng@tbparchitecture.com Contact: Carolyn Loughrey cloughrey@tbparchitecture.com

1.05 PROCUREMENT TIMETABLE

- A. Last Request for Substitution Due: 7 days prior to due date of bids.
- B. Last Request for Information Due: 7 days prior to due date of bids.

- C. Bid Opening: Same day, 3 PM local time.
- D. Bids May Not Be Withdrawn Until: 30 days after due date.
- E. Contract Time: To be stated in bid documents.
- F. The District reserves the right to change the schedule or terminate the entire procurement process at any time.

1.06 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.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

SECTION 00 01 07 SEALS PAGE

ARCHITECT

TBP/ARCHITECTURE

4611 Teller Avenue, Newport Beach, California 92660

Architect of Record (AOR)

MECHANICAL/PLUMBING ENGINEER

POCOCK DESIGN SOLUTIONS, INC.

14451 Chambers Road, Suite 210, Tustin, California 92780

Mechanical Engineer of Record (MEOR)

ELECTRICAL ENGINEER

FBA ENGINEERING

150 Paularino Avenue, Suite A120, Costa Mesa CA 92626

Electrical Engineer of Record (EEOR)





SECTION 00 01 10

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- 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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- 01 10 00 Summary
- 01 20 00 Price and Payment Procedures
- 01 25 00 Substitution Procedures
- 01 30 00 Administrative Requirements
- 01 31 14 Facility Services Coordination
- 01 32 16 Construction Progress Schedule
- 01 35 53 Security Procedures
- 01 40 00 Quality Requirements
- 01 41 00 Regulatory Requirements
- 01 42 19 Reference Standards
- 01 45 33 Code-Required Special Inspections
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- 01 58 13 Temporary Project Signage
- 01 60 00 Product Requirements
- 01 61 16 Volatile Organic Compound (VOC) Content Restrictions

01 61 16.01 - Accessory Material VOC Content Certification Form

- 01 70 00 Execution and Closeout Requirements
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- 01 78 00 Closeout Submittals

01 79 00 - Demonstration and Training

DIVISION 02 -- EXISTING CONDITIONS

02 41 00 - Demolition

DIVISION 05 -- METALS

05 05 19 - Post-Installed Concrete Anchors

05 50 00 - Metal Fabrications

DIVISION 07 -- THERMAL AND MOISTURE PROTECTION

07 05 53 - Fire and Smoke Assembly Identification

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DIVISION 23 -- HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

- 23 05 00 Common Work Results for HVAC
- 23 05 19 Meters and Gauges for HVAC Piping
- 23 05 23 General-Duty Valves for HVAC Piping
- 23 05 29 Hangers and Supports for HVAC Piping and Equipment
- 23 05 53 Identification for HVAC Piping and Equipment
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- 23 07 16 HVAC Equipment Insulation
- 23 07 19 HVAC Piping Insulation
- 23 09 00 Instrumentation and Control for HVAC
- 23 21 13 Hydronic Piping
- 23 21 16 Hydronic Piping Specialties
- 23 21 23 Hydronic Pumps
- 23 22 13 Steam and Condensate Heating Piping
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- 23 51 00 Breechings, Chimneys, and Stacks
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DIVISION 26 -- ELECTRICAL

- 26 05 00 Common Work Results for Electrical
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- 26 05 30 Conduit and Wire

26 24 16 - Branch Circuit Panelboards and Terminal Cabinets

26 24 19 - Motor Control Equipment

SECTION 00 31 00

AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.01 EXISTING CONDITIONS

- A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of Contract Documents, as follows:
- B. Site and Utility Survey: Entitled _____, dated _____.
 - 1. This survey identifies grade elevations prepared primarily for the use of Architect in establishing new grades and identifying natural water shed.
- C. Geotechnical Report: Entitled _____, dated _____.
 - 1. Original copy is available for inspection at District's offices during normal business hours.
 - 2. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of Architect.
 - a. Soil and subsurface investigations conducted at site by an independent testing laboratory and report with log of borings prepared.
 - 3. Interpretation:
 - a. The District, Architect and Engineers disclaim all responsibility for the accuracy of information prepared by others.
 - The District, Architect and Engineers disclaim all responsibility for the information to be completely representative of conditions and materials which may be encountered and as being adequate for the purposes of construction.
 - 2) Variations in kind, depth, quantity, and condition of soils may occur.
 - 3) The District, Architect and Engineers further disclaim responsibility for interpretation by Bidding Contractors and others of soil and subsurface investigation information, such as in projecting soil-bearing values, rock profiles, presence and scope of boulders and cobbles, soil stability and the presence, level and extent of underground water.
 - 4. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in Contract Documents.
 - 5. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Sum accruing to District.
 - a. If variances from Geotechnical Report are found, make written report to Owner Representative.
 - b. Claims for conditions found to be not as indicated in soil investigation data not permitted, unless otherwise indicated in District-Contractor Agreement.
 - 1) This applies only to conditions found after execution of the Agreement to be materially different from those reported and which are not customarily encountered in the geographic area.

1.02 BIDDER'S INVESTIGATIONS

- A. Bidder's Investigation: Bidder shall visit site and become familiar with site conditions.
 - 1. Bidder may, at Bidder's own expense and prior to bidding, make soil surveys and investigations Bidder considers necessary.
 - 2. Bidder assumes risk that soil and underground conditions may be other than that indicated in soil investigation data.
- B. Procedures:
 - 1. Obtain authorization from Owner Representative prior to start of borings or subsurface investigations.
 - 2. Immediately upon completion of Bidder's subsurface investigation, return site areas affected by investigations to condition existing prior to start of Bidder subsurface investigations as directed by Owner Representative.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

SECTION 00 40 25

REQUEST FOR INFORMATION

RFI NUMBER:			DATE:
PROJECT NAI	ME: GLENDALE HS CHII	LER REPLACEMENT	PROJECT NO.: 20916.02
TO:	TBP/ARCHITECTU	RE	
	4611 Teller Avenue	e, Newport Beach, Califo	ornia 92660
Att	ention:		
Сог	ntractor:		
	Address:		
Red	quest By:		Date:
BRIEF S	UMMARY OF RFI:		
Dra	wing No.		Detail No
		Paragraph	
DETAIL	S OF THIS RFI:		
Att	achments:		
RESPO	NSE WILL BE INCLUDED	IN AN ADDENDUM	
		END OF RFI	
Glendale Uni	fied School District		REQUEST FOR INFORMATION

SECTION 00 43 25

SUBSTITUTION REQUEST FORM - DURING PROCUREMENT

DATE:	_
PROJECT NAME:	GLENDALE HS CHILLER REPLACEMENT
PROJECT NUMBER:	20916.02
то:	TBP/ARCHITECTURE
	4611 Teller Avenue, Newport Beach, California 92660
From:	
product and the	nit for your consideration the following product comparisons of the specified proposed substitution. The undersigned fully understands that failure to below may be cause for rejection of request for substitution.
	stitution shall only be made during bidding (not later than 7 days prior to bid usion by Addendum) except under conditions beyond control of Contractor.
SPECIFIED PRODUCT	ſ:
Project Manual	Section Title Paragraph Number Page Paragraph
Drawing No	Detail No
Proposed Substi	tution:
Manufacturer:	Tel:
A. Is the point-by-p	ooint comparative data attached? — REQUIRED BY A/E
B. Reason request	for substitution is being submitted:
DIFFERENCES BETW	EEN PROPOSED SUBSTITUTION AND SPECIFIED PRODUCT
A. Does proposed s	substitution affect in any way the Structural Safety, Access Compliance, or Fir rtions of the project? No Yes
& Life Safety por	
& Life Safety por Explain	substitution affect dimensions, gages, weights, etc. on Drawing? No Yes

C.	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.)

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

SECTION 00 63 25

SUBSTITUTION REQUEST FORM (POST-AWARD)

DATE:			
PROJECT NAME:	GLENDALE HS CHILLER REPL	ACEMENT	
PROJECT NUMBER:	20916.02		
то:	TBP/ARCHITECTURE		
	4611 Teller Avenue, Newp	oort Beach, California	92660
From:			
product and the	mit for your consideration th e proposed substitution. The n below may be cause for rej	e undersigned fully un	derstands that failure to
•	substitution form shall only onditions beyond control of (d of the bidding period
Specified Produ	ct:		
Project Manual	Section Title	Number	Page Paragraph _
Drawing No			Detail No
Proposed Subst	itution:		
Manufacturer:			
A. Reason request	for substitution is being sub	mitted:	
	substitution affect in any wa prtions of the project? No`	-	ty, Access Compliance, or
	substitution affect dimensio		
NoYes	substitution require changes		
(If yes, cost of A Contractor.)	Architect and Engineer docun	nent changes are the	responsibility of the
dale Unified School I		SU	IBSTITUTION REQUEST FO
dale HS Chiller Repla	acement		(POST-AWA

110			product cost, delivery	y time, or construction schedule?	
	Does proposed substitution comply with specified ICC Number, UL Rating, ASTM Numbers? No Yes Explain				
				ems such as wiring, piping, ductwo w)	
-		-	-	f proposed substitution? NoYes_	
lf t		ution request is accep			
		ng of 3 projects (one i		edit of \$ 3 years) using the proposed	
spe		substitute product.		d Vendor qualifications for both oth specified and substitute produc	
pro	oduct, und	-	plication of product,	Documents, is familiar with specifie and understands design intent of th	
	bmitted by				
Sul		(Type Name)	Signature	Date	
	•		C		
Sig		ust be made by person	C	ry to bind his firm to the above tern	
Sig	chitect's Co	ust be made by person omments:	n having legal authorit		
Sig Arc	chitect's Co Accep	ust be made by person omments: ted, accepted	n having legal authorit	ry to bind his firm to the above tern ccepted, received too late.	
Sig Arc	chitect's Co	ust be made by person omments: ted, accepted	n having legal authorit		
Sig Arc	chitect's Co Accep	ust be made by person omments: ted, accepted :	n having legal authorit	ccepted, received too late.	

District

Date

SECTION 01 10 00 SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Glendale HS Chiller Replacement.
- B. District's Name: Glendale Unified School District.
- C. Architect's Name: tBP/Architecture.
- D. The Project consists of the replacement of the single effect 270 Ton absorption chiller with a 300 Ton direct-fired absorption chiller is projected to yield an estimated gas savings of 85,364 Therms/year based upon a third party ASHRAE Level II audit located at Glendale 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.
 - 2. Specifications are found in Divisions 01 through 26 of the Project Manual.
- 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.
 - 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

- 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.
- C. Plumbing: Alter existing system and add new construction, keeping existing in operation.
- D. HVAC: Alter existing system and add new construction, keeping existing in operation.
- E. Electrical Power and Lighting: Alter existing system and add new construction, keeping existing in operation.

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.
- B. Items noted NIC (Not in Contract) will be supplied and installed by District before Substantial Completion.

1.06 PERMITS, LICENSES AND FEES

- A. Licenses:
 - 1. Contractor shall obtain and pay all licenses associated with construction activities, such as business licenses, contractors' licenses and vehicle and equipment licenses.
 - 2. All costs for licenses shall be included in the Contract Sum.
- B. Assessments:
 - 1. District will pay all assessments and utility service connection fees. Costs of assessments shall not be included in the Contract Sum.

1.07 OWNER OCCUPANCY

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

1.08 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
- B. 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.
- C. 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. Site Access:
 - a. Limit access to site to indicated routes and access points as indicated.
 - b. If routes and access points are not indicated, access shall be as approved by District.
 - c. Do not restrict access to adjacent properties and do not restrict access for those performing work under separate contracts for the District.
 - 3. Do not obstruct roadways, sidewalks, or other public ways without permit.
 - 4. 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.
- D. Existing building spaces may not be used for storage.
- E. Time Restrictions:
 - 1. Limit conduct of especially noisy, malodorous, and dusty exterior work to the hours of 8 AM to 6 PM.
- F. 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.

1.09 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.

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.

- 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 Division of the State Architect.
- B. These documents may or may not have approved by the Division of the State Architect 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 a Bulletin on which the Architect's Supplemental Instructions, a Construction Change Directive or a Request for Proposal will 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. 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 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. 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. CAC Section 4-215, 4-233(c), & 4-338(c).
 - a. The approved Construction Change Document shall be signed by:
 - 1) Architect of Record.
 - 2) When applicable:
 - (a) Structural Engineer of Record.
 - (b) Mechanical Engineer of Record.
 - (c) Electrical Engineer of Record.
 - (d) Civil Engineer of Record.
 - (e) Delegated Professional Engineer.
 - 3) Division of the State Architect for final approval.
- 4. 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.
- F. 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.
- G. 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 60 00.
 - 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.
- H. 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.
 - 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 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.
- I. 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.
- J. 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 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.
- K. 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 Owner Representative 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.
- L. 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.
- M. 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.
- N. 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.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

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 01 30 00 Administrative Requirements: Submittal procedures, coordination.
- D. Section 01 60 00 Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.
- E. Section 01 61 16 Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of indoor and outdoor 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:
 - 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.
 - 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:
 - 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.
 - 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:
 - 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.
 - 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. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.
- B. 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.
- C. 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 attached to this section. 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. 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.
- 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 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

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. Coordination drawings.
- J. Submittals for review, information, and project closeout.
- K. Number of copies of submittals.
- L. Requests for Interpretation or Information (RFI) procedures.
- M. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 01 32 16 Construction Progress Schedule: Form, content, and administration of schedules.
- B. Section 01 60 00 Product Requirements: General product requirements.
- C. Section 01 70 00 Execution and Closeout Requirements: Additional coordination requirements.
- D. Section 01 78 00 Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.
- E. 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 Owner Representative and Architect or other responsible design professional.
- B. Informational Submittals: Written information that does not require responsive action by Owner Representative 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.
- 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.
- 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.
 - 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, or Bluebeam PDF Revu, 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: Use one of the following:
 - 1. Bluebeam Software Inc.; Bluebeam Revu Studio: 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:
 - 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 Architect.
 - 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.
 - 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 (OFCI) 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, Owner Representative 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.
 - 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. Contractor's Review: All schedules shall be reviewed and approved by Contractor prior to submission for Architect's and Owner Representative's review.
- B. Reviews by Architect and Owner Representative 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.

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:
 - 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. In addition to periodic, recurring views, take photographs of each of the following events:
 - 1. Completion of site clearing.
 - 2. Final completion, minimum of ten (10) photos.
- F. Take photographs as evidence of existing project conditions as follows:
 - 1. Interior views: each elevation, floor and ceilings prior to demolition.
 - 2. Exterior views: each elevation, roof and areas adjacent to construction limits.
- G. Views:

- 1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
- 2. Consult with Architect for instructions on views required.
- 3. Provide factual presentation.
- 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- 5. Point of View Sketch: Provide sketch identifying point of view of each photograph.
- H. 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.
 - 3. Point of View Sketch: Include digital copy of point of view sketch with each electronic submittal; include point of view identification in each photo file name.
 - 4. 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.
 - 5. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.08 COORDINATION DRAWINGS

- A. See Section 01 31 14 Facility Services Coordination.
- B. Provide information required by Project Coordinator for preparation of coordination drawings.
- C. Review drawings prior to submission to Architect.

3.09 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 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.
 - 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.
 - 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.
- 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 above.

3.10 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.

3.11 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.

3.12 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.

3.13 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.

3.14 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:
 - 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.

3.15 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.
- 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 the 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:
 - 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.

3.16 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.
 - 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

SECTION 01 30 00.01

REQUEST FOR INTERPRETATION

RFI NUMBER:	-	DATE:
PROJECT NAME: GLENDALE HS CHILLER REI	PLACEMENT	PROJECT NO.: 20916.02
TO: TBP/ARCHITECTURE		
. 4611 Teller Avenue, Newport B	each, California 9	2660
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 davs)	Submitted By:
		Organization:
RESPONSE:		
Attachments:		
		Date:
Organization:		
Copies:FileDistrictS CivilLandso		chanical Plumbing Electrical isultants
	END OF RFI	
Glendale Unified School District		REQUEST FOR INTERPRETATION
Glendale HS Chiller Replacement		01 30 00.01 - 1
tBP/Architecture Project 20916.02		

SECTION 01 31 14

FACILITY SERVICES COORDINATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Services of a coordinator for facility services construction.
- B. Coordination documents.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 Summary: Responsibilities of separate contractors.
 - 1. Various types of Work to be coordinated, including Owner-Furnished / Contractor-Installed products.
- B. Section 01 30 00 Administrative Requirements: Additional requirements for coordination.
- C. Section 01 60 00 Product Requirements: Spare parts and maintenance materials.
 - 1. Coordination of products, especially general requirements for system completeness and product substitutions.
- D. Section 01 70 00 Execution and Closeout Requirements: Starting of Systems. Systems Demonstration.
- E. Section 01 78 00 Closeout Submittals: Project record documents.

1.03 MECHANICAL AND ELECTRICAL COORDINATOR

- A. Employ and pay for services of a person, technically qualified and administratively experienced in field coordination of the type of work required to be coordinated, for the duration of the Work.
 - 1. This designated individual may serve a dual role on the project team.

1.04 SUBMITTALS

- A. Submit name, address, and telephone number of coordinator and name of principal officer for review.
- B. Submit coordination drawings and schedules prior to submitting shop drawings, product data, and samples.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 COORDINATION REQUIRED

- A. Coordinate the Work as stated in the Conditions of the Contract.
 - 1. Coordinate Work under the Contract with work under separate contracts by District.
 - 2. Preinstallation Meetings: Coordinate and document work between trades. See Section 01 70 00 Execution and Closeout Requirements.

- 3. Cooperate with District, Owner Representative, and others as directed by District in scheduling and sequencing the incorporation into the Work of Owner Furnished / Contractor Installed (OFCI) products identified in the Contract Drawings and Specifications.
- B. Relationship of Documents:
 - 1. Drawings, Specifications and other Contract Documents in the Project Manual are intended to be complementary.
 - 2. What is required by one shall be as if required by all.
 - 3. What is shown or required, or may be reasonably inferred to be required, or which is usually and customarily provided for similar work, shall be included in the Work.
- C. Discrepancies:
 - 1. Error, omission, ambiguity or conflict in Drawings or Specifications shall be brought to Architect's attention during the bidding period, for Architect's determination and direction in accordance with provisions of the Conditions of the Contract.
- D. Construction Interfacing and Coordination: Layout, scheduling and sequencing of Work shall be solely the Contractor's responsibility.
 - 1. Contractor shall verify, confirm and coordinate field measurements so that new construction correctly and accurately interfaces with conditions existing prior to construction.
- E. Contractor shall bring together the various parts, components, systems and assemblies as required for the correct interfacing and interpretation of all elements of the Work.
 - 1. All work required to provide complete and fully operational systems shall be included in the contract price.
 - 2. Contractor shall coordinate Work to correctly and accurately connect abutting, adjoining, overlapping and related elements, including work under separate contracts by District, utility agencies and companies.
- F. Coordinate the work listed below:
 - 1. Structural: Division 05.
 - 2. Architectural: Division 7.
 - 3. Plumbing: Division 22.
 - 4. Heating, Ventilating, and Air Conditioning: Division 23.
 - 5. Electrical: Division 26.
- G. Coordinate progress schedules, including dates for submittals and for delivery of products.
- H. Conduct meetings among subcontractors and others concerned, to establish and maintain coordination and schedules, and to resolve coordination matters in dispute.
- I. Participate in progress meetings. Report on progress of work to be adjusted under coordination requirements, and any required changes in schedules. Transmit minutes of meetings and reports to concerned parties.
- J. Coordination of subcontracts and separate contracts
 - 1. Superintendence of Work:

- a. Contractor shall appoint a field superintendent and a project manager, who shall directly and full time supervise and coordinate all Work of the Contract.
- 2. Subcontractors, Trades and Materials Suppliers:
 - a. Require all subcontractors, trades, crafts and suppliers to coordinate their portions of Work with the Contractor's field superintendent to prevent scheduling, sequencing, dimensional and other conflicts and omissions.
- 3. Coordination with Work Under Separate Contracts:
 - a. Coordinate and schedule Work under the Contract with work being performed for Project under separate contracts by District, serving utilities and public agencies.
 - b. Make and facilitate direct contacts with parties responsible for work of the Project under separate contracts, in order to provide timely notifications and to facilitate information exchanges.

3.02 COORDINATION DOCUMENTS

- A. Prepare coordination drawings to organize installation of products for efficient use of available space, for proper sequence of installation, and to identify potential conflicts.
 - 1. Produce BIM Drawings for the proposed installation and the placement of pipes, conduits, other materials, and the locations, size and reinforcement of penetrations in the building structure to conform to the structural Drawing and Specifications.
 - 2. Structural requirements take precedence when the requirements of the Mechanical, Electrical or other items are in conflict with structural.
 - 3. Take all precautions prior to coring into an existing building structure.
 - 4. Notify the structural engineer and obtain written approval prior to completing any structural penetrations if the structural integrity of an existing or new building structure may be compromised. Refer to Section 01 70 00 Execution and Closeout Requirements for cutting and patching.
 - 5. Review limitations in available space for installation or service.
 - a. Overlay plans of each trade and verify space requirements and conflicts between trades.
 - b. Minor changes and adjustments that do not affect design intent may be made by Contractor and highlighted for Architect's review prior to purchase and installation.
 - 6. Incompatibility between items provided under different trades.
 - 7. Inconsistencies between drawings, specifications and codes (between trades and within each trade).
 - 8. Items required for existing facilities construction projects are designed and prepared from available as-built drawings that are verified through non-invasive and non-destructive, visual observation only.
 - a. Field verify actual existing conditions during and upon completion of demolition work and incorporate findings into preparation of coordination drawings.
 - b. Minor changes and adjustments that do not affect design intent may be made by Contractor and highlighted for Owner Representative and Architect's review prior to purchase and installation.

- B. Prepare a master schedule identifying responsibilities for activities that directly relate to this work, including submittals and temporary utilities; organize by specification section.
- C. Verify that utility, and other building system requirement characteristics of operating equipment are compatible with provided utilities, and other building systems.
 - 1. Coordinate work of various trades having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Identify electrical power characteristics and control wiring required for each item of equipment.
- E. Maintain documents for the duration of the work, recording changes due to site instructions, modifications or adjustments.
- F. After Architect review of original and revised documents, reproduce and distribute copies to concerned parties.

3.03 COORDINATION DRAWINGS / BIM MODEL

- A. Building Information Modeling (BIM) is required for this Project, such as 3-D Clash Coordination. Submit a BIM Project Execution Plan for Program Project Manager and Design Professional review. The plan shall at minimum include the following items.
 - 1. Project Goals/ BIM uses and Objectives: Clear objective and goals. Align objectives with Construction Documents and Agreement.
 - 2. Project Information: Provide key project contacts including project name, contract type, delivery method, project description, project schedule, phases, and milestones.
 - a. Key Project Contacts:
 - 1) Project Managers.
 - 2) BIM Manager.
 - 3) Trade BIM Managers.
 - 4) Superintendents and other major project roles.
 - b. BIM and Trade BIM Managers must have at least two years of BIM experience of similar size projects.
 - c. Organizational Roles and Staffing: Define roles in each organization and specific responsibilities.
 - 3. BIM Information Exchanges:
 - a. Identify the information exchanges created as part of the planning process in the BIM Project Execution Plan.
 - b. Information exchanges are to illustrate the model elements by discipline, level of detail, and any specific attributes important to the project.
 - 4. Collaboration Procedures:
 - a. Develop Team electronic and activity collaboration procedures.
 - b. Includes model management and standard meeting actions and agendas.
 - 5. Quality Control: Project teams should determine and document their overall strategy for quality control of the model.
 - 6. Model Structure: The team must identify the methods to ensure model accuracy and comprehensiveness.

- 7. Project Deliverables: Identify project deliverables as required by Owner Representative.
- 8. Field Execution of final BIM product: Outline how the final BIM deliverables will be executed to reduce construction errors, change orders, and trade scheduling issues.

3.04 COORDINATION OF SUBMITTALS

- A. Review shop drawings, product data, and samples for compliance with Contract Documents and for coordination with related work. Transmit copies of reviewed documents to Architect.
- B. Check field dimensions and clearances and relationship to available space and anchors.
- C. Check compatibility with equipment and work of other sections, electrical characteristics, and operational control requirements.
- D. Check motor voltages and control characteristics.
- E. Coordinate controls, interlocks, wiring of switches, and relays.
- F. Coordinate wiring and control diagrams.
- G. When changes in the work are made, review their effect on other work.
- H. Verify information and coordinate maintenance of record documents.

3.05 COORDINATION OF SUBSTITUTIONS AND MODIFICATIONS

- A. Review proposals and requests for substitution prior to submission to Architect.
- B. Verify compliance with Contract Documents and for compatibility with work of other sections.
- C. Submit with recommendation for action.

3.06 OBSERVATION OF WORK

- A. Observe work for compliance with Contract Documents.
- B. Maintain a list of observed deficiencies and defects; promptly submit.

3.07 DOCUMENTATION

- A. Observe and maintain a record of tests. Record:
 - 1. Specification section number and product name.
 - 2. Name of Contractor, subcontractor, and special inspector.
 - 3. Name of testing agency and name of inspector.
 - 4. Name of manufacturer's representative present.
 - 5. Date, time, and duration of tests.
 - 6. Type of test, and results.
 - 7. Retesting required.
- B. Assemble background documentation for dispute and claim settlement.
- C. Submit copies of documentation to Architect upon request.

3.08 EQUIPMENT START-UP

A. Verify utilities, connections, and controls are complete and equipment is in operable condition as required by Section 01 70 00.

- B. Observe start-up and adjustments, test run, record time and date of start-up, and results.
- C. Observe equipment demonstrations made to District; record times and additional information required for operation and maintenance manuals.

3.09 INSPECTION AND ACCEPTANCE OF EQUIPMENT

- A. Prior to inspection, verify that equipment is tested, operational, clean, and ready for operation.
- B. Assist Architect with review. Prepare list of items to be completed and corrected.

END OF SECTION

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preliminary schedule.
- B. Construction progress schedule, with network analysis diagrams and reports.
- C. Summary schedule.
- D. Weekly/Short term (Look Ahead) Schedule.

1.02 RELATED SECTIONS

- A. Section 01 10 00 Summary: Work sequence.
- B. Section 01 30 00 Administrative Requirements: Submittal Schedule.

1.03 REFERENCE STANDARDS

- A. AGC (CPSM) Construction Planning and Scheduling Manual; 2004.
- B. M-H (CPM) CPM in Construction Management Project Management with CPM; 2015.

1.04 SUBMITTALS

- A. Within 10 days after date of Agreement, submit preliminary schedule.
- B. Submit two copies to Owner Representative and one copy to Architect.
- C. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- D. 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.
- E. Within 10 days after joint review, submit complete schedule.
- F. Submit updated schedule with each Application for Payment.
 - 1. Revise schedule also upon issuance of Change Orders and Construction Change Directives which substantially affect construction sequence or schedule.
- G. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.
- H. Submit under transmittal letter form specified in Section 01 30 00 Administrative Requirements.

1.05 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one year's minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

- 1. Designate the Scheduler in writing and within ten (10) workdays after Notice of Intent to Award, as the qualified responsible person for preparation, maintenance, updating, and revision of all schedules for the full term of construction.
- 2. Scheduler:
 - a. Dedicated to this project and available on-site as needed to meet the strict requirement of this spec. section.
 - b. All scheduling software and hardware located on-site.
 - c. Scheduler will attend all project meetings called for as specified in Section 01 30 00.
- 3. Qualifications of responsible person:
 - a. Knowledge of critical path method (CPM) scheduling utilizing Primavera P6 latest release software.
- 4. References:
 - a. Submit written reference of three (3) project Owners who have personal experience with this scheduler on previous projects.
 - b. Identify name, address, telephone number, project name, and cost.
- 5. Owner Representative reserves the right to disapprove Scheduler when submitted by Contractor based on his/or her sole discretion. Owner Representative reserves the right to remove Scheduler from the project without cause.
- B. Contractor's Administrative Personnel: Three years minimum experience in using and monitoring CPM schedules on comparable projects.
- C. Reviews by Architect and Owner Representative: Reviews by Architect and Owner Representative 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. Contractor's Review: All schedules shall be reviewed and approved by Contractor prior to submission for Architect's and Owner Representative's review.
- E. Changes and Deviations: Identify all deviations from requirements of Drawings and Specifications.
 - 1. Changes in the Work shall not be authorized by submittals review actions.
 - 2. No review action, implicit or explicit, shall be interpreted to authorized changes in the Work.
 - 3. Changes shall only be authorized by separate written Change Order or Field Change Directive, in accordance with the Conditions of the Contract.

1.06 SCHEDULE FORMAT

- A. Format: Prepare schedules in format at Contractor's option, either bar chart, PERT or GANTT format, providing clear indication of sequencing and scheduling of Work, for determination of "critical path" of construction progress.
 - 1. Prepare schedules in MS Project or Primavera.
 - 2. Provide clear indication of sequencing and scheduling of work for determination of "critical path" of construction progress.

- 3. Present schedule in both electronic and reproducible paper formats with sheet size large enough to clearly read the characters.
- B. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- C. Diagram Sheet Size: Maximum 22 x 17 inches.
- D. Sheet Size: Multiples of 8-1/2 x 11 inches.
- E. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

- A. Prepare preliminary schedule in the form of a horizontal bar chart.
- B. Prescheduling Conference:
 - Owner Representative will conduct a conference within fifteen (15) work days after the Notice of Intent to Award to comply with requirements in Section 01 30 00 -Administrative Requirements.
 - a. Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
 - 1) Review software limitations and content and format for reports.
 - 2) Verify availability of qualified personnel needed to develop and update schedule.
 - 3) Discuss constraints, including phasing work stages area separations interim milestones and partial District occupancy.
 - 4) Review delivery dates for District-furnished products.
 - 5) Review schedule for work of District's separate contracts.
 - 6) Review submittal requirements and procedures.
 - 7) Review time required for review of submittals and resubmittals.
 - 8) Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 9) Review District's IT requirements for installation of their Work.
 - 10) Review time required for Project closeout and District startup procedures, including commissioning activities for MEP, Security Electronics Equipment.
 - 11) Review and finalize list of construction activities to be included in schedule.
 - 12) Review procedures for updating schedule.
- C. At the meeting, the Owner Representative will review scheduling requirements. These include schedule preparation, reporting requirements, labor and equipment loading, updates, revisions, and schedule delay analysis.
 - 1. The Contractor will present schedule methodology, planned sequence of operations, resource loading methodology, and proposed activity coding structure.
- D. Coding structure:

- 1. Submit proposed coding structure, identifying the code fields and the associated code values it intends to use in the project schedule.
- 2. A minimum, include code fields for Project Segment or Phase, Area of Work, Type of Work, Submittal/Procurement/Construction and Responsibility/Subcontractor.
 - a. Refer to NETWORK DETAILS AND GRAPHICAL OUTPUT for listing of activity categories to be included in the schedule.

3.02 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Identify work of separate stages and other logically grouped activities.
 - 1. Identify Work of separate buildings, phases, units or other logically grouped activities to facilitate review of Application for Payment with completed Work.
- D. Provide sub-schedules for each stage of Work identified in Section 01 10 00 Summary.
- E. Provide sub-schedules to define critical portions of the entire schedule.
- F. Include conferences and meetings in schedule.
- G. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- H. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.
 - 1. Format: Prepare Submittals Schedule in a format comparable to Construction Progress Schedule, specified in Article above.
 - 2. Content: List all items specified to be submitted, indicating submittal number (see instructions specified in Section 01 30 00 Administrative Requirements, submittal type (i.e., product data, shop drawings, sample, quality control report, maintenance and operating data, etcetera), scheduled date submittal is to be made and date review should be complete in order to maintain construction on schedule.
 - 3. The Contractor shall submit to the Architect a schedule of the shop drawings that lists their required submission and approval dates.
 - Allow minimum one (1) week for the Architect to review the submittals. Some submittals may require a longer review period. See Section 01 30 00 Administrative Requirements.
 - b. Allow for the possibility that the consultant team will request revisions and resubmittal following the initial submittal.
 - c. The schedule shall encompass the entire construction period and will be revised by the Contractor and reviewed by the project team at each project meeting.
 - 4. Changes and Deviations: Identify all deviations from requirements of Drawings and Specifications.
 - 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 Change Order or Construction Change Directive, in accordance with the Conditions of the Contract and Section 01 20 00 - Price and Payment Procedures.
- 5. Administration: Review of Submittals Schedules by Architect, Owner Representative, and District will be to ascertain the general status of submittals review and shall not be interpreted to establish or approve the means, methods, techniques and sequences of construction.
 - a. Submit one copy each to Owner Representative and Architect.
 - b. Submit initial Submittals Schedule within 14 days of construction start date established in Notice to Proceed.
 - c. After review, resubmit Submittals Schedule within 10 days and thereafter submit updated Submittals Schedules at each Construction Progress Meeting.
- I. Indicate delivery dates for owner-furnished products.
- J. Coordinate content with schedule of values specified in Section 01 20 00 Price and Payment Procedures.
 - 1. Include Submittals Schedule.
- K. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first work day of each week.

3.04 NETWORK ANALYSIS

- A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.
- B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.
- C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
 - 1. Preceding and following event numbers.
 - 2. Activity description.
 - 3. Estimated duration of activity, in maximum 15 day intervals.
 - 4. Project Milestones; include "Project Start" and "End Project" Millstones.
 - a. Schedule starts no earlier than the Project Duration (Day 1) will start on the Notice To Proceed (NTP) date.
 - 5. Earliest start date.
 - 6. Earliest finish date.
 - 7. Actual start date.

- a. "Project Start" Milestone to have no predecessors and "End Project" Milestone has no successors.
- b. "Project Start": Constrained by a "Mandatory Start" Milestone.
- c. "End Project": Constrained by a "Mandatory Finish" Milestone.
- d. No other activities on the schedule may have constraints, unless reviewed and approved by Owner Representative and Architect.
- 8. Actual finish date.
- 9. Latest start date.
- 10. Latest finish date.
- 11. Total and free float; float time shall accrue to District and to District's benefit.
 - a. Contractor does not own the float.
 - b. "Float time" refers to the time between earliest finish date and the latest finish date of each activity shown on the Construction Schedule.
 - c. Any float time indicated in the Construction Schedules required by this Section are to be held jointly by the District and Contractor.
 - d. Any delay (including District caused) encountered is to be subtracted from the available days ahead of progress against the Construction Schedule.
 - 1) District may claim float days equal to the delay until such float days are exhausted.
 - 2) No compensation of any type will be due the Contractor until the delay extends the overall project substantial completion date.
 - e. Weather (Rain) day requirements are as specified in the "Construction Services Agreement."
- 12. Monetary value of activity, keyed to Schedule of Values.
- 13. Percentage of activity completed.
- 14. Responsibility.
- D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.
- E. Required Reports: List activities in sorts or groups:
 - 1. By preceding work item or event number from lowest to highest.
 - 2. By amount of float, then in order of early start.

3.05 CREW SCHEDULES

- A. Separate and concurrent with the Baseline Schedule, submit a schedule histogram depicting crew loading for Contractor's own labor forces and those of each subcontractor. Submit this crew schedule electronically.
- B. Provide the breakdown of a typical crew, by trade, for resource loading quantification.

3.06 WEATHER DAYS ALLOWANCE- AS ANTICIPATED BY THE CONTRACTOR

- A. Based on historical weather in the local area, the Baseline Schedule shall include all non-work days on which the Contractor anticipates Work will not be performed due to adverse weather days that are anticipated to occur within the work day calendar and impact critical activities.
- B. The Contractor shall not receive any additional compensation for unavoidable delays due to inclement or unsuitable weather, and no time extension to complete any Contractual Completion Events as defined in General Conditions, will be considered due to inclement or unsuitable weather or conditions resulting there from.

3.07 REVIEW AND EVALUATION OF SCHEDULE

- A. Review all schedules reviewed and approved by Contractor prior to submission for review by Architect and District.
- B. Participate in joint review and evaluation of schedule with Construction Manager and Architect at each submittal.
- C. Evaluate project status to determine work behind schedule and work ahead of schedule.
- D. After review, revise as necessary as result of review, and resubmit within 10 days.
- E. Review by Architect and District 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.

3.08 SUMMARY SCHEDULE

- A. Provide Summary Schedule, upon request, which consolidates groups of activities associated with Major Items of Work shown on Baseline Schedule.
 - 1. Summary Schedule is intended to give an overall indication of the project schedule without a large amount of detail.
 - 2. This schedule shall include the current status of each of the contract Milestones listed in the Agreement, and any significant activities that are critical to the completion of the Milestone work at the required time.
- B. Include in the Summary Schedule a separate Gantt Chart depicting only the critical path of the project at the time of the update.
- C. Updated and submitted monthly and with each Schedule Update or Schedule Revision.

3.09 WEEKLY (SHORT TERM LOOK-AHEAD) SCHEDULE

- A. Submit to Owner Representative, twenty four (24) hours prior to each weekly progress meeting, a short term look ahead schedule showing the activities completed during the previous week and the schedule of activities for the following 4 weeks.
- B. Using the same computer software as the progress schedule, use the Activity ID's, Descriptions, and logic of the current progress schedule when producing a Weekly Schedule in CPM schedule or a bar chart format.
 - 1. In the event that the Weekly Schedule no longer conforms to the current schedule, Contractor may be required to revise either or both schedule(s).

- C. The activity designations used in the Weekly Schedule must be consistent with those used in the Baseline Schedule and the monthly Schedule Updates.
- D. Contractor and Owner Representative must agree on the format of the Weekly Schedule.
- E. Weekly Schedule should indicate locations of work, critical activities, early start and early finish dates, actual start and actual finish dates, progress, and remaining durations for each activity in the three-week schedule.

3.10 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.
- G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect.

3.11 ADJUSTMENT OF CONTRACT TIMES

- A. Subject to the terms of General Conditions, contract time will be adjusted only for causes specified as generally described below.
 - 1. Non-excusable delay:
 - a. Includes actions or inactions of the Contractor, or events for which the Contractor has assumed contractual responsibility that would independently delay the completion of the Work beyond the current Contract completion date.
 - 1) This also includes actions or inactions of subcontractors, suppliers, or material manufacturers at any tier.
 - b. No time extensions will be granted for non-excusable delays.
 - 2. Excusable delay:
 - a. Events which are unforeseeable, outside the control of, and without the fault or negligence of either the District or the Contractor (or any party for whom either is responsible), which would independently delay the completion of the Work beyond the current Contract completion date.
 - b. The Contractor is entitled to a time extension only.
 - c. No other damages will be approved.
 - 3. Compensable delay:
 - a. Actions or inactions of the District, or events for which the District has assumed contractual responsibility, which would independently delay the completion of the Work beyond the current Contract completion date.
 - b. The Contractor is entitled to a time extension and delay damages.
 - 4. Concurrent delay:

- a. Any combination of the above three (3) types of delay occurring on the same calendar date, or cases where the combination consists of two (2) or more instances of the same type of delay occurring on the same calendar date.
 - 1) Exception to concurrent delay:
 - (a) When one cause of delay is District-caused or caused by an event which is beyond the control and without the fault or negligence of either the District or the Contractor and the other Contractor-caused, the Contractor is entitled only to a time extension and no delay damages.
- B. If the Contractor believes that the District has impacted its work, such that the project completion date will be delayed, the Contractor must submit proof demonstrating the delay to the critical path.
 - 1. Proof, in the form of a Time Impact Analysis, may entitle the Contractor to an adjustment of Contract Time.
- C. Notify Owner Representative of a potential request for Contract Time adjustment within five (5) days of the start of the impact.
- D. The Contractor shall prepare and submit along with any Change Order Request (COR), response to Request for Proposal/Quote (RFP/RFQ), Differing Site Condition (DSC) notification or Request for Additional Compensation (RAC) a Time Impact Analysis (TIA) which includes both a written narrative and a schedule diagram depicting how the changed work may affect the progress of work and other schedule activities.
 - 1. The schedule diagram shall show how the Contractor proposes to incorporate the changed work in the schedule, and how it impacts the current updated schedule and critical path.
 - 2. The TIA shall not be resource constrained, or leveled using resource limits.
 - 3. Failure to include a TIA with the COR, Proposal, Quote, DSC or RAC shall constitute a waiver of the right to later claim any adjustment in time based upon changed or unforeseen Work.
- E. Time Impact Analysis (TIA):
 - 1. Use the accepted schedule update that is current relative to the time frame of the delay event (change order, third party delay, or other District-caused delay). Represent the delay event in the schedule by:
 - a. Inserting new activities associated with the delay event into the schedule.
 - b. Revising activity logic.
 - c. Revising activity durations.
 - 2. If the project schedule's critical path and milestone date(s) are impacted as a result of adding this delay event to the schedule, a time extension equal to the magnitude of the impact without resource constraints may be warranted.
 - 3. The Time Impact Analysis submittal must include the following information:
 - a. A fragment of the portion of the schedule affected by the delay event.
 - b. A narrative explanation of the delay issue and how it impacted the schedule.
 - c. A digital file containing the schedule file used to perform the Time Impact Analysis.

- F. When a delay to the project as a whole can be avoided by revising preferential sequencing or logic, and the Contractor chooses not to implement the revisions, the Contractor will be entitled to a time extension and no compensation for extended overhead.
- G. Indicate clearly that the Contractor has used, in full, all project float available for the work involved in the request, including any float that may exist between the Contractor's planned completion date and the Contract completion date.
 - 1. Utilize the latest version of the Schedule Update accepted at the time of the alleged delay, and all other relevant information, to determine the adjustment of the Contract Time.
- H. Adjustment of the Contract Times will be granted only when the Contract Float has been fully utilized and only when the revised date of completion of the Work has been pushed beyond the Contract completion date.
 - 1. Adjustment of the Contract Times will be made only for the number of days that the planned completion of the work has been extended.
- I. Actual delays in activities which do not affect the critical path work or which do not move the Contractor's planned completion date beyond the Contract completion date will not be the basis for an adjustment to the Contract Time.
- J. Submit request as specified with Contract Documents.
 - 1. In cases where the Contractor does not submit a request for Contract Time adjustment for a specific change order, delay, or Contractor request within the specified period of time, then it is mutually agreed that the particular change order, delay, or Contractor request has no time impact on the Contract completion date and no time extension is required.
- K. The Owner Representative will, within five (5) working days after receipt of a Contract Time adjustment, request any supporting evidence, review the facts, and advise the Contractor in writing.
 - 1. Include the new Progress Schedule data, if accepted by the District, in the next monthly Schedule Update.
 - 2. When the District has not yet made a final determination as to the adjustment of the Contract Time, and the parties are unable to agree as to the amount of the adjustment to be reflected in the Progress Schedule, reflect that amount of time adjustment in the Progress Schedule as the Owner Representative may accept as appropriate for such interim purpose.
 - a. It is understood and agreed that any such interim acceptance by the Owner Representative shall not be binding.
 - b. Interim acceptance shall be made only for the purpose of continuing to schedule the Work
 - c. Interim acceptance shall remain until such time as a final determination as to any adjustment of the Contract Time acceptable to the Owner Representative has been made.
 - d. Revise the Progress Schedule prepared thereafter in accordance with the final decision.

3.12 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Construction Manager, Architect, District, and other concerned parties.
- B. Posting: Post one copy, minimum, of most recent Construction <u>and</u> Submittals Schedules in the Contractor's jobsite office, readily available to Owner Representative and Architect.
- C. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.
- D. Archive: Preserve a minimum of two copies of all superseded schedules, with a minimum of one copy available at job office for review by Owner Representative or Architect.

3.13 FINAL SCHEDULE SUBMITTAL

- A. The final Schedule Update becomes the As-Built Schedule.
 - 1. The As-Built Schedule reflects the exact manner in which the project was constructed by reflecting actual logic, start and completion dates for all activities accomplished on the project.
 - 2. Contractor's Project Manager and Scheduler sign and certify the As-Built Schedule as being an accurate record of the way the project was actually constructed.
- B. Retainage will not be released until final Schedule Update is provided.

END OF SECTION

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, 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.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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. Contractor's construction-related professional design services.
- E. Contractor's design-related professional design services.
- F. Control of installation.
- G. Tolerances.
- H. Manufacturers' field services.
- I. Defect Assessment.

1.02 RELATED REQUIREMENTS

- A. Section 01 21 00 Allowances: Allowance for payment of testing services.
- B. Section 01 30 00 Administrative Requirements: Submittal procedures.
- C. Section 01 41 00 Regulatory Requirements: Compliance with applicable codes, ordinances and standards.
- D. Section 01 42 19 Reference Standards.
- E. Section 01 45 33 Code Testing, Special Inspection and Procedures: Testing laboratory services and inspections required by Division of the State Architect (DSA), during the course of construction.
- F. 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; 2017.

1.04 DEFINITIONS

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

1.05 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:

- 1. Temporary sheeting, shoring, or supports.
- 2. Temporary scaffolding.
- 3. Temporary bracing.
- 4. Temporary falsework for support of spanning or arched structures.
- 5. Temporary stairs or steps required for construction access only.
- 6. Temporary hoist(s) and rigging.
- 7. Investigation of soil conditions to support construction equipment.

1.06 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Base design on performance and/or design criteria indicated in individual specification sections.
- C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
 - 1. Structural Design of Metal Fabrications: As described in Section 05 50 00 Metal Fabrications.

1.07 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements, for submittal procedures.
- B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for District's information.
 - 1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
 - a. Full name.
 - b. Professional licensure information.
 - c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.
- C. Quality Control Submittals Schedule
 - 1. Schedule Format: Include quality control submittals on Submittals Schedule specified in accordance with General Conditions
 - 2. Schedule Content: List all tests, inspections and reports specified to be submitted, indicating submittal number, submittal type (field test, field inspection, fabrication inspection, etcetera), scheduled date of quality control activity and date report should be made.
- D. 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.
- 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.
- E. 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.
- F. 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.
- G. 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.
- H. 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.

1.08 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.
- 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.

1.09 REFERENCES AND STANDARDS - SEE SECTION 01 42 19

1.10 TESTING AND INSPECTION AGENCIES AND SERVICES

- District will employ services of an independent testing agency to perform certain specified testing; payment for cost of services will be derived from allowance specified in Section 01 21 00; see Section 01 21 00 and applicable sections for description of services included in allowance.
- B. 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.
- 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.
 - 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.
 - 7. Inspections and Tests by Authorities Having Jurisdiction:
 - a. Contractor shall cause all tests and inspections to be made for Work under this Contract, as required by Building Departments, Department of Public Works, Fire Department, Health Department and similar agencies having jurisdiction.
 - b. Excepted as specifically noted, scheduling, conducting and paying for such inspections shall be solely the Contractor's responsibility.
 - 8. Inspections and Tests by Serving Utilities:
 - a. Contractor shall cause all tests and inspections required by serving utilities to be made for Work under this Contract.
 - b. Scheduling, conducting and paying for such inspections shall be solely the Contractor's responsibility.
- 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.

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.

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

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 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 are sumarized in this section, as adopted by Division of the State Architect:
 - 1. Part 1, Title 24 CCR 2016 California Building Standards Administrative Code.
 - 2. Part 2, Title 24 CCR 2016 California Building Code (CBC).
 - a. Based on ICC (IBC) ICC International Building Code, 2015.
 - 3. Part 3, Title 24 CCR 2016 California Electrical Code (CEC, NFPA 70-NEC 2014).

- 4. Part 4, Title 24 CCR 2016 California Mechanical Code (CMC).
 - a. Based on IAPMO (UMC) Uniform Mechanical Code, 2015.
- 5. Part 5, Title 24 CCR 2016 California Plumbing Code (CPC).
 - a. Based on IAPMO (UPC) Uniform Plumbing Code, 2015.
- 6. Part 6, Title 24 CCR 2016 California Energy Code.
- 7. Part 7 (No longer published in Title 24. See Title 8, CCR).
- 8. Part 9, Title 24 CCR 2016 California Fire Code (CFC).
 - a. Based on ICC (IFC) International Fire Code; 2015.
- 9. Part 11, Title 24 CCR 2016 California Green Building Standards Code (CALGreen).
- 10. Part 12, Title 24 CCR 2016 California Referenced Standards Code.

1.02 SUMMARY OF REFERENCE STANDARDS

- A. Regulatory requirements applicable to this project are the following:
- B. UL 464 Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories; 2003 Edition.
- C. UL 521 Standard for Heat Detctors for Fire Protective Signaling Systems; 1999.
- D. UL 1971 Standard for Signaling Devices for the Hearing Impaired; 2002.
- E. 28 CFR 35 Nondiscrimination on the Basis of Disability in State and Local Government Services; Final Rule; Department of Justice; current edition.
- F. 28 CFR 36 Nondiscrimination by Public Accommodations and in Commercial Facilities; Final Rule; Department of Justice; current edition.
- G. 36 CFR 1191 Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- H. ADA Standards Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- I. 29 CFR 1910 Occupational Safety and Health Standards; current edition.

1.03 RELATED REQUIREMENTS

A. Section 01 40 00 - Quality Requirements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 42 19

REFERENCE STANDARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements relating to referenced standards.

1.02 QUALITY ASSURANCE

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue specified in the individual specification sections, except where a specific date is established by applicable code.
- C. Obtain copies of standards when required by Contract Documents.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Date of Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by Contract Documents by mention or inference otherwise in any reference document.

PART 2 CALIFORNIA DEPARTMENT OF GENERAL SERVICES, DIVISION OF THE STATE ARCHITECT

2.01 INTERPRETATION OF REGULATIONS

- A. Document IR A-5 Acceptance of Products, Materials, and Evaluations Reports; Revised 1-27-17.
- B. Current listings are on the DGS website: http://www.dgs.ca.gov/dsa/Resources/IRManual.aspx.

PART 3 UNITED STATES GOVERNMENT AND RELATED AGENCIES DOCUMENTS

3.01 CFR -- CODE OF FEDERAL REGULATIONS

- A. ADA Standards Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. 16 CFR 260.13 Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.
- C. 16 CFR 1201 Safety Standard for Architectural Glazing Materials; current edition.
- D. 28 CFR 36 Nondiscrimination by Public Accommodations and in Commercial Facilities; Final Rule; Department of Justice; current edition.
- E. 29 CFR 1910 Occupational Safety and Health Standards; current edition.

- F. 29 CFR 1910, Subpart D Walking-Working Surfaces, 1910.21-1910.30; current edition.
- G. 29 CFR 1910.23 Ladders; current edition.
- H. 29 CFR 1910.38 Emergency action plans; current edition.
- I. 29 CFR 1910.132-138 Personal Protective Equipment; current edition.
- J. 29 CFR 1910.134 Respiratory protection; current edition.
- K. 29 CFR 1926.62 Lead; current edition.
- L. 29 CFR 1926.1101 Asbestos; Current Edition.
- M. 36 CFR 1191 Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- N. 39 CFR 111 U.S. Postal Service Standard 4C; Current Edition.
- O. 40 CFR 59, Subpart D National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- P. 40 CFR 60 Standards of Performance for New Stationary Sources; Current Edition.
- Q. 40 CFR 273 Standards For Universal Waste Management; current edition.
- R. 40 CFR 280 Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks; current edition.
- S. 40 CFR 761 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution In Commerce, And Use Prohibitions; current edition.
- T. 47 CFR 15 Radio Frequency Devices; current edition.
- U. 47 CFR 68 Connection of Terminal Equipment to the Telephone Network; Current Edition .
- V. 49 CFR 37 Transportation Services for Individuals with Disabilities (ADA); current edition.
- W. 49 CFR 178 Specifications for Packaging; current edition.
- X. 49 CFR 192.285 Plastic Pipe: Qualifying Persons to Make Joints; current edition.

3.02 CPSC -- CONSUMER PRODUCTS SAFETY COMMISSION

A. CPSC Pub. No. 325 - Public Playground Safety Handbook; 2010.

3.03 EPA -- ENVIRONMENTAL PROTECTION AGENCY

- A. EPA (NPDES) National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.
- B. EPA 600/4-90/010 Compendium of Methods for the Determination of Air Pollutants in Indoor Air; 1990.
- C. EPA 600-4-790-20 Methods for Chemical Analysis of Water and Wastes; 1983.
- D. EPA 625/1-86/021 Design Manual: Municipal Wastewater Disinfection; 1986.
- E. EPA 625/R-96/010b Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air; 1999.
- F. EPA 712-C-02-190 Health Effects Test Guidelines OPPTS 870.1100 Acute Oral Toxicity; 1996.

3.04 FDA -- FOOD AND DRUG ADMINISTRATION

A. FDA Food Code - Chapter 6 - Physical Facilities; Current Edition.

3.05 FEMA -- U.S. FEDERAL EMERGENCY MANAGEMENT AGENCY

- A. FEMA (MAPS) FEMA Map Service Center; Current Edition.
- B. FEMA 412 Installing Seismic Restraints for Mechanical Equipment; 2002.
- C. FEMA 413 Installing Seismic Restraints for Electrical Equipment; 2004.
- D. FEMA 414 Installing Seismic Restraints for Duct and Pipe; 2004.
- E. FEMA E-74 Reducing the Risks of Nonstructural Earthquake Damage; 2012.

3.06 FS -- FEDERAL SPECIFICATIONS AND STANDARDS (GENERAL SERVICES ADMINISTRATION)

- A. FED-STD-595C Colors Used in Government Procurement (Fan Deck); 2008 (Chg Notice 1).
- B. FS L-F-001641 Floor Covering Translucent or Transparent Vinyl Surface with Backing; 1971, and Amendment 2, 1982.
- C. FS L-S-125 Screening, Insect, Nonmetallic; 1972b, with Notice (1987).
- D. FS RR-P-1352 Partitions, Toilet, Complete; Revision C, 1989.
- E. FS RR-T-650 Treads, Metallic and Nonmetallic, Skid Resistant; 1994e.
- F. FS RR-W-365 Wire Fabric (Insect Screening); 1980, Rev. A (Amended 1986).
- G. FS SS-T-312 Tile, Floor: Asphalt, Rubber, Vinyl, and Vinyl Composition; Revision B, 1974, and Amendment 1, 1979.
- H. FS TT-B-1325 Beads (Glass Spheres); Retro-Reflective; 2007d (Validated 2017).
- I. FS TT-P-115 Paint, Traffic (Highway, White and Yellow); Revision F, 1984.
- J. FS TT-P-1952 Paint, Traffic Black, and Airfield Marking, Waterborne; 2015f.
- K. FS W-C-375 Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).
- L. FS W-C-596 Connector, Electrical, Power, General Specification for; 2017h.
- M. FS W-S-896 Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); 2017g.
- N. STATE STD 01.01 Certification Standard Forced Entry and Ballistic Resistance of Structural Systems; Physical Security Division, Office of Physical Security Programs, Bureau of Diplomatic Security, United States Department of State; 1993.
- O. UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings; 2012.
- P. USPS Handbook AS-503 Standard Design Criteria; United States Postal Service; 2010.

3.07 GSA -- U.S. GENERAL SERVICES ADMINISTRATION

A. GSA PBS-P100 - Facilities Standards for the Public Buildings Service; General Services Administration; 2017.

3.08 NIJ -- NATIONAL INSTITUTE OF JUSTICE (DEPT. OF JUSTICE)

A. NIJ 0108.01 - Standard for Ballistic Resistant Protective Materials; 1985.

3.09 PS -- PRODUCT STANDARDS

A. PS 1 - Structural Plywood; 2009.

- B. PS 2 Performance Standard for Wood-Based Structural-Use Panels; 2010.
- C. PS 20 American Softwood Lumber Standard; 2015.

3.10 USDA -- UNITED STATES DEPARTMENT OF AGRICULTURE

A. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service; 2013.

3.11 USGS -- UNITED STATES GEOLOGICAL SURVEY

A. USGS (FMWQ) - National Field Manual for the Collection of Water-Quality Data; United States Geological Survey; current edition.

END OF SECTION

SECTION 01 45 33

CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

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. ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2018.
- B. ASTM E543 Standard Specification for Agencies Performing Nondestructive Testing; 2015.

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 Division of the State Architect (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. Include documentation of AHJ approval.
- F. Distribution List: The Testing Laboratory will make the following distribution of test and inspection reports:

1.	District	1
2.	Architect	2
3.	Structural Engineer	1
4.	Contractor	1
5.	District's Inspector	1
6.	Division of the State Architect	1
7.	Owner Representative	1

- 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 shall be 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.
- 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).
- 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 Division of the State Architect (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.
 - 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 and AHJ.
 - 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
 - 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.
- 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.

1.10 DISTRICT'S INSPECTOR

- A. An Inspector 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. IOR duties are specifically defined in CCR Title 24 Part 1, Sec. 4-211(b), 4-214, 4-219, and Group 1 Sec. 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.
- 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 DSA IR 17-6 and the current CBC, unless otherwise specified.

3.02 SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE

- A. Inspection: Comply with CBC 1705A.12.
- B. Testing: Comply with CBC 1705A.13.
- C. 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.

D. Structural Observations for Seismic Resistance: Visually observe structural system for general compliance with the approved Contract Documents; periodic.

3.03 SPECIAL INSPECTIONS FOR WIND RESISTANCE

A. Structural Observations for Wind Resistance: Visually observe structural system for general compliance with the approved Contract Documents; periodic.

3.04 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.
- 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.

3.05 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 repsonsible 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
 - 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
 - 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
 - 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, <u>not</u> 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.")
- 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

3.06 CONTRACTOR DUTIES AND RESPONSIBILITIES

A. DSA Requirements:

- 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.
 - (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:
 - 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.
- C. Contractor shall submit a written statement of responsibility to comply with CBC section 1704A.4.
 - 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.

3.07 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

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary sanitary facilities.
- C. Temporary Controls: Barriers, enclosures, and fencing.
- D. Security requirements.
- E. Waste removal facilities and services.
- F. Project identification sign.

1.02 RELATED REQUIREMENTS

A. Section 01 35 53 - Security Procedures

1.03 REFERENCE STANDARDS

1.04 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. Provide and pay for all electrical power, lighting, and water required for construction purposes.
- C. Existing facilities may be used.
- D. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.05 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 Owner Representative for approval.
 - a. Place on-site portable toilets away from building air intakes and entryway.
- B. Maintain daily in clean and sanitary condition.
- C. At end of construction, return facilities to same or better condition as originally found.

1.06 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.07 FENCING

- A. Construction: Contractor's option.
- B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.08 EXTERIOR ENCLOSURES

A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.09 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. Include construction surveillance camera system per the District.

1.10 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 Owner Representative proposed location of any break areas and eating areas for approval.

1.11 SMOKING AND TOBACCO

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

1.12 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.

1.13 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.

1.14 PROJECT IDENTIFICATION

- A. Provide project identification sign of design, construction, and location approved by District.
- B. No other signs are allowed without District permission except those required by law.

1.15 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C. Provide separate private office similarly equipped and furnished, for use of District.
- D. Provide separate private office similarly equipped and furnished, for use of Architect and District.
- E. Locate offices a minimum distance of 30 feet from existing and new structures.

1.16 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.
- E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 58 13

TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project identification sign.
- B. Project informational signs.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 Summary: Responsibility to provide signs.
- B. Section 05 50 00 Metal Fabrications: Miscellaneous connectors.

1.03 REFERENCE STANDARDS

A. FHWA (SHS) - Standard Highway Signs and Markings; 2004, with Supplement (2012).

1.04 QUALITY ASSURANCE

- A. Design sign and structure to withstand 80 miles/hr wind velocity.
- B. Sign Painter: Experienced as a professional sign painter for minimum three years.
 - 1. Sign painter shall be regularly engaged and specializing in the design, execution, construction and installation of exterior signage of equivalent type, size and complexity as those required for Project.
- C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.05 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements for submittal procedures.
- B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

- A. Structure and Framing: New, wood, structurally adequate to support sign panel and suitable for specified finish.
- B. Sign Surfaces: Exterior grade plywood with medium or high density phenolic sheet overlay, minimum 3/4 inch thick, standard large sizes to minimize joints. Provide sheet thickness as required to span across framing members and provide even, smooth surface without waves or buckles.
- C. Rough Hardware: Galvanized steel, as specified in Section 05 50 00 Metal Fabrications..
- D. Sign Face Paint and Primers: Exterior quality, primer, two gloss enamel finish coats; sign background of color as selected. Provide paint type as customarily used for sign painting, adequate to resist weathering and fading for the scheduled construction period.

- E. Sign Structure Paint and Primers: Exterior quality, primer, one gloss enamel finish coats; color as selected. Provide paint type as customarily used for sign painting, adequate to resist weathering and fading for the scheduled construction period.
- F. Lettering: Exterior quality paint, colors as selected.

2.02 PROJECT IDENTIFICATION SIGN

- A. Provide painted sign of construction, design, and content shown on Drawings, location designated or agreed to by Architect.
 - 1. Graphic design, text, style of lettering, and colors shall be as directed; assume 4 colors and special graphic for Project title.
- B. Content:
 - 1. Project number, title, logo and name of District as indicated on Contract Documents.
 - 2. Include organizational logos of parties identified on sign.
 - 3. Names and titles of authorities.
 - 4. Names and titles of Architect and Consultants.
 - 5. Name of Prime Contractor and major Subcontractors.
- C. Graphic Design, Colors, Style of Lettering: Designated by Architect.
 - 1. Sign Painting: Sign panels shall be shop painted and field installed.
 - a. Sign painting shall be performed by professional sign painters. Silk screen method is recommended in order to accurately depict graphics.
 - b. Paint back and edges of sign panels for complete weather resistance and finished appearance.
- D. Project Address Signs: Provide Project name and street address signs, minimum of 4 feet wide, to identify Project to facilitate deliveries.
 - 1. Graphic design and colors shall match Project Identification Sign.
 - 2. Text shall be as directed.
- E. Lettering: Standard Alphabet Series C, as specified in FHWA (SHS).

2.03 PROJECT INFORMATIONAL SIGNS

- A. Restrictions: Signs other than Project Identification Sign specified above and Project Informational Signs specified below shall not be displayed without approval of Architect.
- B. Project Informational Signs: Informational signs, necessary for conduct of construction activities or required by governmental authorities having jurisdiction may be displayed when in conformance to sign construction and graphic requirements specified in this Section.
 - 1. Architect may review such signs. If so, review will be for sign construction, and graphic designs only.
 - 2. Adequacy of signage for safety and conformance to requirements of authorities having jurisdiction and trade practices shall be solely Contractor's responsibility.
- C. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering to provide legibility at 100 foot distance.

- 1. Colors shall be as required by authorities having jurisdiction and, if not otherwise required, of colors consistent with Project graphics.
- 2. Informational signage shall be produced by professional sign painters and be of size and lettering style consistent with use.
- D. Provide at each field office, storage shed, and directional signs to direct traffic into and within site. Relocate as Work progress requires.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install project identification sign within 30 days after date fixed by Notice to Proceed.
- B. Erect at location of high public visibility adjacent to main entrance to site.
- C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
- D. Install sign surface plumb and level, with butt joints. Anchor securely.
- E. Paint exposed surfaces and edges of sign, supports, and framing for a finished appearance.
- F. Project Identification Sign Installation
 - 1. Construction: Construct sign support structure and install panels in durable manner, to resist high winds.
 - 2. Installation: Erect Sign on site at a lighted location of high public visibility, adjacent to the main entrance to the site, as approved by Architect.
 - a. Install sign at height for optimum visibility, on ground-mounted poles or attached to portable structure on skids.
 - b. Portable structure shall resist overturning force of wind.
 - 3. Street Address Signs: Locate and install signs at each access point from public streets.
- G. Project Informational Signs Installation:
 - 1. Construction: Construct sign support structure and install panels in durable manner, to resist high winds.
 - 2. Project Informational Signs Installation:
 - a. Locate signs as necessary for construction activities and as required by authorities having jurisdiction.
 - b. Install informational signs for optimum visibility, on ground-mounted posts or temporarily attached to surfaces of structures.
 - c. Attachment methods shall leave no permanent disfiguration or discoloration on completed Work.

3.02 MAINTENANCE

- A. Maintain signs and supports neat clean condition. Repair all deterioration, weathering and damage to structure framing, and signage.
- B. Sign Relocation: Relocate signs as required by progress of the Work.

3.03 REMOVAL

A. Remove signs, framing, supports, and foundations at completion of Project and restore the area prior to Substantial Completion review.

END OF SECTION

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. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations.
- F. Procedures for District-supplied products.
- G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 Summary: Identification of District-supplied products.
- B. Section 01 25 00 Substitution Procedures: Substitutions made during procurement and/or construction phases.
- C. Section 01 40 00 Quality Requirements: Product quality monitoring.
- D. Section 01 61 16 Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- E. Section 01 74 19 Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.
- F. Division 22 Plumbing.
- G. Division 23 Heating, Ventilation, and Air-Conditioning.

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; 2017, v1.2.
- B. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 - 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.
- 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:
 - If a conflict exists between the Drawings and the Specifications (Project Manual), then the Contractor shall submit a Request for Interpretation from the Architect. See Section 01 30 00 - Administrative Requirements.
 - 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 (Division of the State Architect) 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. See Section 01 20 00 Price and Payment Procedures.
- 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 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.
- H. Mechanical and Plumbing: Comply with requirements specified in Divisions 22 and 23, as included in this Project Manual and in the Drawings.

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.
 - 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.

2.03 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the District, or otherwise indicated as to remain the property of the District, become the property of the Contractor; remove from site.

2.04 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
 - 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 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.

2.05 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:
 - 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:
 - 1. The requirements of Section 01 25 00 Substitution Procedures shall apply 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.

2.06 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.

3.02 OWNER-SUPPLIED PRODUCTS

- A. See Section 01 10 00 Summary for identification of District-supplied products.
- B. District's Responsibilities:
 - 1. Arrange for and deliver District reviewed shop drawings, product data, and samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections, and service.
- C. Contractor's Responsibilities:
 - 1. Review District reviewed shop drawings, product data, and samples.
 - 2. Receive and unload products at site; inspect for completeness or damage jointly with District.
 - 3. Handle, store, install and finish products.
 - 4. Repair or replace items damaged after receipt.

3.03 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.

3.04 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.
 - 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. Providebonded 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.

3.05 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.

3.06 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

SECTION 01 61 16

VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for VOC-Content-Restricted products.
- B. 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.
- D. Section 07 92 00 Joint Sealants: Emissions-compliant sealants.

1.03 DEFINITIONS

- A. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Exterior and interior paints and coatings.
 - 2. Exterior and interior adhesives and sealants, including flooring adhesives.
 - 3. Wet-applied roofing and waterproofing.
 - 4. Other products when specifically stated in the specifications.
- B. Interior of Building: Anywhere inside the exterior weather barrier.
- C. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- D. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

1.04 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D3960 Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).
- C. CARB (SCM) Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2007.
- D. GreenSeal GS-36 Adhesives for Commercial Use; 2013.
- E. SCAQMD 1113 Architectural Coatings; 1977 (Amended 2016).
- F. SCAQMD 1168 Adhesive and Sealant Applications; 1989 (Amended 2017).

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.

1.07 REGULATORY REQUIREMENTS

- A. All VOC restricted products shall be compliant with local jursidiction, South Coast Air Quality Management District, Air Pollution Control District, County of San Diego, and Caifornia 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.
 - 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 described in section 01 60 00 -Product Requirements.

PART 2 PRODUCTS

2.01 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".
- 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

SECTION 01 61 16.01

ACCESSORY MATERIAL VOC CONTENT CERTIFICATION FORM

.01 FORM

- A. Identification:
 - 1. Project Name: Glendale HS Chiller Replacement
 - 2. Project No.: 20916.02
 - 3. Architect: tBP/Architecture
- B. Use of This Form:
 - 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.

1.01 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.

C. _____ Adhesives: I certify that the installation work of my firm on this project has not required the use of any adhesives.

OR (certify either the above or the below, not both)

- D. _____ Adhesives: I certify that my firm has NOT installed any adhesive with VOC content exceeding that specified in Sections 01 6000 and on this project; product data and MSDS sheets for all adhesives used, whether specified or not, are attached.
- E. _____ Joint Sealants: I certify that the installation work of my firm on this project has not required the use of any gunnable or pourable joint sealants.

OR (certify either the above or the below, not both)

- F. _____ Joint Sealants: I certify that my firm has NOT installed any joint sealant with VOC content exceeding that specified in Section 07 92 00 Joint Sealants on this project; product data and MSDS sheets for all joint sealants used, whether specified or not, are attached.
- G. ____ Coatings: I certify that the installation work of my firm on this project has not required the use of any coatings.

OR (certify either the above or the below, not both)

- H. ____ Coatings: I certify that my firm has NOT installed any adhesive with VOC content exceeding that specified in Sections 01 6000 and on this project; product data and MSDS sheets for all coatings used, whether specified or not, are attached.
- I. _____ Composite Wood and Agrifiber Products: I certify that the work of my firm on this project has not required the use of any composite wood or agrifiber products, as defined above.

OR (certify either the above or the below, not both)

J. _____ Composite Wood and Agrifiber Products: I certify that the composite wood and agrifiber products, as defined above, furnished or installed by my firm DO NOT contain any ADDED urea-formaldehyde binder; product data and MSDS sheets for products used, whether specified or not, are attached.

2.01 CERTIFIED BY: (INSTALLER/MANUFACTURER/SUPPLIER FIRM)

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

END OF SECTION

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, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Demonstration and instruction of District personnel.
- H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- I. 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 31 14 Facility Services Coordination: Coordination of trades and BIM documents.
- D. Section 01 40 00 Quality Requirements: Testing and inspection procedures.
- E. Section 01 45 33 Code Required Special Inspections & Procedures: Construction oversight procedures by DSA regarding the execution, approval, and closeout of this building project.
- F. Section 01 71 23 Field Engineering: Additional requirements for field engineering and surveying work.
- G. Section 01 74 19 Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- H. Section 01 78 00 Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- I. Section 01 79 00 Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections
- J. Section 02 41 00 Demolition: Demolition of whole structures and parts thereof; site utility demolition.
- K. Section 07 84 00 Firestopping.
- L. 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. 35 California Fire Code Chapter 35 Welding and Other Hot Work; current edition.
- B. NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.04 SUBMITTALS

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

- A. For demolition work, employ a firm specializing in the type of work required.
 - 1. Minimum of 5 years of documented experience.
- B. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in California.

1.06 PROJECT CONDITIONS

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water.

- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- E. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers.
 - 2. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
- F. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- G. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- H. 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.

1.07 COORDINATION

- A. See Section 01 10 00 for occupancy-related requirements.
- B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After District occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of District's activities.

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.

- 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. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. 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.
- D. Temporary Supports: Provide supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- E. Weather Protection: Provide protection from elements for areas which may be exposed by uncovering Work. Maintain excavations free of water.

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.
 - 1. Coordinate operations of the various trades to assure efficient and orderly installation of each part of Work.
 - 2. Coordinate Work operations of the various trades that depend on each other for proper installation, connection, and operation of Work, including but not limited to:
 - a. Schedule construction operations in sequence required where installation of one part of Work depends on installation of other components, before or after its own installation.

- b. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
- c. Provide provisions to accommodate items scheduled for later installation.
- 3. Prepare and administer coordination drawings. Refer to Section 01 31 14 Facility Services Coordination.
- 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.
 - 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 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.

- 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.
- E. Services (Including but not limited to HVAC, Plumbing, and Electrical): 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; 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.
 - 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.
- 4. Provide openings for penetration of utility services, such as plumbing, mechanical and electrical 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.
- 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 in accordance with Section 07 84 00, 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. 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.
- F. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 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.
 - 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.

3.11 DEMONSTRATION AND INSTRUCTION

A. See Section 01 79 00 - Demonstration and Training.

3.12 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Section 23 05 93 Testing, Adjusting, and Balancing for HVAC.

3.13 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.

- c. Before use, review cleaning agents and materials with Owner Representative 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 Owner Representative review and approval. Processes and degree of cleanliness shall be as directed by Architect, District and/or Owner Representative.
- 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 debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
- J. Clean site; sweep paved areas, rake clean landscaped surfaces.
- K. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and District.
- B. Accompany Architect 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.
 - 1. Final Application for Payment: In the Application for Payment that coincides with the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed substantially complete.

- 2. Warranties, Bonds and Certificates: Submit specific warranties, guarantees, workmanship bonds, maintenance agreements, final certifications and similar documents.
- 3. Locks and Keys: Change temporary lock cylinders over to permanent keying and transmit keys to the District, unless otherwise directed or specified.
- 4. Tests and Instructions: Complete start-up testing of systems, and instruction of the District's personnel. Remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
- E. Clearing and Cleaning: Prior to the Substantial Completion review, Contractorr shall conduct a thorough cleaning and clearing of the Project area, including removal of construction facilities and temporary controls.
- F. Inspection and Testing: Prior to the Substantial Completion review, complete inspection and testing required for the Work, including securing of approvals by authorities having jurisdiction.
 - 1. Complete all inspections, tests, balancing, sterilization and cleaning of plumbing and HVAC systems.
 - 2. Complete inspections and tests of electrical power and signal systems.
 - 3. Complete inspections and tests of conveying (elevator or wheelchair lift) systems.
- G. District will occupy all of the building as specified in Section 01 10 00.
- H. 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 Plumbing, Mechanical, and Electrical.
 - d. Architect, Architect's consultants and District's consultants, if in attendance, will conduct a brief walk-through of Project with the Contractor to review scope and adequacy of the punch list.
 - e. Verbal comments will be made to the Contractor by the Owner Representative, 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 Owner Representative, 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 Owner Representative, 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 Owner Representative, 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 such costs from the Final Payment.
- I. Correct items of work listed in Final Correction Punch List and comply with requirements for access to District-occupied areas.
- J. 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.
- K. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15 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.

3.16 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the District.

END OF SECTION

SECTION 01 71 23 FIELD ENGINEERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Field engineering services by Contractor.

1.02 DESCRIPTION OF SERVICES

- A. Specific services listed in this section are in addition to, and do not supersede, general Execution and Closeout Requirements.
- B. Sole responsibility for establishing all locations, dimensions and levels of items of work.
- C. Sole responsibility for provision of all materials required to establish and maintain benchmarks and control points, including batter boards, grade stakes, structure elevation stakes, and other items.
- D. Keeping a transit, theodolite, or TST (total station theodolite with electronic distance measurement device); leveling instrument; and related implements such as survey rods and other measurement devices, at the project site at all times.
- E. Provision of facilities and assistance necessary for Architect to check lines and grade points placed by Contractor.
 - 1. Performance of excavation or embankment work until after all cross-sectioning necessary for determining payment quantities for Unit Price work have been completed and accepted by Architect.
- F. Preparation and maintenance of daily reports of activity on the work. Submission of reports containing key progress indicators and job conditions to Architect.
 - 1. Number of employees at the Site.
 - 2. Number employees at the Site for each of Contractor's subcontractors.
 - 3. Breakdown of employees by trades.
 - 4. Major equipment and materials installed as part of the work.
 - 5. Major construction equipment utilized.
 - 6. Location of areas in which construction was performed.
 - 7. Materials and equipment received.
 - 8. Work performed, including field quality control measures and testing.
 - 9. Weather conditions.
 - 10. Safety.
 - 11. Delays encountered, amount of delay incurred, and the reasons for the delay.
 - 12. Instructions received from Architect or District, if any.
- G. Preparation and maintenance of professional-quality, accurate, well organized, legible notes of all measurements and calculations made while surveying and laying out the work.

1.03 REFERENCE STANDARDS

- A. SMACNA (SRM) Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.
- B. State Plane Coordinate System for California.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements, for submittal procedures.
- B. Submit in addition to items required in Section 01 70 00 Execution and Closeout Requirements.
- C. Informational Submittals: Submit the following:
 - 1. Field Engineering: Submit daily reports, with content as indicated in this section.
 - a. When requested by Architect, submit for Record documentation verifying accuracy of field engineering including, but not limited to, Contractor's survey notes and field notes.

1.06 QUALITY ASSURANCE

- A. Field Engineer's Qualifications: As established in Section 01 70 00 Execution and Closeout Requirements.
- B. Use adequate number of skilled and thoroughly-trained workers to perform the work of this section in a timely and comprehensive manner.
- C. Minimum accuracy for required work is as follows:
 - 1. Grade: Horizontal Tolerance: Plus or minus 0.5 feet, Vertical Tolerance: Plus or minus 0.05 feet.
 - 2. Culverts and ditches: Horizontal Tolerance: Plus or minus 0.5 feet, Vertical Tolerance: Plus or minus 0.05 feet.
 - 3. Structures: Horizontal Tolerance: Plus or minus 0.5 feet (location), Vertical Tolerance: Plus or minus 0.05 feet.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. Notify District's Representative and Architect of any discrepancies immediately in writing before proceeding to lay out the work. Locate and protect existing benchmarks and base line. Preserve permanent reference points during construction.

B. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify existing conditions.

3.02 FIELD ENGINEERING

- A. Maintain field office files, drawings, specifications, and record documents.
- B. Coordinate field engineering services with Contractor's subcontractors, installers, and suppliers as appropriate.
- C. Prepare layout and coordination drawings for construction operations.
- D. Check and coordinate the work for conflicts and interferences, and immediately advise Architect and District of all discrepancies of which Contractor is aware.
- E. Cooperate as required with Architect and District in observing the work and performing field inspections.
- F. Review and coordinate work on a regular basis with shop drawings and Contractor's other submittals.
- G. Check the location, line and grade of every major element as the work progresses. Notify the Architect when deviations from required lines or grades exceed allowable tolerances. Include in such notifications a thorough explanation of the problem, and a proposed plan and schedule for remedying the deviation. Do not proceed with remedial work without District's concurrence of the remediation plan.
- H. Check all formwork, reinforcing, inserts, structural steel, bolts, sleeves, piping, other materials and equipment for compliance with shop drawings and Contract Documents requirements.
- I. Check all bracing and shoring for structural integrity and compliance with designs prepared by the Contractor.

3.03 SUPPORT AND BRACING

- A. General requirements: Design all support and bracing systems, if required. Provide for attachment to portions of the building structure capable of bearing the loads imposed. Design systems to not overstress the building structure.
- B. Seismic Bracing: Design where required by authorities having jurisdiction.
 - 1. Design and install all support systems to comply with the seismic requirements of the Construction Code of California.
 - 2. Design and install seismic bracing so as not to defeat the operation on any required vibration isolation or sound isolation devices.
 - 3. For seismic bracing guidelines for mechanical, electrical and plumbing systems, refer to SMACNA (SRM).

3.04 REPORTS

A. Submit two copies of Contractor's daily reports at Architect's field office (or electronically) by 9:00 AM the next working day after the day covered in the associated report. Daily report shall be signed by responsible member of Contractor's staff, such as project manager or superintendent, or foreman designated by Contractor as having authority to sign daily reports.

3.05 RECORDS

A. Maintain at the Site a complete and accurate log of control and survey work as it progresses.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 Demonstration and Training, for additional requirements.

END OF SECTION

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.
 - Recycle and/or salvage for reuse a minimum of 65percent 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. 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.
 - 6. Paint.
 - 7. Plastic sheeting.
 - 8. Rigid foam insulation.
 - 9. Mechanical and electrical equipment.
 - 10. 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.
 - 2. General information contacts regarding construction and demolition waste:
 - a. EPA Construction and demolition (C&D) debris website: 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.
 - 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/.
 - 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.

1.03 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- 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.
- 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 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 10 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.
- 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.
 - 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.
- 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.
 - 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.
 - 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

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: City: State: Zip: Phone: City: Phone: City: Properted by: Properted by: Project Period: Project Period: From: To: Project Period: Project Project Project Project Project										
Contractor's Name: State: Zip: Street Address: Fax: () Fax: () Phone: () Fax: () Fax: () E-Mail Address: Property () Fax: () Prepared by: (Print Name) Project Period: From: TO: Project Period: From: TO: TO: Reuse, Recycling or Disposal Processes To Be Used Describe the types of recycling processes or alcivities 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 for the say of the	Project Title:									
Street Address: Zip: City: State: Zip: Phone: () Fax: () Fax: () E-Mail Address: Prepared by: (Print Name) Fax: () Date Submitted: From: TO: Project Period: From: TO: Reuse, Recycling or Disposal Processes To Be Used Describe the types of recycling processes or advise attivities 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 Obuilding 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 at an offsite recycling center (i.e. lighting, fixtures) 03 - Recycling commingled loads of C&D materials at an offsite mixed debris recycling center or transfer station 06 - Recycling commingled loads of C&D materials at an offsite mixed debris recycling center or transfer station 06 - Recycling conter transfer station. 09 - Ohter (please describe) Types of Material To Be Generated I = Nixed Inert G = Green Materials 05 - Recycling control paraterial salvage or frecise any moiler or transfer station. 09 - Ohter (please describe) Toplent (describe) 01 -	Contract or Work Order No.:									
City: State: Zip: Phone: () Fax: () E-Mail Address: Prepared by: (Print Name) Date Submitted: Project Period: TO: 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) 3 - Recycling source separated materials on site (i.e. crushing asphalt/concrete for reuse or grinding for mulch) 03 - Recycling source separated materials at an offsite recycling center (i.e. scrap metal or green materials) 00 - Recycling source separated 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 OB - 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 capital andfill or transfer station. OB - Drywall	Contractor's	Contractor's Name:								
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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 commingled loads of C&D materials at an offsite recycling center (i.e. scrap metal or green materials) 05 - 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 Name of Facility and Location (City) Total 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 ccur. Type of Type of Activity Facility to be Used/Location Location (City) Other Wt.			Reus	e. Recycling or Disposa	al Processes	To Be Used				
Include all recycling activities for source separated or mixed material recycling centers where recycling will occur. Type of Type of Total Truck Total Quantities Material Activity Facility to be Used/Location Loads Tons Cubic YD Other Wt.	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) Use these codes to indicate the types of material that will be generated on the project A = Asphalt C = Concrete M = Metals D = Drywall P/C=Paper/Cardboard 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									
Include all recycling activities for source separated or mixed material recycling centers where recycling will occur. Type of Type of Total Truck Total Quantities Material Activity Facility to be Used/Location Loads Tons Cubic YD Other Wt.	by connuccu		•	TION I - RE-USED/RE	CYCLED M	ATERIALS				
Type of Material Type of Activity Total to be Used/Location Total Truck Loads Total Quantities	· · · · · · · · · · · · · · · · · · ·									
(ex.) M 04 ABC Metals, Los Angeles 24 355		· · · ·						Cubic YD	Other Wt.	
Image: state of the state o	(ex.) M	(ex.) IVI U4 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.							
		Total Quantities			es		
Type of	Type of				Other		
Material	Activity	Facility to be Used/Location	Loads	Tons	Cubic YD	Wt.	
(ex.) D	08	DEF Landfill, Los Angeles	2	35			
b. Total Disp	osal			0	0	0	
SECTION III - TOTAL MATERIALS GENERATED							
This se	ection calculate	es the total materials to be generated during	the project period (Reu	ıse/Recycle + I	Disposal = Gener	ation	
				Tons	Cubic YD	Other Wt.	
a. Total Reu	sed/Recycle	ed		0	0	0	
b. Total Disp	b. Total Disposed				0	0	
c. Total Gen	b. Total Disposed 0						
	SECTION IV - CONTRACTOR'S LANDFILL DIVERSION RATE CALCULATION						
	Add totals from Section I + Section II						
						Other	
Tons					Cubic YD	Wt.	
a. Materials Re-Used and Recycled 0							
b. Materials Disposed							
c. Total Materials Generated (a. + b. = c.)					0	0	
d. Landfill Diversion Rate (Tonnage Only)*							
* Use tons only to calculate recycling percentages: Tons Reused/Recycled/Tons Generated = % Recycled							
Contractor's activities):	Contractor's Comments (Provide any additional information pertinent to planned reuse, recycling, or disposal activities):						
(Use when a. Asphal broken	1. Suggested Conversion Factors: From Cubic Yards to Tons (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. Appliese. Drywall Scrap: .20to broken chunks of concrete)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:	Street Address:								
City: State: Zip:									
Phone: ()									
E-Mail Address:									
Prepared by: (Print Nam	e)								
Date Submitted:	ate Submitted:								
Project Period:		From: TO:							
	Reus	e, Recycling or Disposa	al Processes t	o Be Use	d				
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 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 Type of Total Quantities									
Type ofType ofMaterialActivityFacility to be Used/Location		Loads	иск	Tons Cubic YD		Other Wt.			
· · · ·			24	ļ.	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.							
	Total Quantities					ies	
Type of	Type of	Total Truck				Other	
Material	Activity	Facility to be Used/Location	Loads	Tons	Cubic YD	Wt.	
(ex.) D	08	DEF Landfill, Los Angeles	2	35			
b. Total Dis	posal						
SECTION III - TOTAL MATERIALS GENERATED							
This s	ection calculat	es the total materials to be generated during	the project period (Re				
	Tons Cubic YD Other W						
	ised/Recycle	ed					
b. Total Dis							
c. Total Ger	c. Total Generated						
	SE	CTION IV - CONTRACTOR'S LANDFILL	DIVERSION RATE	CALCULAT	ION		
	Add totals from Section I + Section II						
						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' activities):	Contractor's Comments (Provide any additional information pertinent to planned reuse, recycling, or disposal activities):						
Notes:							
(Use when so	cales are not	-	c. Ferrous Meta tons) d Non-Ferrous				
	 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) 						
		000 CY Concrete = 930 tons. Applies	e. Drywall Scrap	•			
	to broken chunks of concrete) 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. District 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 & Procedures: 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.

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.

- 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 specified.
- D. Specific Warranty and Guarantee Requirements: Specific requirements are included in product Specifications Sections of Divisions 3 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.

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 Owner Representative.
 - 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.

- 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.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. 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.
- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- D. Include color coded wiring diagrams as installed.
- E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- G. Provide servicing and lubrication schedule, and list of lubricants required.
- H. Include manufacturer's printed operation and maintenance instructions.
- I. Include sequence of operation by controls manufacturer.
- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
 - 1. Parts Data:
 - a. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams as necessary for service and maintenance.
 - b. Include complete nomenclature and catalog numbers for consumable and replacement parts.
 - c. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in stock by the District or operator.
- O. Include test and balancing reports.
- P. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for District's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
 - 1. Provide duplicate electronic formatted (PDF) versions of the O&M binder for record purposes. Organize the same as the printed versions.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Project Directory.
 - 2. Table of Contents, of all volumes, and of this volume.
 - 3. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Product data, shop drawings, and other submittals.
 - c. Operation and maintenance data.
 - d. Field quality control data.
 - e. Photocopies of warranties and bonds.
 - 4. Design Data: To allow for addition of design data furnished by Architect or others, provide a tab labeled "Design Data" and provide a binder large enough to allow for insertion of at least 20 pages of typed text.

3.06 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.
 - 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.

3.07 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:
 - 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:

- 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

SECTION 01 79 00

DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

- A. Demonstration of products and systems where indicated in specific specification sections.
- B. Training of District personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment.
 - 3. Electrical systems and equipment.
 - 4. Items specified in individual product Sections.
- C. Training of District personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

- A. Section 01 78 00 Closeout Submittals: Operation and maintenance manuals.
- B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements, for submittal procedures.
- B. Training Plan: District will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Each Sub, Design-Builder SubContractor and vendor responsible for training submits a written training plan to the Architect and District Representative for review and approval prior to training.
 - 2. Submit to Architect for transmittal to District.
 - 3. Submit not less than four weeks prior to start of training.
 - 4. Revise and resubmit until acceptable.
 - 5. Provide an overall schedule showing all training sessions.
 - 6. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.1) Equipment list
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - 1) Agenda and subjects (design intent, equipment inspections, modes of operation, system interactions, troubleshooting, preventative maintenance, etc.)

- f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
- g. Media to be used, such a slides, hand-outs, etc.
 - 1) The approved O&M manuals shall be used during the training for equipment specific references.
- h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.
 - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.
- D. Training Reports:
 - 1. Identification of each training session, date, time, and duration.
 - 2. Sign-in sheet showing names and job titles of attendees.
 - 3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
- E. Video Recordings: Submit digital video recording of each demonstration and training session for District's subsequent use.
 - 1. Format: DVD Disc.
 - 2. Label each disc and container with session identification and date.

1.04 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
 - 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
 - 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 TRAINING OF OWNER PERSONNEL

- A. The Contractor and Design-Builder SubContractors shall be responsible for training coordination and scheduling and for ensuring that training is completed.
- B. The specific training requirements of District personnel by Subs, Design-Builder SubContractors and vendors is specified in the Division in which the equipment is specified.

C. For primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.

3.02 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by District.
- B. Demonstration may be combined with District personnel training if applicable.
- C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 - 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.03 TRAINING - GENERAL

- A. Conduct training on-site unless otherwise indicated.
- B. District will provide classroom and seating at no cost to Contractor.
- C. Provide training in minimum two hour segments.
- D. Training schedule will be subject to availability of District's personnel to be trained; re-schedule training sessions as required by District; once schedule has been approved by District failure to conduct sessions according to schedule will be cause for District to charge Contractor for personnel "show-up" time.
- E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 - 3. Typical uses of the O&M manuals.
- F. Product- and System-Specific Training:
 - 1. Review the applicable O&M manuals.
 - 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 - 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 - 4. Provide hands-on training on all operational modes possible and preventive maintenance.

- 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
- 6. Discuss common troubleshooting problems and solutions.
- 7. Discuss any peculiarities of equipment installation or operation.
- 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
- 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
- 10. Review spare parts and tools required to be furnished by Contractor.
- 11. Review spare parts suppliers and sources and procurement procedures.
- G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

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 50 00 Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- D. Section 01 60 00 Product Requirements: Handling and storage of items removed for salvage and relocation.
- E. 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; current edition.
- B. NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

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, 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 Owner Representative, 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.
 - Refer to sequence requirements specified in Section 01 10 00 Summary; and construction progress schedule requirements specified in Section 01 32 16 - Construction Progress Schedule.

1.06 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain property of Glendale Unified 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 Owner Representative 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.

1.07 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements, for submittal procedures.
- B. Site Plan: Showing:
 - 1. Areas for temporary construction and field offices.
 - 2. Areas for temporary and permanent placement of removed materials.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
 - 2. Identify demolition firm and submit qualifications.
- D. Demolition phase:
 - 1. Proposed dust-control measures.
 - 2. Proposed noise-control measures.
 - 3. Schedule of demolition activities indicating the following:
 - a. Detailed sequence of demolition and removal work, including start and end dates for each activity.
 - b. Dates for shutoff, capping, and continuation of utility services.
 - 4. If hazardous materials are encountered and disposed of, landfill records indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
 - 5. Contractor's Waste Management and Recycling Plan: See Section 01 74 19 Construction Waste Management and Disposal.
 - a. This plan will not otherwise relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures.
 - 6. Contractor's Reuse, Recycling, and Disposal Report: See Section 01 74 19 Construction Waste Management and Disposal.
- E. 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 SUBMITTALS

- A. Demolition and Removal Procedures and Schedule: Submit for Project record only.
- B. Project Record Drawings: Submit in accordance with provisions specified in Section 01 78 00 -Closeout Submittals. Indicate verified locations of underground utilities and storm drainage system on project record drawings.

1.09 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.

1. Minimum of 5 years of documented experience.

1.10 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, South Coast 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.
 - 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 Owner Representative, 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. Environmental Controls
 - 1. Comply with federal, state and local regulations pertaining to water, air, solid waste, recycling, chemical waste, sanitary waste, sediment and noise pollution.
 - 2. Confine demolition activities to areas defined by public roads, easements, and work area limits indicated on the drawings.
 - 3. Temporary Construction: Remove indications of temporary construction facilities, such as haul roads, work areas, structures, stockpiles or waste areas.
 - 4. Water Resources: Comply with applicable regulations concerning the direct or indirect discharge of pollutants to underground and natural surface waters.
 - a. Oily Substances: Prevent oily or other hazardous substances from entering the ground, drainage areas, or local bodies of water in such quantities as to affect normal use, aesthetics, or produce a measurable ecological impact on the area.
 - 1) Store and service construction equipment at areas designated for collection of oil wastes.
 - 5. Dust Control, Air Pollution, and Odor Control: Prevent creation of dust, air pollution and odors.

- a. Use temporary enclosures and other appropriate methods to limit dust and dirt rising and scattering in air to lowest practical level.
- b. Store volatile liquids, including fuels and solvents, in closed containers.
- c. Properly maintain equipment to reduce gaseous pollutant emissions.
- 6. Noise Control: Perform demolition operations to minimize noise.
 - a. Repetitive, high level impact noise will be permitted only during the times indicated in Section 01 70 00 Execution and Closeout Requirements. Repetitive impact noise on the property shall not exceed the following dB limitations:

Sound Level in dB	Time Duration of Impact Noise			
70	More than 12 minutes in any hour			
80	More than 3 minutes in any hour			

- b. Provide equipment, sound-deadening devices, and take noise abatement measures that are necessary to comply with the requirements of this Contract.
- c. At least once every five successive working days while work is being performed above 55 dB noise level, measure sound level for noise exposure due to the demolition.
 - 1) Measure sound levels on the 'A' weighing network of a General Purpose sound level meter at slow response.
 - 2) To minimize the effect of reflective sound waves at buildings, measurements may be taken three to six feet in front of any building face.
- E. 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.
 - 3. Use of explosives is not permitted.
 - 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - a. Survey condition of the building to determine whether removing any element might result in a structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during demolition.
 - Retain a licensed and qualified civil or structural engineer to provide analysis, including calculations, necessary to ensure the safe execution of the demolition work.
 - b. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.
 - c. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - a. Provide, erect, and maintain temporary barriers, safety and security devices , for protection of streets, sidewalks, curbs, adjacent property and the public.

- b. Protection: Protect existing construction and adjacent areas with temporary barriers and security devices in accordance with requirements specified in Section 01 50 00 Temporary Facilities and Controls.
 - 1) Review location and type of construction of temporary barriers with District and/or the Owner Representative.
 - 2) Barriers shall control dust, debris and provide protection for persons occupying and using adjacent facilities.
 - 3) Maintain protected egress and access at all times, in accordance with requirements of authorities having jurisdiction and with permission of DSA (AHJ having jurisdiction).
- 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
- 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
- 8. Do not close or obstruct roadways or sidewalks without permit.
- 9. 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.
- 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- F. Do not begin removal until receipt of notification to proceed from District.
- G. Do not begin removal until built elements to be salvaged or relocated have been removed.
- H. 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.
 - 4. Protect existing landscaping materials, appurtenances, structures and items that are not to be demolished, or are on adjacent property.
 - 5. Mark location of utilities.
- I. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- J. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.
- K. 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.
- L. Perform demolition in a manner that maximizes salvage and recycling of materials.
 - 1. Comply with requirements of Section 01 74 19 Construction Waste Management and Disposal.
 - 2. Dismantle existing construction and separate materials.
 - 3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

M. Damages: Promptly repair damages to adjacent facilities caused by demolition operations.

3.02 EXISTING UTILITIES

- A. Protect existing utilities to remain from damage.
- B. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to District.
- C. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to District.
- D. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- E. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- F. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.
- G. Utility Lines, Posts and Structures:
 - 1. Work by Utility: Posts, conductors, guy wires, boxes, structures and equipment shown to be cleared or removed by the responsible utility company or agency shall be considered work under a separate contract.
 - 2. Coordination: The Contractor shall arrange, schedule and coordinate work by utility companies and agencies.
 - 3. Payment: Costs, if any, imposed by utility companies and agencies shall be included in the Contract Sum.

3.03 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. Separate areas in which demolition is being conducted from other areas that are still occupied.
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
- 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. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
- E. Services (Including but not limited to HVAC, Plumbing, and Electrical): Remove existing systems and equipment as indicated.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
 - 2. 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.
 - 3. See Section 01 10 00 for other limitations on outages and required notifications.
 - 4. Verify that abandoned services serve only abandoned facilities before removal.
 - 5. Remove abandoned pipe, ducts, conduits, and equipment; remove back to source of supply where possible, otherwise cap stub and tag with identification.
- 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.
 - 4. Patch as specified for patching new work.

3.04 DEBRIS AND WASTE REMOVAL

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

END OF SECTION

SECTION 05 05 19

POST-INSTALLED CONCRETE ANCHORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for materials and equipment for post-installed mechanical and adhesive anchors in concrete.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 Administrative Requirements: Submittal procedures.
- B. Section 01 45 33 Code-Required Special Inspections and Procedures: Test reporting.
- C. Section 01 60 00 Product Requirements: Requirements for material and product quality.
- D. Section 05 50 00 Metal Fabrications.
- E. Divisions 22 Plumbing, 23 Heating, Ventilating, and Air-Conditioning (HVAC), and 26 Electrical: Mounting of equipment and components.
- F. Other miscellaneous sections, where indicated.

1.03 REFERENCE STANDARDS

- A. ASTM A193/A193M Standard Specification for Alloy Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications; 2016.
- B. ASTM A510/A510M Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel; 2013.
- C. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018, with Editorial Revision (2018).
- D. ASTM B633 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- E. ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2018.
- F. ASTM E488/E488M Standard Test Methods for Strength of Anchors in Concrete Elements; 2018.
- G. ASTM F594 Standard Specification for Stainless Steel Nuts; 2009 (Reapproved 2015).

1.04 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements, for submittal procedures.
- B. Product Data: If requested, manufacturer's product literature and installation instructions for each type of anchor indicated.
- C. Samples: If requested, representative length and diameters of each type of anchor shown on the drawings.
- D. ICC ES Reports: If requested, ICC Evaluation Service report indicating conformance with ICC-ES Acceptance Criteria.

E. Field quality-control test and inspection reports.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM E329 and Section 01 45 33 for testing indicated.
- B. 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.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in manufacturer's or distributor's original packaging undamaged, and with printed installation instructions.
- B. Store and handle all materials in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Simpson Strong-Tie Company, Pleasanton, CA www.simpsonanchors.com.
 - 2. Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
- B. Substitutions: Substitutions of products from manufacturer's not listed are not permitted.
 - 1. Substitution of structural anchors requires structural calculations and DSA approval.

2.02 MATERIALS

- A. Interior Use: For use in conditioned environments free from potential moisture, provide zinc plated carbon steel anchors.
- B. Exterior Use:
 - 1. In exposed or potentially wet environments, and for attachment of exterior cladding materials, provide stainless steel anchors.
 - 2. Stainless steel nuts and washers shall be of matching alloy group of equal or greater strength than the rod.
 - 3. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
- C. Deformed Reinforcing Bars: Deformed steel rebar conforming to ASTM A615/A615M Grade60. Permissible sizes as described in each adhesive products ICC report.

2.03 MECHANICAL ANCHORS

- A. Expansion, screw or undercut anchors having current ICC approval for use in cracked and uncracked concrete, with a published ICC Evaluation Service report.
 - 1. Type and size as indicated on drawings.
- B. Basis of Design Approved Products conforming to this specification are acceptable for anchoring to concrete are as follows:

- 1. 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.
- 2. Simpson Strong Tie Anchor Systems; Simpson Strong-Tie[®] Strong-Bolt[®] 2 Wedge Anchor For Cracked And Uncracked Concrete (ICC Report ESR-3037); www.strongtie.com.
- 3. Substitutions: See Section 01 60 00 Product Requirements.
- C. Basis of Design Approved Products conforming to this specification are acceptable for anchoring to grouted masonry are as follows:
 - 1. Simpson Wedge-All Wedge Anchor (ICC-ES ESR-1396)
 - 2. Hilti Kwik Bolt 3 Expansion Anchor (ICC-ES ESR-1385)
 - 3. Hilti Kwik Bolt TZ Expansion Anchor (ICC-ES ESR-3785)
 - 4. Substitutions: See Section 01 60 00 Product Requirements.

2.04 ADHESIVE ANCHORS

- A. Cartridge Injection Adhesive Anchors: Threaded carbon steel rod, inserts, or reinforcing dowels complete with required nuts, washers, adhesive system and manufacturer's installation instructions.
 - 1. Type and size as indicated on drawings.
 - 2. Current ICC approval for use in cracked and uncracked concrete with a published ICC Evaluation Service report required.
- B. Interior Use: Unless otherwise indicated on the Drawings, provide:
 - 1. 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).
 - 2. Carbon steel HIT TZ rods conforming to ASTM A510/A510M with chemical composition of AISI 1038.
- C. Exterior Use: As indicated on the Drawings, provide stainless steel anchors.
 - 1. 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.
 - 2. All nuts shall conform to ASTM F594, unless otherwise specified.
- D. Basis of Design Approved Products conforming to this specification are acceptable for anchoring to concrete are as follows:
 - 1. Simpson SET-XP Epoxy Adhesive (ICC-ES ESR-2508)
 - 2. Hilti HAS threaded rods with HIT-HY 200 Safe Set System using Hilti Hollow Drill Bit System for anchorage to concrete, ICC ESR-3187.
 - 3. Hilti HIT-Z anchor rods with HIT-HY 200 Safe Set System for anchorage to concrete, ICC ESR-3187.
 - 4. Hilti HAS threaded rods with RE 500 V3 Injection Adhesive Anchoring System for anchorage to concrete, ICC ESR-3814.

5. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 POWDER-DRIVEN FASTENERS

- A. Use only if approved by Architect, generally not permitted where not specifically indicated or in load-bearing installations; Fed Spec FF-P-395 or Fed Spec GGG-D-777; as follows.
 - 1. Hilti, Inc.; Hilti Low Velocity Powder Driven Fasteners (ICC Report ESR-1663); www.us.hilti.com.
 - 2. Simpson Strong-Tie Company, Inc.; Simpson Strong-Tie[®] Powder-Actuated Fasteners, Threaded Studs and Assembles (ICC Report ESR-2138); www.strongtie.com.
 - 3. Substitutions: See Section 01 60 00 Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions
 - 1. Base Material Strength: Unless otherwise specified, do not drill holes in concrete until concrete has achieved full design strength.
 - a. Adhesive anchors shall be installed in concrete having a minimum concrete compressive strength equal to or greater than the specified minimum 28-day compressive strength or a minimum age of 21 days at time of anchor installation. Whichever are more restrictive.
 - 2. Temperature of concrete surface and ambient air temperature must meet manufacturer's requirements prior to use of adhesive anchor products.
 - 3. Embedded Items:
 - a. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors.
 - b. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items.
 - c. Take precautions as necessary to avoid damaging anything embedded in the concrete including electrical/telecommunications conduit, gas pipes, and plumbing pipes.
 - d. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling.
 - 4. Beginning of installation indicates acceptance of existing conditions.

3.02 INSTALLATION

- 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.
 - 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 ECR 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.

3.03 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 and Procedures.
- 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 and CBC 1913A.7.
 - c. Post-Installed Anchor Load Testing: CBC Section 1910A.5.
 - 1) As indicated on Structural Drawings, minimum 10 % of drilled-in sill plate bolting anchor applications shall be proof loaded by the independent testing laboratory.

- 2) 100 % of each type and size of drilled-in anchor shall be proof loaded by the independent testing laboratory.
- 3) Adhesive anchors and capsule anchors shall not be torque tested unless otherwise directed by the Architect.
- 4) Tension testing should be performed in accordance with ASTM E488/E488M.
- 5) Torque shall be applied with a calibrated torque wrench.
- 6) Proof loads shall be applied with a calibrated hydraulic ram, as required and indicated on the Structural Drawings. Comply with CBC 1913A.7.2.
- 7) If any of the tested anchors fail to achieve the specified torque or proof load within the limits as defined on the Drawings, all anchors of the same diameter and type as the failed anchor shall be tested, unless otherwise instructed by the Architect.
- d. Verify anchor type, anchor dimensions, hole dimensions, anchor spacing, edge distances, anchor embedment and adherence to the manufacturer's published installation instructions.
- e. 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:
 - 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.

3.04 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

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel items.
- B. Steel framing and supports for applications where framing and supports are not specified in other sections.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 09 91 23 Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

- A. ASME B18.2.1 Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series); 2012, Including July 2013 Errata.
- B. ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2018.
- C. ASTM A36/A36M Standard Specification for Carbon Structural Steel; 2014.
 - 1. Use 2008 as indicated in 2016 CBC Referenced Standards.
- D. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- E. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- F. ASTM A283/A283M Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.
 - 1. Use 2012a as indicated in 2016 CBC Referenced Standards.
- G. ASTM A307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).
- H. ASTM A500/A500M Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
- I. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
 - 1. Use 2011 as indicated in 2016 CBC Referenced Standards.
- J. ASTM A1011/A1011M Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.
- K. ASTM A780/A780M Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009 (Reapproved 2015).

- L. ASTM A924/A924M Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process; 2017a.
- M. ASTM A992/A992M Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).
- N. ASTM F3125/F3125M Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions; 2015a.
- O. ASTM D1187/D1187M Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2018).
- P. AWS A2.4 Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- Q. AWS D1.1/D1.1M Structural Welding Code Steel; 2015, with Errata (2016).
 - 1. Use 2010 w/Errata as indicated in 2016 CBC Referenced Standards.
- R. IAS AC172 Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2017.
- S. SSPC-PA 1 Shop, Field, and Maintenance Painting of Steel; 2016.
- T. SSPC-Paint 15 Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
- U. SSPC-Paint 20 Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).
- V. SSPC-SP 10 Near-White Blast Cleaning; 2007.
- W. SSPC-SP 2 Hand Tool Cleaning; 1982, with Editorial Revision (2004).
- X. SSPC-SP 3 Power Tool Cleaning; 1982, with Editorial Revision (2004).
- Y. SSPC-SP 5 White Metal Blast Cleaning; 2007.
- Z. SSPC-SP 6 Commercial Blast Cleaning; 2007.

1.04 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements, for submittal procedures.
- B. 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.
- C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.
- D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements: 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."

- B. Coordination: Provide templates and sleeves for incorporation of embedded items into the Work specified in other Sections.
- C. Field-Verified Dimensions: Prior to fabrication, field verify dimensions and details of construction. Immediately report variances in writing to Owner Representative and Architect.
- D. Fabricator's Qualifications: Fabricator of light structural steel framing members and other miscellaneous metal fabrications of structural character shall be approved by the authorities having jurisdiction in accordance with applicable Code provisions.
- E. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel or equal.
- F. Welder's Qualifications:
 - 1. Welding shall be performed by certified welders qualified in accordance with procedures specified in applicable referenced AWS standard, using materials, procedures and equipment of the type required for the Work.
 - 2. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.

1.06 PACKAGING, DELIVERY, STORAGE AND HANDLING

- A. Storage, General: Store products in enclosed, well-ventilated spaces, not in contact with soil or vegetation and not subject to inclement weather.
- B. Delivery, Storage and Handling, Galvanized Products:
 - 1. Stack and bundle during transport and store to allow air flow between galvanized surfaces.
 - 2. Load for transport to permit continuous drainage should wetting occur.
 - 3. Do not rest galvanized products on cinders or clinkers.

1.07 PROJECT CONDITIONS

- A. Field Inspection of Fabricated Products: Prior to installation, inspect products for damage and verify markings and dimensions against reviewed submittals.
- B. Environmental Conditions: Do not install products intended for interior locations when spaces are uncovered and unprotected from inclement weather.
- C. Coordination: Coordinate metal fabrications Work with Work specified in other Sections so that related Work shall be accurately and properly joined.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: Steel plates, bars, angles, channels, and H-sections; ASTM A 36/A 36M.
 - 1. Galvanized Steel: Structural shapes, plates and bars: From fully killed or semi-killed steel, ASTM A992/A992M, except silicon content in the range 0 to 0.4 percent or 0.15 to 0.25 percent, as applicable, only.
- B. Steel Tubing: ASTM A500/A500M, Grade B cold-formed structural tubing.
- C. Plates: ASTM A283/A283M.

- D. Steel Sheet:
 - 1. For structural uses: Hot-rolled, ASTM A1011/A1011M; cold-rolled, ASTM A1008/A1008M.
 - 2. For nonstructural uses: Cold-rolled, ASTM A1008/A1008M; hot-rolled, ASTM A1011/A1011M.
 - 3. Galvanized Sheet steel: ASTM A653/A653M, with ASTM A924/A924M, Coating Designation G90, for precoated sheet; ASTM A1011/A1011M for sheet used in fabrications.
- E. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.
- F. Slotted Channel Framing: ASTM A653/A653M, Grade 33.
- G. Slotted Channel Fittings: ASTM A1011/A1011M.
- H. Fasteners: See Article Anchors, Fasteners and Accessory Materials below.
- I. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- J. Galvanizing: See requirements specified below.
- K. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- L. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- M. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 ACCESSORIES

- A. Anchors and Fasteners, General: Same material, color and finish as the metal to which applied, unless otherwise indicated.
- B. Exterior Exposure: Provide stainless steel.
- C. Type, Size and Spacing: Unless otherwise indicated, provide fasteners of type, grade and class required for intended use and sized and spaced as required for loads and substrate.
- D. Screw Head, Typical: Unless otherwise noted, exposed screws shall be phillips oval or flat head, countersunk.
- E. Standard Bolts and Nuts, Steel: ASTM A307, Grade A, hexagonal head.
- F. Lag Screws and Bolts, Steel: ASME B18.2.1, type and grade best suited for the purpose, hexagonal or square head.
- G. Plain Steel Screws: FS FF-S-85, FS FF-S-92 and FS FF-S-111; type and grade best suited for the purpose.
- H. Self-Drilling Metal Screw Fasteners: TEKS by Buildex Division, Illinois Tool works, Inc.; ICC Report ESR-1976; www.itwbuildex.com.
- I. Plain Steel Washers: FS FF-W-92, round, carbon steel.
- J. Lock Washers: FS FF-W-84, helical spring, carbon steel.
- K. Fiber Plugs, Lead Expansion Shields and Screws: Not permitted.
- L. Anchors and/or Dowels Installed with Adhesives: See notes on Structural Drawings.

- M. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.
- N. Shop Primer Paint:
 - 1. Shop primer, general: Coordinate primer with finish paint and coating, as applicable, to provide sound foundation for field-applied topcoats despite prolonged exposure during construction.
 - 2. Shop primer for ferrous metal at exposed exterior locations: Fabricator's standard zinc-rich two-part catalyzed epoxy coating.
 - 3. Shop primer for ferrous metal at concealed exterior locations and for interior locations: Manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer, complying with performance requirements of FS TT-P-645.
 - 4. Shop primer for galvanized steel, for exposed exterior locations: Fabricator's standard two-part catalyzed epoxy coating, compatible with specified finish paints.
- O. Field Primer and Finish Paints: As specified in Section 09 91 23 Interior Painting.
- P. Bituminous Coating: High-build mineral-filled coal tar pitch coating, or a cold-applied asphalt mastic complying with ASTM D1187/D1187M, except containing no asbestos fibers.
 - 1. Basis of Design Product: H.B. Tnemecol Series 46-465 as manufactured by Tnemec, Inc., www.tnemec.com, or approved equal.
 - 2. Acceptable Manufacturers:
 - a. BASF (24 g/L).
 - b. Chemmasters.
 - c. Euclid Chemical.
 - d. Henry.
 - e. Polyguard.
 - f. W.R. Meadows, Inc.; Sealmatsic Type II (Brush-on/Spray Grade): www.wrmeadows.com
 - g. Substitutions: See Section 01 60 00 Product Requirements.
- Q. Bond Breaker Tape: Isolate dissimilar metals with Pecora 531 Bond Breaker Tape or equal.

2.03 FABRICATION

- A. Ferrous Metal Surfaces, General:
 - 1. For metal fabrications exposed to view upon completion of the Work: Provide ferrous metals materials selected for their surface flatness, smoothness, and freedom from surface blemishes.
 - 2. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
- B. Preparation Before Fabrication: Remove loose mill scale and rust and remove twists and bends in manners not injurious to materials and finishes.
- C. Fabrication: Fabricate and finish metal items in accordance with the Drawings and reviewed shop drawings.

- 1. Contractor shall verify measurements before fabrication.
- 2. Galvanize all exterior steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.
- 3. 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.
- 4. Fit and shop assemble items in largest practical sections, for delivery to site.
- 5. Prepare and reinforce fabrications as required to receive applied items and transport to site.
- D. Cutting and Fitting: Fabricate with accurate angles and surfaces, true to the required lines and levels and as required to suit installation conditions.
 - 1. Fabricate items with joints tightly fitted and secured.
 - 2. 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.
 - 3. Punch, drill and reaming in manner to leave clean, true lines and surfaces.
 - a. Oversize hole 1/16 inch by punching, when material thickness is equal to or less than bolt diameter plus 1/8 inch.
 - b. Sub-punch 1/16 inch smaller than bolt and drill or ream to oversize by 1/16 inch, when material thickness is thicker than bolt diameter plus 1/8 inch.
 - 4. Gas cutting of non-structural steel items may be acceptable where stress is not transmitted through flame-cut surfaces.
 - a. Make cuts clean and to contour.
 - b. Deduct 1/8 inch from effective width of members cut by torch.
- E. 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.
- F. Bolted and Screwed Connections:
 - 1. Provide holes and connections for work specified in other Sections.
 - 2. Use bolts for field connections only.
 - 3. Provide washers under heads and nuts bearing on wood.
 - 4. Draw all nuts tight and nick threads of permanent connections.
 - 5. Use beveled washers where bearing is on sloped surfaces.
 - 6. 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.
- G. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

- H. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- I. 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.
- J. Joints on Finished Surfaces: Provide welds ground smooth and filled.
- K. Joints Exposed to Weather or Water: Fabricate to keep water out, or provide adequate drainage of water that penetrates.
- L. 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.
- M. Coordination: Make provisions to connect metal fabrications with or to receive work specified in other Sections.

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.
 - 2. Fabricate items to sizes, shapes, and dimensions required. Provide malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.
- B. Slotted Channel Framing: Fabricate channels and fittings from structural steel complying with the referenced standards; factory-applied, rust-inhibiting thermoset acrylic enamel finish.
- C. 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 Owner Representative and Architect.

2.05 FINISHES - STEEL

- A. Prime paint all steel items. Conform to SSPC Painting Manual. Shop primer paint after fabrication all metal fabrications.
 - 1. Exceptions: Galvanize items to be embedded in concrete.
 - 2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
 - 3. Exceptions:
 - a. Do not prime stainless steel, plated steel, and anodized aluminum fabrications, unless specifically noted.

- b. Do not shop prime galvanized fabrications, unless specifically noted.
- c. Do not shop prime fabrications for which an entirely field-applied coating system is indicated.
- B. Prepare surfaces to be primed in accordance with minimum SSPC-SP2.
 - 1. Exterior fabrications: Clean in accordance with SSPC-SP 5, SSPC-SP 6, 8, or SSPC-SP 10.
 - Interior fabrications: Clean in accordance with SSPC-SP 2, SSPC-SP 3, SSPC-SP 5, SSPC-SP 6, 8, or SSPC-SP 10.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat where finish painting is to be applied.
 - 1. Shop Priming: Comply with SSPC-PA 1. Coordinate with requirements specified in Section 09 91 23 Interior Painting .
 - a. Coordinate primer with finish paint and coating, as applicable, to provide sound foundation for field-applied topcoats despite prolonged exposure during construction.
 - 1) Shop primer for ferrous metal at exposed exterior locations: Tnemec 90E-92, ethyl silicate zinc primer, or equal.
 - Tnemec Series V10, or approved equal, modified alkyd rust-inhibitive primer, or manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer, complying with performance requirements of FS TT-P-645.
 - b. Apply primer immediately following surface preparation.
 - c. Do not prime surfaces to be welded.
 - d. Do not prime surfaces in direct contact bond with concrete or mortar.
 - e. Spray apply shop prime without holidays, drips, runs.
 - f. Provide two coats where product is not to be finish painted or is to be concealed in completed work.
 - g. Apply an additional coat to corners, welds, edges, and fasteners.
 - h. Allow primer to dry and cure before handling.
- E. Shop Painting
 - 1. Shop Painting: Comply with SSPC-PA 1. Shop paint fabrications where feasible.
 - a. Apply thermosetting enamel paint, gloss or semi-gloss, of a type and color as selected and approved by Architect, if not otherwise specified.
 - b. Shop applied finish paint shall be baked to set and cure.
 - c. Allow finish paint to thoroughly dry and cure before handling.
 - 2. Steel Embedded in Concrete: Coat concealed faces with bituminous coating.
 - 3. Galvanized Pre-Treatment: Where zinc-coated surfaces are specified to be shop primed, chemically treat surfaces to provide bond for paint before applying primer.
- F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.06 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.

3.02 PREPARATION

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

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.
- F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 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.

3.05 CLEANING AND TOUCH-UP

- A. Cleaning: Perform initial cleaning immediately after completion of installation. Prepare surfaces for finish painting.
- B. Galvanizing Touch-Up: Touch up galvanizing immediately after installation, including field welding.
 - 1. Prepare surface and apply cold galvanizing compound in compliance with ASTM A780/A780M and the manufacturer's instructions and recommendations.

- C. Primer Paint Touch-Up: Touch up shop paint immediately after erection. Use products compliant with Section(s) 09 91 13 Exterior Painting and 09 91 23 Interior Painting.
 - 1. Clean exposed areas of rust, field welds, bolted joints, and areas where primer is damaged by SSPC-SP 2 hand tool cleaning or SSPC-SP 3 power-tool cleaning.
 - 2. Paint with SSPC-Paint 15 (interior) or SSPC-Paint 20 (exterior) compliant material used for shop painting, minimum 3 mils dry film thickness.

END OF SECTION

SECTION 07 05 53

FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.02 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.
- C. Schedule: Completely define scope of proposed marking, and indicate location of affected walls and partitions, and number of markings.
- D. Samples: Submit two samples of each type of marking proposed for use, of size similar to that required for project, illustrating font, wording, and method of application.

1.03 QUALITY ASSURANCE

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

1.04 FIELD CONDITIONS

A. Do not install adhered markings when ambient temperature is lower than recommended by label or sign manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Partition Identification Labels:
 - 1. Fire Wall Signs, Inc: www.firewallsigns.com.
 - 2. Safety Supply Warehouse, Inc: www.safetysupplywarehouse.com.
 - 3. Substitutions: See Section 01 60 00 Product Requirements.

2.02 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

- A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of the building code.
- B. Adhered Fire and Smoke Assembly Identification Signs: Printed vinyl or paper sign with factory applied adhesive backing.
- C. Languages: Provide sign markings in English.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

- A. Locate markings as required by CBC Section 703.7.
- B. Install adhered markings in accordance with manufacturer's instructions.
- C. Install neatly, with horizontal edges level.
- D. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION

SECTION 07 84 00 FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 70 00 Execution and Closeout Requirements: Cutting and patching.

1.03 REFERENCE STANDARDS

- A. California Building Code: Section 714 Penetrations and 715 Fire Resistant Joint Systems.
- B. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.
- C. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials; 2018c.
 - 1. Use 2012a as indicated in 2016 CBC Referenced Standards.
- D. ASTM E814 Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
 - 1. Use 2013 as indicated in 2016 CBC Referenced Standards.
- E. ASTM E1966 Standard Test Method for Fire-Resistive Joint Systems; 2015.
 - 1. Use 2007a as indicated in 2016 CBC Referenced Standards.
- F. ASTM E2174 Standard Practice for On-Site Inspection of Installed Firestops; 2018.
 - 1. Use 2010ae1 as indicated in 2016 CBC Referenced Standards.
- G. ASTM E2393 Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2010a (Reapproved 2015).
 - 1. Use 2010ae1 as indicated in 2016 CBC Referenced Standards.
- H. ASTM E2307 Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2015b, with Editorial Revision (2016).
 - 1. Use 2010 as indicated in 2016 CBC Referenced Standards.
- I. ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- J. ITS (DIR) Directory of Listed Products; current edition.
- K. FM 4991 Approval Standard for Firestop Contractors; 2013.
- L. FM (AG) FM Approval Guide; current edition.

- M. Firestop Contractors International Association (FCIA): M.O.P. Manual of Practice.
- N. International Firestop Council (IFC); www.firestop.org:
 - 1. Reference 1: Recommended IFC Guidelines for Evaluating Firestop Engineering Judgments.
 - 2. Reference 2: Inspectors Pocket Guide; Fifth Edition.
- O. NFPA 101 Life Safety Code; 2015.
 - 1. Use 2015 as indicated in 2016 CBC Referenced Standards.
- P. SCAQMD 1168 Adhesive and Sealant Applications; 1989 (Amended 2017).
- Q. UL 1479 Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
 - 1. Use 2003 as indicated in 2016 CBC Referenced Standards.
- R. UL 2079 Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.
 - 1. Use 2004 as indicated in 2016 CBC Referenced Standards.
- S. UL (DIR) Online Certifications Directory; Current Edition.
- T. UL (FRD) Fire Resistance Directory; Current Edition.
 - 1. UL runs ASTM E814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually with a midyear supplement.
 - 2. Through-Penetration Firestop Devices (XHCR)
 - 3. Fire Resistance Ratings (BXUV)
 - 4. Through-Penetration Firestop Systems (XHEZ)
 - 5. Fill, Voids, or Cavity Material (XHHW)
 - 6. Forming Materials (XHKU)
- U. UL Qualified Firestop Contractor Program

1.04 SUBMITTALS

- A. See Section 01 30 00 Administrative Requirements, for submittal procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- D. Sustainable Design Submittal: Submit VOC content documentation for all non-preformed materials.
- E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Certificate from authority having jurisdiction indicating approval of materials used.
- H. Installer Qualification: Submit qualification statements for installing mechanics.

1.05 QUALITY ASSURANCE

- A. Provide products for all trades from the same manufacturer to the greatest extent possible and from the same supplier/distributor.
- B. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
 - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
 - 3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
 - 1. One firestop manufacturer shall be used for the entirety of applications on this project unless otherwise approved by the Architect. The manufacturer will be required to furnish UL tested systems for all applications pertaining to the project, in addition to material safety data sheets and all other relevant information.
 - a. Materials of different manufacture than allowed by the tested and listed system shall not be intermixed in the same firestop system or opening.
 - b. Tested and listed firestop systems are to be used before an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) is installed.
 - 2. A manufacturer's knowledgeable direct representative (manufacturer authorized; distributor, independent representative, manufacturer's representative, or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.
- D. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Trained by manufacturer.
 - 2. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
 - a. UL Qualified Firestop Contractor
 - b. Verification of minimum three years documented experience installing work of this type.
 - c. Shown to have successfully completed not less than 5 comparable scale projects.
 - d. Verification of at least five satisfactorily completed projects of comparable size and type.
 - e. Firestop Contractors International Association Contractor Member in good standing.
 - f. Licensed by local authorities having jurisdiction (AHJ).

1.06 MOCK-UP

A.Install one firestopping assembly representative of each fire rating design required on project.Glendale Unified School DistrictFIRESTOPPINGGlendale HS Chiller Replacement07 84 00 - 3tBP/Architecture Project 20916.0207 84 00 - 3

- 1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
- B. Obtain approval of authorities having jurisdiction (AHJ) before proceeding.
- C. If accepted, mock-up will represent minimum standard for the Work.
- D. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.07 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Firestopping Manufacturers:
 - 1. Basis of Design: Specified Technologies, Inc: www.stifirestop.com/#sle.
 - 2. 3M Fire Protection Products: www.3m.com/firestop.
 - 3. A/D Fire Protection Systems Inc: www.adfire.com.
 - 4. Hilti, Inc: www.us.hilti.com/#sle.
 - 5. Nelson FireStop Products: www.nelsonfirestop.com.
 - 6. Rectorseal; Bio FireShield and Metacaulk Systems: www.rectorseal.com.
 - 7. Tremco Commercial Sealants & Waterproofing; TREMstop Acrylic: www.tremcosealants.com/#sle.
 - 8. Substitutions: See Section 01 60 00 Product Requirements.

2.02 REGULATORY REQUIREMENTS

- A. Firestop System installation must meet requirements of ASTM E814, ASTM E2307, ASTM E1966 and UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.
 - 1. Positive pressure in accordance with California Building Code (CBC) for ratings. Reference: CBC Section 714.3.1.2.
 - 2. Comply with UL Standard 2079 for top of wall assemblies.
 - 3. Conform to CBC Section 714.3.1.1 and 714.3.2.
- B. For those firestop applications that exist for which no UL tested system is available through any manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council (September 7, 1994).

2.03 MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.
- C. Mold and Mildew Resistance: Provide firestoppping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.
- D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- E. Fire Ratings: Refer to drawings for required systems and ratings.

2.04 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
 - 1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
 - 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 - 3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
 - 4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.05 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

- A. Penetrations Through Floors or Walls By:
 - 1. Multiple Penetrations in Large Openings:
 - a. 2 Hour Construction: UL System C-AJ-8143; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - b. 2 Hour Construction: UL System C-AJ-8035; Specified Technologies Inc. SSM mortar.
 - c. 2 Hour Construction: UL System C-AJ-8055; Specified Technologies Inc. SSP Firestop Putty.
 - d. 2 Hour Construction: UL System C-AJ-8114; Specified Technologies Inc. SSM mortar.
 - e. 2 Hour Construction: UL System C-AJ-8115; Specified Technologies Inc. SSM mortar.
 - f. 2 Hour Construction: UL System C-AJ-8220; Specified Technologies Inc. SSM mortar.
 - 2. Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction, 2-1/2 inch minimum concrete: UL System C-AJ-1353; F Rating:
 3 Hour; SpecSeal LCI Sealant, optional steel sleeve.
 - b. 2 Hour Construction, 4-1/2 inch minimum concrete: UL System C-AJ-1616; F Rating:
 2 Hour; SpecSeal LCI Sealant, optional steel sleeve.
 - 3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction, 4-1/2 inch minimum concrete: UL System C-AJ-2031; F Rating:
 3 Hour; T Rating: 2 Hour; SpecSeal LCI Sealant.
 - b. 2 Hour Construction, 4-1/2 inch minimum concrete: UL System C-AJ-2064; F Rating:
 2 & 3 Hour; T Rating: 2 & 3 Hour; SpecSeal BLU Wrap Strip.

- c. 2 Hour Construction, 2-1/2 inch minimum concrete: UL System C-AJ-2166; F Rating:
 2 Hour; T Rating: 0 & 1 Hour; SpecSeal RED2 Wrap Strip.
- d. 2 Hour Construction, 4-1/2 inch minimum concrete: UL System C-AJ-2574; F Rating:
 2 Hour; T Rating: 0 Hour; SpecSeal Series SSS Sealant, SpecSeal LCI Sealant, Pensil
 300 Sealant or SpecSeal Series SIL300 Sealant for floors or walls and Pensil 300 S/L
 Sealant or SpecSeal Series SIL300SL Sealant for floors only, optional steel sleeve.
- e. 2 Hour Construction, 4-1/2 inch minimum concrete: UL System C-AJ-2576; F Rating:
 2 Hour; T Rating: 1/4 Hour; SpecSeal Series SSS Sealant or SpecSeal LCI Sealant, optional steel sleeve.
- 4. Electrical Cables Not In Conduit:
 - a. 2 Hour Construction, 4-1/2 inch minimum concrete: UL System C-AJ-3128; F Rating:
 3 Hour; T Rating: 0 Hour; SpecSeal 100, 101, 102 or 105 Sealant, optional steel sleeve.
 - b. 2 Hour Construction with EZ Path, 4-1/2 inch minimum concrete: UL System
 C-AJ-3260; F Rating: 2 Hour; T Rating: 0 and 1/2 Hour; Firestop Device: EZ PATH
 Series 44+ Fire Rated Pathway, optional steel sleeve.
 - 1) When cable fill within the device is min 0 percent (empty) to max 20 percent, the T. FT and FTH Ratings are 0 Hr. When cable fill within the device is greater than 20 percent, the T, FT and FTH Ratings are 1/2 Hr.
- 5. Cable Trays with Electrical Cables:
 - a. 2 Hour Construction: UL System C-AJ-4094; Hilti CFS-BL Firestop Block.
- 6. Insulated Pipes:
 - a. 2 Hour Construction, 4-1/2 inch minimum concrete: UL System C-AJ-5029; F Rating:
 3 Hour; T Rating: 1 Hour; SpecSeal 100, 101, 102 or 105 Sealant.
 - b. 2 Hour Construction, 4-1/2 inch minimum concrete: UL System C-AJ-5112; F Rating: 1-1/2 Hour; T Rating: 3/4 Hour; SpecSeal 100, 101, 102 or 105 Sealant, optional steel sleeve.

2.06 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

- A. Penetrations By:
 - 1. Penetrations by Structural Struts, Cables or Threaded Rod:
 - a. 1 and 2 Hour Wall Construction: UL System W-L-7136; F Rating: 1 and 2 Hour; T Rating: 0 Hour; SpecSeal Series SSS Sealant, SpecSeal LCI Sealant, SpecSeal LC150 Sealant, or SpecSeal LE600 Sealant.
 - 2. Multiple Penetrations in Large Openings:
 - a. 1, 2, 3, and 4 Hour Wall Construction with EZ Path: UL System W-L-3377; F Rating: 1, 2, 3, and 4 Hour; T Rating: 0, 1/2, 3/4, 1, 1-1/2, and 2 Hour; Firestop Device: EZ PATH Series 22, 33 or 44+ Fire Rated Pathway, optional steel sleeve.
 - b. 1 and 2 Hour Wall Construction: UL System W-L-8026; F Rating: 1 and 2 Hour; T Rating: 0, 1/2, 1, 1-3/4 and 2 Hour; mineral wool packing with SpecSeal Series SSS Sealant or SpecSeal LCI Sealant.
 - c. 1 and 2 Hour Wall Construction: UL System W-L-1168; F Rating: 1 and 2 Hour; T Rating: 1/4, 3/4 and 1 Hour; SpecSeal LC150 Sealant, SpecSeal Series SSS Sealant or SpecSeal LCI Sealant.

- d. 1 and 2 Hour Wall Construction: UL System W-L-3214; F Rating: 1 and 2 Hour; T Rating: 1/4, 3/4 and 1 Hour; SpecSeal LC150 Sealant, SpecSeal Series SSS Sealant or SpecSeal LCI Sealant.
- e. 1 and 2 Hour Wall Construction: UL System W-L-8027; F Rating: 1 and 2 Hour; T Rating: 1/4 Hour; SpecSeal LCI Sealant.
- 3. Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 1 and 2 Hour Wall Construction: UL System W-L-1049; F Rating: 1 and 2 Hour; T Rating: 0 Hour; SpecSeal Series SSS Sealant or SpecSeal LCI Sealant.
 - b. 1 and 2 Hour Wall Construction: UL System W-L-1222; F Rating: 1 and 2 Hour; T Rating: 1/4, 3/4 and 1 Hour; SpecSeal LCI Sealant.
 - c. 1 and 2 Hour Wall Construction: UL System W-L-1049; F Rating: 1 and 2 Hour; T Rating: 0 Hour; SpecSeal 100, 101, 102, 105, 120 or 129 Sealant, SpecSeal LCI Sealant.
- 4. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
 - a. 1 and 2 Hour Wall Construction with pipe clamp ring: UL System W-L-2029; F Rating: 1 and 2 Hour; T Rating: 1, 1-1/2 and 2 Hour; SpecSeal Firestop Collar, SpecSeal LCC Collar.
 - b. 1 and 2 Hour Wall Construction: UL System W-L-2100; F Rating: 1 and 2 Hour; T Rating: 0, 1/4, 1 and 1-1/2 Hour; SpecSeal Series SSS Sealant or SpecSeal LCI Sealant.
 - c. 1 and 2 Hour Wall Construction: UL System W-L-2241; F Rating: 1 and 2 Hour; T Rating: 0, 1/4, 1, and 1-3/4 Hour; SpecSeal LCI Sealant.
 - d. 1 and 2 Hour Wall Construction: UL System W-L-2548; F Rating: 1 and 2 Hour; T Rating: 0 Hour; SpecSeal LCI Sealant or SpecSeal Series SSS Sealant.
- 5. Electrical Cables Not In Conduit:
 - a. 1 and 2 Hour Wall Construction: UL System W-L-3169; F Rating: 1 and 2 Hour; T Rating: 1/4 and 3/4 Hour; SpecSeal LCI Sealant.
 - b. 1 and 2 Hour Wall Construction: UL System W-L-3210; F Rating: 1 and 2 Hour; T Rating: 3/4 Hour; mineral wool packing with SpecSeal Series SSS Sealant, SpecSeal LCI Sealant or SpecSeal Putty.
- 6. Cable Trays with Electrical Cables:
 - a. 2 Hour Construction: UL System W-L-4011; Hilti CFS-BL Firestop Block.
 - b. 1 and 2 Hour Wall Construction: UL System W-L-4074; F Rating: 1 and 2 Hour; T Rating: 1/4, 1/2, 1 and 1-1/4 Hour; mineral wool packing with SpecSeal LCI Sealant.
 - c. 1 Hour Construction: UL System W-L-4011; Hilti CFS-BL Firestop Block.
- 7. Insulated Pipes:
 - a. 1 and 2 Hour Wall Construction: UL System W-L-5014; F Rating: 1 and 2 Hour; T Rating: 1 Hour; SpecSeal Series SSS Sealant or SpecSeal LCI Sealant.
 - b. 1 and 2 Hour Wall Construction: UL System W-L-5054; F Rating: 1 and 2 Hour; T Rating: 3/4 and 1 Hour; SpecSeal Series SSS Sealant or SpecSeal LCI Sealant.
 - c. 1 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - d. 1 Hour Construction: UL System W-L-5029; Hilti FS-ONE Intumescent Firestop Sealant.

- e. 1 Hour Construction: UL System W-L-5096; Hilti FS-ONE Intumescent Firestop Sealant.
- f. 1 Hour Construction: UL System W-L-5096; Hilti FS-ONE Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, or CP 601S Elastomeric Firestop Sealant.
- 8. HVAC Ducts, Uninsulated:
 - a. 1 and 2 Hour Wall Construction with up to 100 x 100 inch duct: UL System
 W-L-7025; F Rating: 1 and 2 Hour; T Rating: 1/2 Hour; Polyethylene backer rod or
 mineral wool packing with SpecSeal Series SSS Sealant, SpecSeal LCI Sealant,
 SpecSeal LC150 Sealant or SpecSeal LE 600 Sealant.
 - b. 1 and 2 Hour Wall Construction with up to 24 inch round duct: UL System W-L-7026; F Rating: 1 and 2 Hour; T Rating: 0 Hour; Polyethylene backer rod or mineral wool packing with SpecSeal Series SSS Sealant, SpecSeal LCI Sealant, SpecSeal LC150 Sealant or SpecSeal LE 600 Sealant.
 - c. 1 and 2 Hour Wall Construction with up to 24 x 24 inch duct: UL System W-L-7029; F Rating: 1 and 2 Hour; T Rating: 1/4 Hour; Polyethylene backer rod or mineral wool packing with SpecSeal Series SSS Sealant, SpecSeal LCI Sealant, SpecSeal LC150 Sealant or SpecSeal LE 600 Sealant.
- 9. HVAC Ducts, Insulated:
 - a. 1 and 2 Hour Wall Construction with up to 20 inch round duct: UL System W-L-7179;
 F Rating: 1 and 2 Hour; T Rating: 3/4 Hour; SpecSeal Series SSS Sealant, or SpecSeal LCI Sealant.
 - b. 1 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.07 FIRESTOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.
 - 1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.01 SEQUENCING AND SCHEDULING

- A. Project coordination is essential to inform and educate all the parties involved with the firestopping process of their role and how they can affect firestopping on the project. A pre-construction meeting shall be scheduled and required for all parties involved prior to the start of construction.
- B. Do not cover up firestopping installations until District's inspection agency or the Authorities Having Jurisdiction have examined each installation.

3.02 EXAMINATION

A. Verify openings are ready to receive the work of this section.

- B. Pre-Installation Inspection: Inspect all fire and smoke barriers for penetrations of any type; mark or otherwise identify all penetrations indicating action required: 1) repair; 2) firestopping; or 3) smokestopping.
 - 1. Conduct inspection prior to covering up or enclosing walls or ceilings.
 - 2. Conduct inspection jointly with authorized representative of authority having jurisdiction.
- C. If the configuration of a particular penetration does not conform to the configuration necessary for the required firestopping assembly:
 - 1. Notify the installer of the penetration for modification of the configuration to suit the assembly.
 - 2. Do not use the firestopping assembly in other configurations except as specifically stated in the test report or as approved by the authority having jurisdiction.

3.03 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to prevent liquid material from leakage.
- D. Priming:
 - 1. Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods.
 - 2. Confine primers to areas of bond.
 - 3. Do not allow spillage and migration onto exposed surfaces.
- E. Masking Tape:
 - 1. Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work.
 - 2. Remove tape as soon as it is possible to do so without disturbing the firestopping seal with substrates.
- F. Verify that system components are clean, dry, and ready for installation.
- G. Verify that field dimensions are as shown on the Drawings and as recommended by the manufacturer.
- H. Prepare penetrations in accordance with the material manufacturer's instructions.
- I. Ventilation: Ventilate per firestopping manufacturers' instructions or Material Safety Data Sheet (MSDS).

3.04 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
 - 1. Provide all accessory materials.
- B. Do not cover installed firestopping until inspected by District's Independent Testing Agency.

- C. Penetration Firestops:
 - 1. Coordinate with other trades to assure that all pipes, conduit, cable, and other items, which penetrate fire rated construction, have been permanently installed prior to installation of firestop assemblies.
 - 2. Schedule the work to assure that partitions and all other construction that conceals penetrations are not erected prior to the installation of firestop and smoke seals.
 - 3. Install forming/damming materials and other accessories in accordance with manufacturers written instructions.
 - 4. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
 - a. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
 - b. Install materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 5. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces
- D. Remove combustible forming materials, unless they are a required component of the tested assembly.
- E. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- F. Install labeling required by code; 07 05 53 Fire and Smoke Assembly Identification.
 - 1. Near fire and smoke barriers, mark each exposed penetration with label identifying it as a fire-stopped or smoke-stopped assembly.

3.05 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Inspection agency employed and paid by District, will examine penetration firestopping in accordance with ASTM E2174, and ASTM E2393.
- B. The inspector shall advise the Contractor of any deficiencies noted within one (1) working day.
- C. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.
- D. Do not proceed to enclose firestopping with other construction until inspection agency has verified that the firestop installation complies with the requirements.
- E. Submit report of inspection to the Owner Representative and Architect.

3.06 CLEANING

- A. Hazardous disposal of firestop materials shall be strictly observed as noted on the individual MSDS.
- B. Clean adjacent surfaces of firestopping materials.
 - 1. Clean up excess material adjacent to penetrations promptly; use methods and materials approved by the manufacturers of the penetration seals and of surfaces to be cleaned.

3.07 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.
- B. Protect firestopping during and after curing period from contact with contaminating substances.
- C. Protect installed Work from damage from construction operations using substantial barriers as necessary.
- D. Repair damaged materials in accordance with manufacturer's instructions.

END OF SECTION

SECTION 07 92 00 JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Joint backings and accessories.
- C. 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.
- B. Section 07 84 00 Firestopping: Firestopping sealants.

1.03 REFERENCE STANDARDS

- A. ASTM C661 Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015.
- B. ASTM C794 Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants; 2018.
- C. ASTM C834 Standard Specification for Latex Sealants; 2017.
- D. ASTM C920 Standard Specification for Elastomeric Joint Sealants; 2018.
- E. ASTM C1087 Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2016.
- F. ASTM C1193 Standard Guide for Use of Joint Sealants; 2016.
- G. ASTM C1311 Standard Specification for Solvent Release Sealants; 2014.
- H. ASTM C1330 Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2018.
- I. ASTM C1521 Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2013.
- J. SWRI (VAL) SWR Institute Validated Products Directory; Current Edition.

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.
- 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. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- G. Installation Plan: Submit at least four weeks prior to start of installation.
- H. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.
- I. Field Quality Control Plan: Submit at least two weeks prior to start of installation.
- J. 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.
- K. Installation Log: Submit filled out log for each length or instance of sealant installed.
- L. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

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. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
 - 1. Adhesion Testing: In accordance with ASTM C794.
 - 2. Compatibility Testing: In accordance with ASTM C1087.
 - 3. Allow sufficient time for testing to avoid delaying the work.

- 4. Deliver to manufacturer sufficient samples for testing.
- 5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
- 6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.
- E. Installation Plan: Include schedule of sealed joints, including the following.
 - 1. Joint width indicated in contract documents.
 - 2. Joint depth indicated in contract documents; to face of backing material at centerline of joint.
 - 3. Method to be used to protect adjacent surfaces from sealant droppings and smears, with acknowledgement that some surfaces cannot be cleaned to like-new condition and therefore prevention is imperative.
 - 4. Approximate date of installation, for evaluation of thermal movement influence.
 - 5. Installation Log Form: Include the following data fields, with known information filled out.
 - a. Unique identification of each length or instance of sealant installed.
 - b. Location on project.
 - c. Substrates.
 - d. Sealant used.
 - e. Stated movement capability of sealant.
 - f. Primer to be used, or indicate as "No primer" used.
 - g. Size and actual backing material used.
 - h. Date of installation.
 - i. Name of installer.
 - j. Actual joint width; provide space to indicate maximum and minimum width.
 - k. Actual joint depth to face of backing material at centerline of joint.
 - I. Air temperature.
- F. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
 - 1. Identification of testing agency.
 - 2. Name(s) of sealant manufacturers' field representatives who will be observing
 - 3. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
 - a. Substrate; if more than one type of substrate is involved in a single joint, provide two entries on form, for testing each sealant substrate side separately.
 - b. Test date.
 - c. Location on project.
 - d. Sealant used.

- e. Stated movement capability of sealant.
- f. Test method used.
- g. Date of installation of field sample to be tested.
- h. Date of test.
- i. Copy of test method documents.
- j. Age of sealant upon date of testing.
- k. Test results, modeled after the sample form in the test method document.
- I. Indicate use of photographic record of test.
- G. 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.
- H. Field Quality Control Plan:
 - 1. Visual inspection of entire length of sealant joints.
 - 2. Non-destructive field adhesion testing of sealant joints, except interior acrylic latex sealants.
 - a. For each different sealant and substrate combination, allow for one test every 12 inches in the first 10 linear feet of joint and one test every 24 inches thereafter.
 - b. If any failures occur in the first 10 linear feet, continue testing at 12 inch intervals at no extra cost to District.
 - 3. Destructive field adhesion testing of sealant joints, except interior acrylic latex sealant.
 - a. For each different sealant and substrate combination, allow for one test every 100 feet in the first 1000 linear feet, and one test per 1000 linear feet thereafter, or once per floor on each elevation.
 - b. If any failures occur in the first 1000 linear feet, continue testing at frequency of one test per 500 linear feet at no extra cost to District.
 - 4. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.
- I. 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.
 - 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.
- J. Non-Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Spot Method.
 - 1. Record results on Field Quality Control Log.
 - 2. Repair failed portions of joints.
- K. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
 - 1. Sample: At least 18 inch 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.
- L. 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.
 - 2. Bostik Inc: www.bostik-us.com.
 - 3. Dow Corning Corporation: www.dowcorning.com/construction/sle.
 - 4. Fortifiber Building Systems Group: www.fortifiber.com/sle.

- 5. Hilti, Inc: www.us.hilti.com/#sle.
- 6. Master Builders Solutions by BASF: www.master-builders-solutions.basf.us/en-us/#sle.
- 7. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com/sle.
- 8. Pecora Corporation: www.pecora.com.
- 9. The QUIKRETE Companies: www.quikrete.com.
- 10. Sherwin-Williams Company: www.sherwin-williams.com.
- 11. Sika Corporation: www.usa-sika.com.
- 12. Specified Technologies Inc: www.stifirestop.com/#sle.
- 13. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
- 14. W.R. Meadows, Inc: 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.
 - 2. Bostik Inc: www.bostik-us.com.
 - 3. Dayton Superior Corporation: www.daytonsuperior.com.
 - 4. Dow Corning Corporation: www.dowcorning.com/construction/sle.
 - 5. Master Builders Solutions by BASF: www.master-builders-solutions.basf.us/en-us/#sle.
 - 6. Pecora Corporation: www.pecora.com.
 - 7. The QUIKRETE Companies: www.quikrete.com.
 - 8. Sherwin-Williams Company: www.sherwin-williams.com.
 - 9. Sika Corporation: www.usa-sika.com.
 - 10. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
 - 11. W.R. Meadows, Inc: 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.
 - b. Joints between door, window, and other frames and adjacent construction.
 - c. Joints between different exposed materials.
 - d. Openings below ledge angles in masonry.
 - e. 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. 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, unless otherwise indicated.
 - 1. Type SM-1 Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
 - 2. Type SM-1 Lap Joints between Manufactured Metal Panels: Butyl rubber, non-curing.
- C. Type IP-1 Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
 - 1. Type IA-1 Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
 - 2. Type WP-1 Wall and Ceiling Joints in Wet Areas: Non-sag polyurethane sealant for continuous liquid immersion.
 - 3. Type WP-1 Floor Joints in Wet Areas: Non-sag polyurethane "non-traffic-grade" sealant suitable for continuous liquid immersion.
 - 4. Wall, Ceiling, and Floor Joints Where Tamper-Resistance is Required: Non-sag tamper-resistant silyl-terminated polyurethane sealant.
 - 5. Type FS-1 Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
- D. Interior Wet Areas: restrooms and kitchens; fixtures in wet areas include plumbing fixtures, countertops, cabinets, and other similar items.
- E. Areas Where Tamper-Resistance is Required: As indicated on drawings.

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.

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 65 to 180 degrees F.
- 6. Manufacturers:
 - a. Dow Chemical Company; 790 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - b. Dow Chemical Company; 791 Silicone Weatherproofing Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - c. Dow Chemical Company; 795 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - d. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com/sle.
 - e. Pecora Corporation: www.pecora.com.
 - f. Sika Corporation; Sikasil WS-290: www.usa-sika.com/#sle.
 - g. Sika Corporation; Sikasil WS-295: 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. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Color: To be selected by Architect from manufacturer's full range.
 - 3. Cure Type: Single-component, neutral moisture curing
 - 4. Service Temperature Range: Minus 65 to 180 degrees F.
 - 5. Manufacturers:
 - a. Fortifiber Building Systems Group; Moistop Sealant: www.fortifiber.com/#sle.
 - b. Dow Chemical Company; 758 Silicone Weather Barrier Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - c. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com/sle.
 - d. Pecora Corporation: www.pecora.com.
 - e. Sherwin-Williams Company; Silicone Rubber All Purpose Sealant: www.sherwin-williams.com/#sle.
 - f. Sika Corporation; Sikasil GP: 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.
 - 2. Manufacturers:
 - a. BASF Construction Chemicals-Building Systems; OmniPlus, by Sonneborn Building Products Div.: www.buildingsystems.basf.com.
 - b. Dow Corning Corporation; 786 Silicone Sealant: www.dowcorning.com.

- c. Momentive Performance Materials, Inc (GE Silicones products); Silpruf SCS 1700 Sanitary: www.momentive.com.
- d. Pecora Corporation: www.pecora.com.
- e. Sika Corporation; Sikasil GP: 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. Movement Capability: Plus and minus 35 percent, minimum.
 - 2. Hardness Range: 20 to 40, 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. Sherwin-Williams Company; Stampede 100 Low-Modulus Hybrid Urethane Sealant: www.sherwin-williams.com/#sle.
 - b. Substitutions: See Section 01 60 00 Product Requirements.
- E. Tamper-Resistant, Silyl-Terminated Polyurethane (STPU) Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 12-1/2 percent, minimum
 - 2. Hardness Range: 25 to 30, 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. Pecora Corporation: www.pecora.com.
 - b. Sika Corporation; SikaHyflex-150 LM: www.usa-sika.com/#sle.
 - c. Substitutions: See Section 01 60 00 Product Requirements.
- F. 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. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Hardness Range: 20 to 35, 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. The QUIKRETE Companies; QUIKRETE® Polyurethane Non-Sag Sealant: www.quikrete.com/#sle.
 - b. Sherwin-Williams Company; Stampede-1/-TX Polyurethane Sealant: www.sherwin-williams.com/#sle.
 - c. Sika Corporation; Sikaflex-1a: www.usa-sika.com/#sle.

- d. Sika Corporation; Sikaflex-15 LM: www.usa-sika.com/#sle.
- e. W. R. Meadows, Inc; POURTHANE NS: www.wrmeadows.com/#sle.
- f. Substitutions: See Section 01 60 00 Product Requirements.
- G. Type WP-1 Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface.
 - 1. Movement Capability: Plus and minus 35 percent, minimum.
 - 2. Hardness Range: 20 to 35, 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; Sikaflex-1a: www.usa-sika.com/#sle.
 - b. Substitutions: See Section 01 60 00 Product Requirements.
- H. 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. Hardness Range: 40 to 50, 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.
- I. Tamper-Resistant Polyurethane Sealant: ASTM C920, Grade NS, Uses M, G, and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 12-1/2 percent, minimum.
 - 2. Hardness Range: 50 to 60, 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.
- J. Epoxy 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: 65 to 75, 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. Pecora Corporation: www.pecora.com.
 - b. Substitutions: See Section 01 60 00 Product Requirements.
- K. Polysulfide Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.

- 3. Color: To be selected by Architect from manufacturer's full range.
- 4. Manufacturers:
 - a. Pecora Corporation: www.pecora.com.
 - b. W.R. Meadows, Inc; Deck-O-Seal Gun Grade: www.wrmeadows.com/#sle.
 - c. Substitutions: See Section 01 60 00 Product Requirements.
- L. Polysulfide Sealant for Continuous Water Immersion: Polysulfide; ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; not expected to withstand traffic.
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Hardness Range: 20 to 35, 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. Pecora Corporation; Synthacalk GC2+: www.pecora.com/#sle.
 - b. W.R. Meadows, Inc; Deck-O-Seal Gun Grade: www.wrmeadows.com/#sle.
 - c. Substitutions: See Section 01 60 00 Product Requirements.
- M. Acrylic-Urethane Sealant: Water-based; ASTM C920, Grade NS, Uses M and A; single component; paintable; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 12-1/2 percent, minimum.
 - 2. Hardness Range: 20 to 40, Shore A, when tested in accordance with ASTM C661.
 - 3. Color: White.
 - 4. Service Temperature Range: Minus 40 to 180 degrees F.
 - 5. Manufacturers:
 - a. Sherwin-Williams Company; Shermax Urethanized Elastomeric Sealant: www.sherwin-williams.com/#sle.
 - b. Substitutions: See Section 01 60 00 Product Requirements.
- N. Type IA-1 Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
 - 1. Color: To be selected by Architect from manufacturer's full range.
 - 2. Grade: ASTM C834; Grade Minus 18 Degrees C.
 - 3. Manufacturers:
 - a. Hilti, Inc; CP 506 Smoke and Acoustical Sealant: www.us.hilti.com/#sle.
 - b. Hilti, Inc; CP 572 Smoke and Acoustical Spray Sealant: www.us.hilti.com/#sle.
 - c. Pecora Corporation: www.pecora.com.
 - d. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
 - e. Specified Technologies Inc; Smoke N' Sound Acoustical Sealant: www.stifirestop.com/#sle.
 - f. Substitutions: See Section 01 60 00 Product Requirements.

O. Non-Curing Butyl Sealant: Solvent-based; ASTM C1311; single component, non-sag, non-skinning, non-hardening, non-bleeding; vapor-impermeable; intended for fully concealed applications.

2.05 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 Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type C Closed Cell Polyethylene.
 - 2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B Bi-Cellular Polyethylene.
 - 3. 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 7 days in advance.
 - 3. Arrange for sealant manufacturer's technical representative to be present during tests.
 - 4. Record each test on Preinstallation Adhesion Test Log as indicated.
 - 5. 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.
 - 6. 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.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

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. 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.
- D. Install bond breaker backing tape where backer rod cannot be used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- F. 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.
- G. 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.

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

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 SCOPE

- A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to, the following:
 - 1. Examine all other Sections for work related to those other Sections and required to be included as work under this Section.
 - 2. Electrical General Provisions and Requirements for electrical work.
 - 3. Division-1; General Requirements; General Conditions.
- B. Organization of the Specifications into Divisions, Sections and Articles, and arrangement of Drawings shall not control the Contractor in dividing the Contract Work among Sub-Contractors or in establishing the extent of work to be performed by any trade.

1.02 GENERAL SUMMARY OF ELECTRICAL WORK

- A. The Specifications and Drawings are intended to cover a complete installation of systems. The omission of expressed reference to any item of labor or material for the proper execution of the work in accordance with present practice of the trade shall not relieve the Contractor from providing such additional labor and materials.
- B. Refer to the Drawings and Shop Drawings of other trades for additional details, which affect the proper installation of this work. Diagrams and symbols showing electrical connections are diagrammatic only. Wiring diagrams do not necessarily show the exact physical arrangement of the equipment.
- C. Before submitting a bid, the Contractor shall become familiar with all features of the Building Drawings and Site Drawings, which may affect the execution of the work. No extra payment will be allowed for failure to obtain this information.
- D. If there are omissions or conflicts between the Drawings and Specifications, clarify these points with the District's Representative before submitting bid and before commencing work.
- E. Provide work and material in conformance with the Manufacturer's published recommendations for respective equipment and systems.

1.03 LOCATIONS OF EQUIPMENT

A. The Drawings indicate diagrammatically the desired locations or arrangements of conduit runs, outlets, equipment, etc., and are to be followed as closely as possible. Proper judgment must be exercised in executing the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structure conditions encountered.

- B. Where outlets are placed on a wall, locate symmetrically with respect to each other, furniture, cabinets, and other features or finishes on the wall.
- C. In the event changes in the indicated locations or arrangements are necessary, due to developed conditions in the building construction or rearrangement of furnishings or equipment, such changes shall be made without cost to the Contract, providing the change is ordered before the conduit runs, etc., and work directly connected to same is installed and no extra materials are required.
- D. Lighting fixtures in mechanical spaces are shown in their approximate location only. Do not install light outlets or fixtures until mechanical piping and ductwork is installed; then install lights in a location to provide best lighting.
- E. Coordinate and cooperate in every way with other trades in order to avoid interference and assure a satisfactory job.
- F. The location of the existing utilities, building, equipment and conduit shown on the Drawings is approximate. Verify exact locations and routing of existing systems by potholing all trench routes prior to digging the trench. Pothole at least 100 feet ahead of the actual trenching to allow space to alter the new conduit routing to accommodate existing conditions.
- G. Underground Detection Services Existing Utility Structures
 - 1. Detection/location services shall be provided utilizing the latest detection equipment available. Services shall be performed by a company regularly engaged in the business of existing Underground Utility Structure Detection for the past 5-years.
 - 2. Prior to excavation and prior to directional boring the following work shall be performed:
 - a. Contractor to mark excavating and trenching/directional boring locations and indicate width and depth.
 - b. Locate, by way of vertical and horizontal control dimensions, existing subgrade petroleum product pipes, process piping, conduits, sewer, water, gas, storm drain, electrical, telephone, and irrigation lines in the affected areas of Contract construction work.
 - c. Arrange and meet with the District's Representative to review existing underground conditions.
 - d. The proposed route of each excavation shall be continuously surveyed along the entire excavation path using Ground-Penetrating Radar (GPR) operating from the surface grade. The GPR shall detect and map existing underground metal and non-metal, both private and public utility lines, pipes, conduits, conductors, etc. The GPR shall identify the horizontal and vertical location of existing underground conditions located at a depth of up to 3-meters below finish grade and located with a vertical and horizontal accuracy within ±12-inches of actual condition. The Contractor shall add this information to the existing conditions site plan.
 - 3. Exercise extreme caution in directional boring, excavating and trenching on this site to avoid existing underground utilities and structures, and to prevent hazard to Personnel and/or damage to existing underground utilities or structures. The Contract Documents, Drawings and Specifications do not include necessary components for construction safety, which is the responsibility of the Contractor.
 - 4. Repair/replace, without additional cost to the Contract, and to the satisfaction of the District any existing work damaged that was identified in the Record Drawings provided;

Identified by the District's Representative; Identified by the Underground Detection Services performed; or any existing work damaged as a result of failure to comply with all the Referenced Requirements.

- 5. The Contractor shall contact Common Ground Alliance (CGA) telephone #811 "Know What's Below-Call Before You Dig" and Underground Service Alert (USA), not less than 72-hours prior to excavation. Contractor shall not excavate until verification has been received from CGA and USA that existing underground utilities serving the site have been located, identified, and marked.
- H. The locations of existing underground utilities, where shown on Drawings, are shown diagrammatically and have not been independently verified by the District, the District's Representative, the Architect/Engineer. The District, the District's Representative, and the District's Architect/Engineer are not responsible for the location of underground utilities or structures, whether or not shown or detailed and installed under this or any other Contracts. The Contractor shall identify each existing utility line prior to excavation and mark the locations on the ground of each existing utility line.

1.04 AIR CONDITIONING, HEATING, PLUMBING EQUIPMENT WIRING

Provide electrical work, materials, and control components required for proper operation of the air conditioning, heating and plumbing systems as indicated on the Electrical, Mechanical, and Plumbing Contract Documents and specified herein.

1.05 PERMITS

Take out and pay for all Required Permits, Inspections and Examinations without additional cost to the District.

1.06 QUALITY ASSURANCE

- A. Work and Materials shall be in full accordance with the latest Rules and Regulations as follows. The following publications shall be included in the Contract Documents Requirements. If a conflict occurs between the following publications and any other part of the Contract Documents, the Requirements describing the more restrictive provisions shall become the applicable Contract definition:
 - 1. California Code of Regulations Title 24.
 - 2. California Part 3 "California Electrical Code" CEC, Title 24 and Title 8 "Division of Industrial Safety".
 - 3. California Building Code CBC.
 - 4. California Fire Code CFC
 - 5. The National Electrical Code NEC/NFPA 70.
 - 6. International Building Code IBC.
 - 7. National Fire Protection Agency NFPA.
 - 8. National Fire Alarm Code NFAC/NFPA 72.
 - 9. Underwriter's Laboratory UL.
 - 10. Other applicable State and Local Government Agencies Laws and Regulations.

- 11. Electrical Installation Standards National Electrical Contractors Association (NECA) and National Electrical Installation Standards (NEIS):
 - a. NECA/NEIS-1: Standard of Practices for Good Workmanship in Electrical Contracting
 - b. NECA/NEIS-101: Standard for Installing Steel Conduit (Rigid, IMC, etc.)
 - c. NECA/NEIS-104: Recommended Practice for Installing Aluminum Building Wire and Cable
 - d. NECA/NEIS-105: Recommended Practice Installing Metal Cable Trays
 - e. NECA/NEIS-111: Recommended Practice Installing Nonmetallic Raceways
 - f. NECA/NEIS-230: Recommended Practice for Installing Motors
 - g. NECA/FOA-301: Standards for Installing and Testing Fiber Optic Cables
 - h. NECA/NEIS-305: Standard for Fire Alarm System Job Practice
 - i. NECA/NEIS–331: Standards for Installing Building and Service Entrance Grounding
 - j. NECA/NEIS-400: Recommended Practice for Installing and Maintaining Switchboards
 - k. NECA/NEIS-402: Recommended Practice for Installing and Maintaining Motor Control Centers
 - I. NEIS/NECA and EGSA-404: Recommended Practice for installing Generator Sets
 - m. NECA/NEIS-405: Recommended Practices for installing and Commissioning Interconnected Generation Systems
 - n. NECA/NEIS-407: Recommended Practice for Installing Panelboards
 - o. NECA/NEIS-408: Recommended Practices for Installing Busway
 - p. NECA/NEIS-409: Recommended Practice for Installing and Maintaining Dry-Type Transformers
 - q. NEIS/NECA and IESNA-500: Recommended Practice for installing indoor Commercial Lighting Systems
 - r. NEIS/NECA and IESNA-501: Recommended Practice for Installing Exterior Lighting Systems
 - s. NEIS and IESNA-502: Recommended Practice for Installing Industrial Lighting Systems
 - t. NECA/BICSI-568: Standards for Installing Commercial Building Telecommunications System
 - u. NECA/NEIS-600: Recommended Practice Installing Medium-Voltage Cable
- B. All Material and Equipment shall be new and shall be delivered to the site in unbroken packages. All material and equipment shall be listed and labeled by Underwriters Laboratories or other recognized Testing Laboratories, where such listings are available. Comply with all installation Requirements and restrictions pertaining to such listings.
- C. Work and Material shown on the Drawings and in the Specifications are new and included in the Contract unless specifically indicated as existing or N.I.C. (not in Contract).
- D. Keep a copy of all applicable Codes and Standards available at the job site at all times for reference while performing work under this Contract. Nothing in plans or Specifications shall be construed to permit work not conforming to the most stringent of Building Codes.
- E. Where a conflict or variation occurs between applicable Codes, Standards and/or the Contract Documents, the provisions of the most restrictive provision shall become the Requirement of the Contract Documents.

1.07 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. General

- Review of Contractor's submittals is for General Conformance with the design concept of the Project and General Compliance with the information given in the Contract Documents. Any action shown is subject to the Requirements of the Plans and Specifications. Contractor is responsible for quantities; dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of work with that of all other trades and satisfactory performance of their work.
- 2. The Contractor shall review each submittal in detail for compliance with the Requirements of the Contract Documents prior to submittal. The Contractor shall "Ink Stamp" and sign each item of the submittal with a statement "CERTIFYING THE SUBMITTAL HAS BEEN REVIEWED BY THE CONTRACTOR AND COMPLIES WITH ALL THE REQUIREMENTS OF THE CONTRACT DOCUMENTS". The Contractor shall clearly and specifically identify each individual proposed substitution, substitution of equal or proposed deviation from the Requirements of the Contract Documents with a statement "THIS ITEM IS A SUBSTITUTION".

The burden of research, preparation of calculations and the furnishing of adequate and complete Shop Drawings information to demonstrate the suitability of Contractor's proposed substitutions and suitability of proposed deviations from the Contract Documents is the responsibility of the Contractor.

- 3. Departure from the submittal procedure will result in resubmittals and delays. Failure of the Contractor to comply with the Submittal Requirements shall render void any acceptance or any approval of the proposed variation. The Contractor shall then be required to provide the equipment or method without variation from the Contract Documents and without additional cost to the Contract.
- 4. The Contractor at no additional cost or delays to the Contract shall remove any work, material and correct any deficiencies resulting from deviations from the Requirements of the Contract Documents not approved in advance by the District prior to commencement of work.
- 5. Shop Drawings submitted by the Contractor, which are not specifically required for submittal by the Contract Documents, or Contractor Shop Drawings previously reviewed and resubmitted without a written resubmittal request to the Contractor, will not be reviewed, considered, or commented on. The respective Shop Drawing submittal /resubmittal will not be returned to the Contractor and will be destroyed without comment or response to the Contractor. The respective submittal shall be considered null and void as being not in compliance with the Requirements of the Contract Documents.
- 6. Refer to Division-1 for Additional Requirements.
- B. Material Lists and Shop Drawings
 - 1. Submit material list and Equipment Manufacturers for review within 35 days of award of Contract. Give name of Manufacturer and where applicable, brand name, type and/or catalog number of each item. Listing of more than one Manufacturer for any one item of equipment, or listing items "as specified", without both make and model or type

designation, is not acceptable. Shop Drawings shall not be submitted before review completion of Manufacturers list. The right is reserved to require submission of samples of any material whether or not particularly mentioned herein.

- 2. After completion of review of the material and Equipment Manufacturers list, submit Shop Drawings for review. Shop Drawings shall be submitted in completed bound groups of materials (i.e., all lighting fixtures or all switchgear, etc.). The Contractor shall verify dimensions of equipment and be satisfied as to fit and that they comply with all code Requirements relating to clear working space about electrical equipment prior to submitting Shop Drawings for review. Submittals, which are intended to be reviewed as substitution or departure from the Contract Documents, must be specifically noted as such. The Requirements of the Contract Documents shall prevail regardless of the acceptance of the submittal.
- 3. Shop Drawings shall include catalog data sheets, instruction manuals, dimensioned plans, elevations, details, wiring diagrams, and descriptive literature of component parts where applicable. Structural calculations and mounting details, signed by a Structural Engineer registered by the State of California, shall be submitted for all equipment weighing over 400-pounds, and shall be in compliance with Title 21 of the California Code of Regulations.
- 4. Each Shop Drawing item shall be identified with the Specification Section and paragraph numbers, lighting fixture types and Drawing sheet numbers; the specific Shop Drawing is intended to represent. Shop Drawings 11-inches by 17-inches or smaller in size shall be bound in three ring binders. Divider tabs shall be provided in the three ring binders identifying and separating each separate Shop Drawing submittal item. Shop Drawings larger than 11-inches by 17-inches, Shop Drawing pages/sheets submittals shall be sequentially numbered with unique alphanumeric numbering system to facilitate correspondence referencing identification of individual sheets.
- 5. The time required to review and comment on the Contractor's submittals will not be less than 14 calendar days, after receipt of the submittals at the office of FBA Engineering. The review of Contractor submittals and return to Contractor of submittals with review comments will occur in a timely manner conditioned upon the Contractor complying with all of the following:
 - a. The submittals contain complete and accurate information, complying with the Requirements of the Contract Documents.
 - b. Contractor's submittals are each marked with Contractor's approval "Stamp", and with Contractor signatures.
 - c. The submittals are received in accordance with a written, Shop Drawing submittal schedule for each submittal. The Contractor distributes the schedule not less than 35-calendar days in advance of the Shop Drawing Submittals, and the schedule identifies the calendar dates, the Contractor will deliver the various submittals for review.
- 6. Shop Drawings shall include the Manufacturers projected days for shipment from the factory of completed equipment, after the Contractor releases the equipment for production. It shall be the responsibility of the Contractor to insure that all material and equipment is ordered in time to provide an orderly progression of the work. The Contractor shall notify the District's Representative of any changes in delivery, which would affect the Project completion date.

- 7. Submittal Identification
 - a. Each submittal shall be dated: with submittal transmission date; sequentially numbered and titled with submittal contents identification and applicable Specification/Drawing references (*i.e., Submittal dated: 5/12/98 Submittal #4 Contents: Branch Circuit Panelboards Sheet #E5.1 and Transformers Specification Section 260501 Paragraph 2.11, etc.*).
 - Each resubmittal shall be dated: with original submittal date and resubmittal transmission dates; sequentially numbered with original submittal number and sequential resubmittal revision number and titled with submittal contents identification and applicable Specifications/Drawing references (*i.e., Original Submittal Date: 5/12/98 Resubmittal Date: 10/9/98 Original Submittal #4 Resubmittal Revision R2 Contents: Transformer Resubmittal Specification Section 260501 Paragraph 2.11, etc.*).
 - c. Contractor shall provide a written response narrative with each resubmittal. Describe each response-action, resubmittal addition, change and deletion. Correspond to each response to the A/E specific review comment.
- C. The Contractor shall be responsible for incidental, direct and indirect costs resulting from the Contractor's substitution of; or changes to; the specified Contract Materials and Work.
- D. The Contractor shall pay, upon request by the District's Representative, a fee for the District's Representative time involved in the review of substitution submittals and design changes resulting from the Contractor's requested substitutions. The fee shall be not less than \$125.00 per hour but, in no case, less than stated in Division-1, whichever is greater.
- E. Maintenance and Operating Manuals
 - 1. The Contractor shall furnish three copies of type-written Maintenance and Operating Manuals for all electrical equipment, fire alarm equipment, sound system equipment, etc., to the District.
 - 2. Instruct the District's Personnel in correct operation of all equipment at completion of Project. Provide the quantity and duration of instruction class as specified; but in no case less than two 4-hour durations separate instruction classes for each individual equipment group furnished as part of the Contract. Instruction classes shall be presented by Manufacturer's Authorized Field Service Engineer at the Project Site. Instruction class size shall be at the District's discretion, not less than one or more than fifteen students shall attend each instruction session. Submit fifteen written outline copies of the proposed instruction class curriculum, 14-days prior to the class-scheduled dates.
 - 3. Maintenance and operating manuals shall be bound in three ring, hard-cover, plastic binders with table of contents. Manuals shall be delivered to the District's Representative, with an itemized receipt.
- F. Portable or Detachable Parts: The Contractor shall retain in his possession, and shall be responsible for all portable and detachable parts or portions of the installation such as fuses, keys, locks, adapters, locking clips, and inserts until final completion of Contract Work. These parts shall then be delivered to the District's Representative with an itemized receipt.

- G. Record Drawings (Additional Requirements)
 - 1. Provide and maintain in good order a complete set of Electrical Contract "Record" prints. Changes to the Contract to be clearly recorded on this set of prints. At the end of the Project, transfer all changes to one set of transparencies to be delivered unfolded to the District's Representative.
 - 2. The actual location and elevation of all buried lines, boxes, monuments, vaults, stub-outs and other provisions for future connections shall be referenced to the building lines or other clearly established base lines and to approved bench marks. If any necessary dimensions are omitted from the Record Drawings, the Contractor shall, at the Contractor's own expense, do all excavation required to expose the buried work and to establish the correct locations.
 - 3. The Contractor shall keep the "Record" prints up to date and current with all work performed.
 - 4. Refer to Division-1 for Additional Requirements.

1.08 CLEANING EQUIPMENT, MATERIALS, PREMISES

All parts of the equipment shall be thoroughly cleaned of dirt, rust, cement, plaster, etc., and all cracks and corners scraped out clean. Surfaces to be painted shall be carefully cleaned of grease and oil spots and left smooth, clean and in proper condition to receive paint finish.

1.09 JOB CONDITIONS - PROTECTION

Protect all work, materials and equipment from damage from any cause whatever and provide adequate and proper storage facilities during the progress of the work. Provide for the safety and good condition of all the work until final acceptance of the work by the District and replace all damaged or defective work, materials, and equipment before requesting final acceptance.

1.10 EXCAVATION, CUTTING, BACKFILL AND PATCHING ADDITIONAL REQUIREMENTS

- A. General
 - 1. Perform excavation, cutting, backfill, core drilling, directional boring, and patching of the construction work required for the proper installation of the electrical work.
 - 2. Patching shall be of the same material, thickness, workmanship, and finish as existing and accurately match-surrounding work to the satisfaction of the District's Representative.
 - 3. Prior to penetrating, coring, drilling or cutting existing building elements, concrete and/ or masonry, provide imaging equipment examinations of each specific location. The imaging process shall identify existing internal embedded components and locations, including structural elements/anchors, conduit, and piping that are present. Do not penetrate or damage the existing internal embedded elements. Imaging shall employ one of the following, with GPR methodology preferred:
 - a. Non-invasive imaging employing high frequency, Ground Penetrating Radar (GPR), single side echo reflection technology.
 - b. Non-invasive imaging employing x-ray radiography, through-and-through imaging technology.

- B. Excavation Temporary Cover
 - 1. Excavations for Contract Work occurring in streets, vehicular drive areas, parking lots, sidewalks; any paved surface; or any area accessible to the public; provide temporary steel plating and shoring support for the plates, to completely cover the excavations under one or more of the following conditions:
 - a. Excavation shall not remain "open" for more than 4-calendar days; provide temporary plating.
 - b. Excavation shall not be "open" over weekends (Saturday, Sunday) or Holidays; provide temporary plating.
 - 2. The temporary plating shall be a minimum of 0.75-inch thickness steel, but in no case shall the thickness be less than required to support AASHO-H20 traffic loading.
 - 3. Provide a minimum of two 100% open lane(s) (12-foot lane width) for vehicular traffic at all times during construction, for vehicle access to all areas.

1.11 IDENTIFICATION

- A. Equipment Nameplates
 - 1. Panelboards, terminal cabinets, circuit breakers, disconnect switches, starters, relays, time switches, contactors, push-button control stations, and other apparatus used for the operation or control of feeders, circuits, appliances, or equipment shall be properly identified by means of descriptive nameplates or tags permanently attached to the apparatus and wiring.
 - 2. Provide nameplate label on electrical service entrance equipment describing available short circuit information calculated by the Contractor, including:
 - a. Calculation date, month-day-year.
 - b. Calculate maximum available short circuit fault current.
 - c. Description of parameters and changes affecting the Requirements for recalculation of the fault current information.
 - 3. Electrical equipment including switchgear, switchboards, electric panels and control panels, motor control centers, combination motor starters, transformers, disconnects, etc., shall each be labeled by the Manufacturer with "Electric-Arc-Flash" warning signs. The signs shall explain a hazard to personnel may exist if the equipment is worked on while energized or operated by Personnel while energized. The sign shall instruct personnel to wear the correct Protective Equipment/clothing (PPE) when working "Live", or operating "Live" electrical equipment and circuits.
 - 4. Nameplates shall be engraved laminated phenolic. Shop Drawings with dimensions and format shall be submitted before installation. Attachment to equipment shall be with escutcheon pins, rivets, self-tapping screws or machine screws. Self-adhering or adhesive backed nameplates shall not be used.
 - 5. Provide black-on-white laminated plastic nameplates engraved in minimum ¼-inch high letters to correspond with the designations on the Drawings. Provide other or additional information on nameplates where indicated.

- B. Plates: All cover and device plates shall be furnished with engraved or etched designations under any one of the following conditions (minimum character size not less than 0.188 inch. Engraving shall indicate circuits and equipment controlled or connected):
 - 1. More than two devices under a common coverplate.
 - 2. Lock switches.
 - 3. Pilot switches.
 - 4. Switches in locations from which the equipment or circuits controlled cannot be readily seen.
 - 5. Manual motor starting switches.
 - 6. Where so indicated on the Drawings.
 - 7. As required on all control circuit switches, such as heater controls, motor controls, etc.
 - 8. Receptacles other than standard 15 amp 120 volt duplex receptacles; shall indicate circuit voltage, ampere, phase and source circuit number.
 - 9. Where outlets or switches are connected to emergency power circuit; provide panelboard and circuit number engraved on plate.
 - 10. Low voltage and signal system outlets.
- C. For equipment and access doors or gates to equipment containing or operating on circuits of more than 100 volts AC or DC nominal. Provide red-on-white laminated warning signs engraved in ½-inch high letters to read: "DANGER - 480 (or applicable voltage) VOLTS KEEP OUT AUTHORIZED PERSONNEL ONLY".
- D. Wire and Cable Identification
 - 1. Provide identification on individual wire and cable including signal systems, fire alarm, electrical power systems (each individual phase, neutral and ground), empty conduit pull ropes, and controls circuit.
 - 2. Permanent identification shall be provided at each termination location, splice location, pullbox, junction box and equipment enclosure.
 - a. Individual wire and cable larger than #6AWG or 0.25-inch diameter, shall be provided with polypropylene identification tag holders, with yellow polypropylene tags interchangeable black alphanumeric characters, character height 0.25 inch. Attach identification tags with plastic "tie" wraps, minimum of two for each tag. As manufactured by Almetek Industries-"EZTAG" series; or TECH Products - "EVERLAST" series.
 - b. Individual wire and cable #6AWG and smaller or smaller than 0.25 inch diameter, shall be provided with water and oil resistant, flexible, self-laminating pressure sensitive machine embossed plastic tags that wrap a minimum of 360 degrees around the wire/cable diameter. The entire tag shall then be covered with a clear flexible waterproof plastic cover wrapped a minimum of 540 degrees around the wire/cable diameter and completely covering the identification. As manufactured by Brady Identification; or 3M; or Panduit.
 - c. Each identification tag location shall indicate the following information: circuit number, circuit phase, source termination and destination termination equipment name (or outlet number as applicable).

- 3. Install permanent identification after installation/pulling of wire/cable is complete, to prevent loss or damage to the identification.
- E. Cardholders and cards shall be provided for circuit identification in panelboards. Cardholders shall consist of a metal frame retaining a clear plastic cover permanently attached to the inside of panel door. List of circuits shall be typewritten on card. Circuit description shall include name or number of circuit, area, and connected load.
- F. Junction and pull boxes shall have covers stenciled with box number when shown on the Drawings, or circuit numbers according to panel schedule. Data shall be lettered in a conspicuous manner with a color contrasting to finish.

1.12 TESTING

- A. The Contractor shall obtain an independent Testing Laboratory, provide all instrumentation and perform tests on the electrical system and equipment as hereinafter described and further directed by the District's Representative. The test shall be performed after the completion of all electrical systems included in the Contract Scope of Work. All tests shall be recorded and documented and submitted to the District's Representative for review.
 - 1. All equipment and Personnel required for set-up and testing shall be provided by the Contractor.
- B. Test for Phase to Ground and Neutral Condition:
 - 1. Open main service disconnects.
 - 2. Isolate the system neutral from ground by removing the neutral disconnects link located in the service switchboard.
 - 3. Close all submain disconnects.
 - 4. Close all branch feeder circuit breakers.
 - 5. Turn all switches to "on" position, unplug all portable equipment from outlet receptacles.
 - 6. Measure the resistance of each phase to ground and phase to neutral. A properly calibrated "megger" type test instrument shall be used. The test voltage shall be a nominal 500 volts.
 - 7. Record all readings after 1-minute duration and document into a complete report.
 - 8. Isolating Grounds: In the event that low resistance ground neutral connections are found in the system, they shall be isolated and located by testing each circuit individually as outlined above. Make proper corrections to restore the resistance values to an acceptable value.
- C. Method of obtaining ground resistance shall be in accordance with the latest edition of the James G. Biddle (Plymouth Meeting, Pennsylvania) manual published on this subject.
 - 1. Perform "fall-of-potential" three point tests on the main grounding electrode of system per IEEE Standard No. 81, Section 8.2.1.5. when suitable locations for test rods are not available, a low resistance dead earth or reference ground shall be utilized.
 - 2. Perform the two point method test per IEEE Standard No. 81, Section 8.2.1.1, to determine the ground resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.

- D. The testing, calibrating and setting of all ground and ground fault equipment, circuit breakers, circuit device protection relays, and meters adjustable settings shall be by an independent Testing Laboratory. Set as recommended by the respective Manufacturer and Coordination Study so as to be coordinated with other protection devices within the electrical design. Bound and tabulated copies of the test and settings shall be sent to the District's Representative.
- E. Ampere and Voltage Measurements
 - 1. Measure and record ampere and line voltage measurements under full load on all panel feeders, switchboard, and switchgear feeders, motor control centers and motor circuits provided in the Contract. Record measurements at the equipment tested and submit to the District's Representative for review.
 - 2. Ampere voltage readings shall be:
 - a. Phase A-B, A-C and B-C.
 - b. Phase A-Neutral, B-Neutral and C-Neutral.
 - 3. The ampere and voltage readings shall be not less than 20-minutes duration for each test. Record and submit the measured minimum, maximum and 20-minute average for each ampere and voltage value and test location. Voltage and ampere measurements shall occur at the connected load end of each respective feeder, not at the source of supply end of each feeder.
 - 4. Test equipment shall be accurate within plus or minus 1%.
 - 5. Branch circuit devices 40 amp or less and motor loads ten horsepower or smaller are excluded from ampere and voltage testing Requirement.
 - 6. If, in the opinion of the District's Representative, the voltages and regulations are not met within acceptable limits, make arrangements with the serving utility for proper electrical service. Retest feeder line voltages, and submit to District's Representative for review, after the Utility Company has completed corrective actions. Reset "voltage taps" on transformers provided or modified as part of the Contract Work, to adjust line voltages to within acceptable values, as directed by the District's Representative.
- F. The Contractor shall complete the following work before any electrical equipment is energized.
 - 1. All equipment shall be permanently anchored.
 - 2. All bus connections and conductor/wire connections shall be tightened per Manufacturer's instructions and witnessed by the District's Representative.
 - 3. All ground connections shall be completed and identified. Perform and successfully complete all required megger and ground resistance tests.
 - 4. Feeders shall be connected and identified.
 - 5. The interiors of all electrical enclosures including busbars and wiring terminals shall be cleaned of all loose material and debris, paint, plaster, cleaners or other abrasive's over spray removed and equipment vacuumed clean. The District's Representative shall observe all interiors before covers are installed.
 - 6. All wall, ceiling, and floor work and painting shall be completed within areas containing electrical equipment prior to installation of equipment. The equipment indoor rooms and spaces shall be weather-tight and weather protected from environmental incursions.

- 7. All doors to electrical equipment rooms shall be provided with locks in order to restrict access to energized equipment.
- 8. Electrical spaces and rooms shall not be used as storage rooms after power is energized.
- 9. Outdoor electrical equipment enclosures and housings shall be weather protected.
- 10. The electrical system time current coordination and Arc-Fault study shall be complete for circuit breakers, ground relays sets, and circuit relay sets, fuses; set-up, tested and calibrated accordingly.

1.13 COMMISSIONING - CX

- A. General
 - 1. The Commissioning shall verify the electrical systems for the term of the Contract, by observation; and by calibration; and by testing. The Commissioning shall ensure the electrical systems perform interactively and correctly, according to the Contract and Operational Requirements.
 - Commissioning shall provide startup, testing and documented confirmation of the Contract Constructed Systems, materials and work, functions in compliance within the criteria set forth in the Contract Documents to the satisfaction of the District's needs. The Commissioning Scope shall encompass each system identified as requiring "Commissioning" by the Contract Documents, including but not limited to:
 - a. Electrical circuits' protection, short circuit, overcurrent, and ground fault devices.
 - b. Electrical circuits monitoring and metering.
 - c. Light fixtures, lamps and ballasts.
 - d. Lighting control devices, equipment and lighting control systems.
 - e. Standby and emergency electric power supply equipment and systems.
 - f. Fire alarm, equipment, devices and fire alarm systems.
 - g. Additional systems described in the Contract Documents.
 - 3. Commissioning process shall review all of the Shop Drawing submittals, including:
 - a. Controls, Operation and Maintenance Requirements.
 - b. Facility performance testing compliance.
 - c. Project Contract Requirements compliance.
 - d. Compliance with basis for design and operational descriptions provided in the Contract.
 - 4. Commissioning shall be the process of ensuring all the systems described in the Contract Documents comply with the Contract Document design; all systems are installed properly; all systems are functional, tested and capable of being operated and maintained to perform within the Contract Requirements and design intent.
 - 5. Functional setup, recalibration, correcting deficiencies, retesting and the associated costs, for system(s) that fail commissioning, shall be the responsibility of the Contractor. The Contractor shall include all commissioning costs in the Contract Scope of Work.
 - 6. Complete all commissioning functions prior to the occupancy of the facility by the District, unless directed otherwise by the District's Representative.
 - 7. Submit six copies of Commissioning Documentation to District's Representative.

- 8. Commissioning, unless specifically indicated otherwise, shall be performed by Factory-Trained Technician(s) Authorized and Certified by the Manufacturers of the respective equipment/systems. Where specifically indicated, commissioning shall be performed by Independent Test Lab.
- B. Commissioning Procedures
 - 1. Prepare a Commissioning Matrix identifying components and systems included in the Commissioning Scope; the status; actions completed and actions to be completed.
 - 2. Verify Contractor compliance with Contract Document Requirements Manufacturer's recommendations and approved Shop Drawings.
 - 3. Perform startup, functional tests, reports, and document results.
 - 4. Evaluate and document the setup parameters, software, operating condition and performance of each system at the time of functional test completion. Document and record each performance parameter and condition, in the Commissioning Report.
 - 5. Schedule testing and prepare descriptions of testing.
 - 6. Describe measures performed to correct deficiencies.
 - 7. Verify that instructions to District's Representatives, Operations and maintenance manuals comply with Contract Documents.
 - 8. Prepare warranty matrix identifying the start dates, expiration dates, routine preventative maintenance dates and the District's responsibility for performing preventative maintenance and keeping logs for each maintenance function and warranty claims.
 - 9. Confirm completion of all punch list items that have been acceptably accomplished and a list of what has not been acceptably completed.
 - 10. Describe uncorrected deficiencies accepted by the District.
- C. Commissioning Phasing

The Commissioning Phases of work shall include the following activities:

- 1. SDQ Shop Drawing Qualification shall verify complete and correct Shop Drawings have been submitted.
- 2. IQ The Installation Qualification of Contract Work shall verify systems are correctly and properly installed.
- 3. OQ Verify systems interfaces and software are correctly and properly operational.
- 4. ITM Verify the Contract Inspection, Testing and procedures for Maintenance are complete.
- 5. PQ Performance Qualification complete the functional performance testing to validate each building system.

1.14 POWER OUTAGES

A. All electrical services in all occupied facilities of the Contract Work are to remain operational during the entire Contract period. Any interruption of the electrical services for the performance of this work shall be at the convenience of the District and performed only after consultation with the District's Representative. Work involving circuit outages shall be only at such a time and of such a duration as approved in writing. Work involving circuit outages for

the work required to connect new equipment and disconnect existing equipment shall be performed at the convenience of the District.

- B. Contract Work involving outages or disruption of normal function in electrical power systems, telephone/communication systems, fire alarms, shall be performed during the following time periods. The Contract Work shall be phased to limit outages in the respective systems to the stated periods:
 - 1. 11:30 p.m. Friday to 11:30 p.m. Sunday of the same weekend. Work shall occur on multiple weekend periods if a single weekend is not sufficient time to complete the work.
 - 2. The Contract Work involving outages shall be phased in multiple work time units, to comply with the permitted outage limitations.
- C. Work involving system outages to the building fire alarm system shall be performed only after consultation with the District and shall be only at such a time and of such duration as approved in writing. Contractor shall provide continuous "Fire-Watch" during fire alarm system outages and comply with AHJ "Fire-Watch" Requirements.
- D. Provide overtime work; double shift work; night time work; Saturday, Sunday, and holiday work to meet outages schedule.
- E. Provide temporary electrical power to meet the Requirements of this Article.
- F. Any added costs to Contractor due to necessity of complying with this Article shall be included in the Contract Scope of Work.
- G. When electrical work involving power disruptions to existing areas is initiated, the work shall proceed on a continuous basis without stopping until electric power is restored to the affected areas.
- H. The Contractor shall request in writing to the District's Representative a minimum of 3-weeks in advance, for any proposed electrical outage.

1.15 TEMPORARY ELECTRICAL POWER

- A. Provide temporary electrical power if work requiring power outages cannot be completed in time permitted and approved by the District's Representative.
- B. Temporary electrical power shall be a standby diesel engine generators. Voltage, frequency, regulation, etc. shall be equal to that of normal utility source. Exhaust system shall have a critical silencing muffler. Generator voltage shall match the existing secondary voltage required at the site. The Contractor shall furnish all necessary cables, switches, etc., to make all required connections to existing panels, feeders, etc. Generator shall be sized to adequately carry the demand load. If record of demand load is not available, size generator to match corresponding transformer, maximum capacity circuit as directed by the District's Representative.
- C. After completion of required usage of the temporary generators, prior to completion of the Project, the Contractor shall remove the generators. All temporary cables, switches, etc. shall be removed and all permanent equipment left in satisfactory condition.
- D. Each generator shall be housed in security type sound attenuated housing to prevent access by unauthorized personnel. Temporary power cables, connections, etc. shall be protected from unauthorized personnel.

- E. The Contractor shall be responsible for complete operation of the generator including personnel, fuel supplies, proper safety precautions, etc. Generator shall not be left unattended while in operation.
- F. The Contractor shall provide temporary construction lighting and power as required in areas where work is being performed. Temporary power arrangements, outages, installation, work schedules, etc., shall be submitted in writing 3-weeks prior to requested outage date, and approved by the District's Representative prior to start of work.

1.16 ASBESTOS, POLYCHLORINATED BIPHENYL (PCB) OR HAZARDOUS WASTE:

- A. It is understood and agreed that this Contract does not contemplate the handling of asbestos, PCB or any hazardous waste material. If asbestos, PCB or any hazardous waste material is encountered, notify the District's Representative immediately. Do not disturb, handle or attempt to remove.
- B. Lighting Fixture Demolition Hazardous Materials
 - 1. The removal of existing lighting fixtures will generate hazardous material waste disposal Contract Documents.
 - a. The existing lighting fixture ballast contains PCB material.
 - b. The existing lighting fixture lamps contain mercury.
 - c. The existing lighting fixture internal wire insulation may contain asbestos.
 - 2. Remove, handle, store, contain, dispose of and document the hazardous materials resulting from existing lighting fixtures work, as part of the Contract Requirements.

1.17 TIME/CURRENT COORDINATION, SHORT CIRCUIT, ARC-FLASH AND SERIES RATED EQUIPMENT

- A. Series Rated Equipment.
 - 1. Circuit protective Devices identified as "Series Rated" or "Current Limiting" (i.e., CLCB -Current Limiting Circuit Breaker; CLF - Current Limiting Fuse, etc.) shall be Series Rated and Tested (UL 489 and CSA5) by the Manufacturer with all equipment and circuit protective devices installed downstream of the identified series rated or current limiting device.
 - Provide nameplates on all equipment located downstream, including the CLCB and CLF devices, to comply with CEC/NEC paragraphs 110-22 and 240-83 "CAUTION SERIES RATED SYSTEM - NEW DEVICE INSTALLATIONS AND REPLACEMENTS SHALL BE THE SAME MANUFACTURER AND MODELS".
- B. Short Circuit, Coordination and Arc-Flash
 - 1. Perform Engineering Analysis and submit engineered settings for each equipment location, fuse and circuit breaker device, showing the correct time and current settings to provide the selective coordination within the limits of the specified equipment. Shall comply with the latest application standards of IEEE and ANSI. Provide electrical system short circuit worst case bolted-fault analysis, both 3-phase line-to-line and 1-phase line-to-ground calculations as part of the Coordination Analysis recommendations. Provide Electric Arc-Flash calculations as part of the Coordination Analysis recommendations.
 - 2. The information shall be submitted in both tabular form and on time current log-log graph paper, with an Engineering Narrative. Written narrative describing data, assumptions, analysis of results and prioritized recommendations, six copies.

- 3. The goal is to minimize an unexpected but necessary electrical system outage and personnel exposure to the smallest extent possible within the fault occurrence location, using the specified Contract Equipment. Shall comply with, but not limited to:
 - a. IEEE-242, Recommended Practices for Protection and Coordination of Industrial and Commercial Distribution.
 - b. IEEE-399, Recommended Practices for Industrial and Commercial Power System Analysis.
 - c. IEEE-1584, Guide to Performing Arc-Flash Hazard Calculations.
 - d. CEC/NEC
- 4. Provide permanent warning labels on each equipment location. The labels shall describe Arc-Flash, Short-Circuit and Time/Current Coordination, including safety precautions and protective clothing. Also described actions to be taken if any circuit changes or equipment modifications occur.
- 5. Shall be submitted with the Shop Drawing submittals for the respective equipment.
- 6. The Contractor shall independently contact the serving Utility Company to obtain the current system short circuit amps or available fault current.
- 7. The Contractor shall independently obtain As-Built Drawings for the existing infrastructure to establish lengths. If As-Built Drawings are no available, the Contractor shall research existing conditions and make reasonable but conservative estimates of conductor length. Where existing conductors have been re-used, the Contractor shall confirm conductor quantity, size, and conduit type.

1.18 INDEPENDENT TESTING LABORATORY

- A. Testing Laboratories Definition
 - 1. The Testing Laboratory shall meet Federal OSHA Criteria for accreditation of Nationally Recognized Testing Laboratories (NRTL) Title 29 Part 1907 and 29 CFR-1910.
 - 2. Membership in the National Electrical Testing Association (NETA) shall also constitute acceptance of meeting said criteria, for testing of electrical systems.

1.19 SPARE FUSES

Provide three spare fuses for each size and type at each location to match the installed fuses where the fuses are provided as part of the Contract. Provide spare fuse holders on inside door of each respective fuse compartment. Provide engraved nameplate on front of fuse access door indicating fuse type/catalog number ampere rating and Manufacturer of fuse.

1.20 EQUIPMENT SEISMIC AND WIND LOAD REQUIREMENTS (ADDITIONAL REQUIREMENTS)

- A. Refer to Structural, Architectural, and Soils Report Contract Documents for Additional Requirements.
- B. General
 - 1. Equipment supports and anchorage's provided as part of the Contract shall be designed, constructed and installed in accordance with the Earthquake Regulations of the California Building Code (CBC), International Building Code (IBC).
 - 2. Provide equipment anchorage details, coordinated with the equipment mounting provision, prepared, signed and "stamped" with PE Registration in good standing, by a

Civil or Structural Engineer Licensed as a Professional Engineer (PE) in the State of California.

- 3. Mounting recommendations shall be provided by the Manufacturer based upon approved shake-table tests used to verify the seismic design of that type of equipment.
- 4. The Equipment Manufacturer shall document the details necessary for proper wind-load and seismic mounting, anchorage, and bracing of the equipment for floor, ceiling, and wall/back installation location.
- 5. Seismic performance shall be based on actual install location of the respective equipment in the building and height above or below grade.
- 6. The Seismic Requirements are typical for each equipment item exceeding 19-pounds, including but not limited to the following:
 - a. Switchgear, switchboards, and motor control equipment
 - b. Transformers
 - c. Equipment racks and terminal cabinets
 - d. Panels
 - e. Conduits with floor, ceiling or wall attachment support and conduits with suspension attachments.
 - f. Busway, wire way and cable tray
 - g. Uninterruptable Power Supplies (UPS)
 - h. Inverters
 - i. Generators and related equipment
 - j. Lighting equipment
 - k. Fire alarm equipment
- C. Certification
 - Electrical Equipment Manufacturers and Contractor shall provide Special Seismic Certification (SCC) for each specific equipment configuration with shake-table verification, all furnished as part of the Contract Documents Requirements. The SCC shall include the specific installation location characteristics of the respective equipment including as follows:
 - a. Ground or floor attachment
 - b. Wall attachment
 - c. Ceiling attachment
 - d. Roof attachment
 - 2. Wind Loading

Electrical equipment and anchorages shall withstand the wind-load imposed at the install location. Wind Loading Withstand Requirements shall apply to all electrical equipment installed in outdoor locations and to all electrical equipment exposed to the weather. The equipment shall be Tested and Certified by the Manufacturer and Contractor. The wind-load withstand qualification of the equipment and anchorages shall be verified by the following methods:

a. Aerodynamic wind tunnel test method.

- b. Analytical calculation method, for oversized equipment too large for wind tunnel test method.
- 3. The wind-load withstand rating and the SCC shall comply with the Requirements of the Authority Having Jurisdiction (AHJ), and include the latest revisions, but not limited to the following:
 - a. American Society of Civil Engineers; ASCE-7
 - b. CBC/IBC; including but not limited to Sections 1702, 1708, 1709, 1708A and 1709A.
 - c. California Office of Statewide Health Planning and Development OSHPD; OPA-Preapproval of Anchorage; Code Application Notice CAN 2-1708A.5 and OSP-Special Seismic Certification Approval
 - d. US Department of Homeland Security; FEMA- (installing seismic restraints for electrical equipment)
- D. Wall Mounted Electrical Equipment
 - 1. Surface Mounted Equipment
 - a. Provide multiple horizontal sections of metal "C" channels for support and attaching wall mounted equipment to walls. Channels shall provide "turned lips" at longitudinal edges to hold "lock-in" fasteners and shall comply with ANSI-1008 and ASTM-A569 latest revision. The channels shall be steel hot dip zinc galvanized. As manufactured by Unistrut or Kindorf.
 - b. The "C" channels shall be positioned horizontally within 3-inches of the top and bottom of each, equipment section cabinet and located behind each equipment vertical section. Provide additional intermediate "C" channels at not less than 36-inches on center between the "top" and "bottom" "C" channel positions, located behind each equipment vertical section.
 - c. The "C" channels shall be of sufficient length to provide connection to not less than two vertical structural wall framing elements separated by not less than 16-inches; but in no case shall the "C" channel length be less than the width of the respective Equipment Section.
 - d. Attach the "C" channels to the wall structural elements after the wall, finish surface, installation (including painting) is complete.
 - e. Attach the "C" channels with fasteners to the building wall framing structural elements as follows: welded to steel framing; bolted to wood framing; cast in place concrete inserts for masonry and concrete construction; drilled "afterset" expansion anchors for existing masonry and concrete construction.
 - f. Attach the equipment to the "C" channels with threaded and bolted fasteners to "pre-locate" and lock into the channel "turned lips" and channel walls.
 - 2. Flush mount equipment
 - a. Provide anchor attachment of equipment into adjacent wall structural elements.
- E. Housekeeping Pad
 - 1. Provide cast-in-place, steel re-enforced concrete raised "housekeeping" pads under all floor standing electrical equipment (except data network equipment racks).

- 2. Pad sizes
 - a. The raised housekeeping pad height shall extend 4-inches above the surrounding finished floor elevation for interior building locations.
 - b. The pad shall extend 8-inches below finish grade plus 4-inches above finish grade for outdoor equipment location on grade.
 - c. The pads shall extend 7-inches past the "footprint" edge of the respective floor standing equipment.
- 3. Anchor equipment to pads. Anchor pads to the building structural floor. Equipment pad, equipment re-enforcing and equipment anchoring shall comply with Seismic Earthquake Requirements and Wind Load Requirements.
- 4. Unless shown otherwise on Drawings. The equipment housekeeping pad steel reenforcing shall consist of two layers of Number 4-size steel-rebar laid horizontally and uniformly spaced 6-inches on center. Position rebar in two directions (90-degrees opposed) and centered inside the concrete housekeeping pad. Horizontal rebar shall extend to within 3-inches of the edge of the concrete pad in all directions. Metal wire "tie-wrap" shall be provided at each rebar crossing.
- 5. Equipment anchor attachments shall extend through the housekeeping pad and into the structural concrete below the pad a minimum of not less than 2-inches.

1.21 ELECTRICAL WORK CLOSEOUT

- A. Prepare the following items and submit to the District's Representative before final acceptance.
 - 1. Two copies of all test results as required under this Section.
 - 2. Two copies of Local and/or State Code Enforcing Authority's Final Inspection Certificates.
 - 3. Copies of Record Drawings as required under the General Conditions, pertinent Division One Sections and Electrical General Provisions.
 - 4. Two copies of all receipts transferring portable or detachable parts to the District's Representative when requested.
 - 5. Notify the District's Representative in writing when installation is complete and that a Final Inspection of this work can be performed. In the event any defect or deficiencies are found during this Final Inspection they shall be corrected to the satisfaction of the District's Representative before final acceptance can be issued.
 - 6. List of spare fuses and locations identified by equipment name and building designation.
 - 7. Prior to energizing, retighten to the proper torque, each circuit conductor lug landing, each bus bar (phases, neutral and ground) and circuit protection device threaded connections in all switchboards, switchgear, motor control centers, transformers, busways, disconnect switches, motor starters, motor terminals and panelboards, after the equipment is installed/connected and prior to energizing the equipment. The torque values shall comply with Manufacturer's recommendations.
- B. Electrical Power Single Line Diagrams SLD
 - 1. Provide single line diagrams showing the Contract Document Work complete electrical power system (normal and emergency). SLD shall show inter-connection circuits, electrical equipment, panels, and circuit protection devices, nominal 50% (½-size)

approximately 18-inches by 24-inches. Show installed voltages and electrical capacity sizes.

- 2. SLD shall be mounted in metal (picture frame) rigid enclosure frame with rigid-backing (backer-board) and clear/transparent front, for hanging on wall. Provide clear transparent cover over SLD inside the frame.
- 3. Provide a wall-hung (\pm 48-inches) SLD in each "main" and "sub" electrical equipment room. If wall space is limited, alternatively securely attach SLD frame to room door facing into the respective electrical room.

END OF SECTION 26 05 00 032519/212253

Addendum 1

SECTION 26 05 01

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SCOPE

- A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Examine all other Sections for work related to those other Sections and required to be included as work under this Section.
 - 2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. Submit product data sheets for all outlet boxes, floor boxes, wiring devices, device plates, relays, contactors, timeswitches, and disconnects fuses.
- B. Submit Detailed Shop Drawings including Dimensioned Plans, elevations, details, schematic and point-to-point wiring diagrams and descriptive literature for all component parts for transformers, relays, time clocks, and photocells.
- C. Submit Transformer Test Reports.
- D. Submit Material List for Outlet Boxes.

PART 2 - PRODUCTS

2.01 OUTLET AND JUNCTION BOXES

- A. General:
 - 1. Flush or concealed outlet boxes and junction boxes.
 - a. Non-masonry and/or non-concrete locations provide pressed steel boxes. Steel thickness not less than 0.062-inch, hot-dip galvanized. Knockout (KO) type with conduit entrances and quantities size to match conduits shown connecting to respective junction box and outlet box.
 - b. UL-514 listed and labeled.
 - c. Minimum required box depth is exclusive of extension-ring depth.
 - d. Provide all boxes with matching cover plates. Cover plates shall be gasketed watertight in wet and outdoor locations.
 - e. Boxes installed in masonry or concrete shall be UL "concrete-tight" approved for installation in concrete, and shall allow the placing of conduit without displacing reinforcing bars.
 - 2. Provide outlet boxes of proper Code size for the number of wiring devices, connecting conduits, and conductors/cables or conduits passing through or terminating therein. In no case shall outlet box be less than 4.0-inches square by 2.125-inches deep. Unless

specified elsewhere or noted otherwise on the Drawings, 2.5-inches minimum depth for box width's exceeding 2-gang.

- 3. Increase the minimum outlet box size to 4.69-inches square by not less than 2.125-inches deep, where one or more of the following conditions occurs:
 - a. More than two conduits connect to the outlet box.
 - b. Circuit "Homerun" or Conduit "Homerun" connects to outlet box.
- 4. Signal, Communication and Low Voltage Outlet Boxes:
 - a. Individual or duplex audio/visual, telephone, computer or data outlets: 4.69-inches square by 2.125-inches deep minimum with single gang wide extension ring.
 - b. Combination AV/signal/telephone/data or computer outlets: 4.69-inches square by 2.125-inches deep minimum with 2-gang wide extension ring.
- 5. Junction boxes shall be sized to comply with the following:
 - a. Code Requirements size based on the conduit quantities, conduit sizes and wire-fill connected to the junction box.
 - b. Junction box minimum size shall not be less than 4.69-inches square by 2.5-inches deep, but not less than size indicated on the Drawings or required by Code.
- 6. Provide extension rings on flush outlet boxes and flush junction boxes, to finish face of extension ring flush to (within ±0.63-inches) of finished building surfaces. Extension ring shall match outlet box materials/construction and contain "attachment mounting-tabs" for wiring devices. Extension rings shall be "screw-attached" to respective box and maintain "ground" bonding continuity.
- 7. Outlet boxes installed in outdoor locations, or in wet locations, or in concrete/masonry, shall be cast-iron or cast-bronze, with threaded conduit hubs. UL rated for wet locations.
 - a. Aluminum boxes shall NOT be in contact with concrete or masonry. Die-cast aluminum or cast aluminum water-tight electrical outlet boxes with threaded hubs may be provided as an alternate to cast-iron or cast-bronze outlet boxes, only where one or more of the following conditions occur:
 - 1) Outdoor locations above finish grade.
 - 2) Indoor wet locations surface or flush in walls or ceilings.
 - 3) Not in contact with concrete or masonry.
- 8. Provide fixture-supporting device in outlet boxes for surface mounted fixtures as required.
- 9. Provide solid gang boxes for three or more devices, typical for line and low voltage switches, receptacles, low voltage/signal outlets, etc. for mounting devices behind a common device plate.
- 10. Provide isolation barriers in outlet boxes:
 - a. Between line voltage and low voltage devices.
 - b. Where more than one device is installed in an outlet box, between and separating each device.
 - c. Between 277-volt and 120-volt devices.
 - d. Between devices connected to emergency and non-emergency circuits of all voltages.

- 11. Outlet boxes installed penetrating into fire rated walls, fire rated floors, fire rated ceilings and all fire rated construction. The outlet boxes shall be UL listed, classified and labeled, for fire rated and temperature rated penetration of the respective fire rated surface and fire rated construction. The outlet box fire rating and temperature rating shall equal or exceed the fire/temperature rating of the surface/construction being penetrated. Provide UL listed and labeled supplemental fire and temperature protection to maintain ratings:
 - a. Wall and ceiling penetrations, supplemental tumescent fire wrap (external or internal of outlet box).
 - b. Floors provide subfloor supplemental fireproofing below floor box.
- 12. Outlet boxes installed in floors. The floor outlet boxes shall be UL listed and labeled for scrub water exclusion Requirements, including but not limited to tiles, carpeting and exposed wood and concrete floor fishes.
- 13. Outdoor flush in wall device outlet boxes:
 - a. Flush in wall outlet box with corrosion resistant gasketed water tight, hinged, key locking cast metal, self-closing cover. Tamper resistant and vandal resistant.
 - b. UL-listed and labeled for installation in masonry, cast-in-place concrete, hollow-framed walls and wet locations.
 - c. Flush cast-iron or cast-bronze or brass, device back-box, nominal 4.68-inch square by 2.25-inch deep.
 - d. Internal metal adapter plate for wiring device types, in the box as indicated on the Drawings.
 - e. As manufactured by Legrand/Pass and Seymour #4600 Series; or C.W. Cole #310 Series.
- 14. PVC Coating
 - a. Metal outlet and junction boxes installed in outdoor or exposed non-weather protected locations shall be PVC coated.
 - b. PVC coating shall be factory applied, to comply with NEMA-RN1 and 5-19.
 - c. The adhesion of the PVC coating to the metal box shall exceed the strength of the coating itself, based on 0.5-inch "strip-pull" test.
 - d. Uniform coating thickness shall be continuous without "breaks" or "pinholes" and shall not be less than the following:
 - 1) Box exterior surfaces, 40-millimeter coating thickness.
 - 2) Box interior surfaces, 10-millimeter coating thickness.
- 15. Refer to Architectural and Structural Contract Documents and Details for Additional Box and Install Requirements.
- B. Surface Outlet Boxes
 - Surface mounted outlet boxes, cast iron Type FS or FD, with threaded hubs as required. Box interior dimensions and interior volume capacity not less than required for "press steel boxes", and "sheet steel boxes". Provide plugs in all unused openings. Provide weatherproof gaskets for all exterior boxes.

- C. Floor Boxes
 - 1. General:
 - a. Outlet boxes installed in floors. The floor outlet boxes shall be UL listed and labeled for scrub water exclusion Requirements, including but not limited to floor tiles, carpeting and exposed wood and concrete floor fishes.
 - Electrical power receptacles in a floor box; shall be industrial grade wet location heavy-duty, high-abuse rated devices, tamper resistant. Grounding type, 125 volts, 60Hz AC, 20-amp, NEMA 5-20R (duplex), or other NEMA configurations noted on the Drawings. Standard length receptacle mounting strap as required by the Manufacturer of floor box being furnished.
 - c. Tested, listed and labeled to comply with UL-514A and/or UL514C.
 - 2. Concrete floor outlet box for chair/seat aisle light fixture connection:
 - a. Flush-in -concrete floor box, brass or cast iron, nominal 18-cubic inches internal wire capacity, removable screw attached flush top cover.
 - b. Minimum of three 0.75-inch conduit threaded entrances; one surface/top entrance location for aisle light fixture connection to box, plus two side and bottom locations for "in-out" branch circuit connections.
 - c. The top entrance conduit position shall not interfere with removal and reinstallation of the box top cover, with the top conduit connected between the box and aisle light fixture and the top of the box set flush with finish floor surface.
 - d. Box and conduit shall be protected and concealed, below each respective aisle seat containing an electric aisle light fixture. Orientation of top entrance conduit to match position of aisle light fixture.
 - e. As manufactured by Hubbell #F3185 Series; no known equal.
 - 3. Poke-Thru floor boxes for "After-Set" Floor Outlets.
 - a. Through floor wiring for power and communication shall be UL listed with a fire and temperature rating of not less than 2-hours. The units shall include an internally divided floor fitting; a divided through-floor conduit/ raceway, and a divided under floor junction "split-box" not less than 4.7-inches by 4.7-inches by 2.125-inches in size. Junction box shall be installed concealed in ceiling space of the floor below. The length of the floor "through-raceway" shall match the thickness of the finish floor and as recommended by the Manufacturer. Unit shall be self-supporting without the attachment of an above floor fitting. Internal isolation barriers between high potential and low potential circuits and sections. The integral fire barrier shall incorporate a cold smoke barrier to prevent the passage of smoke when heat is not present.
 - b. Poke-Thru Floor boxes shall contain dual services for high potential and low potential devices and circuits.
 - c. Poke-Thru Floor pedestal type; (internally divided high potential and low potential sections) service fittings die cast, brushed aluminum, single piece device housing, with stainless steel device cover plates front and rear of the housing as follows:
 - 1) Front side (high potential) one 20-amp, 120 volt, 60Hz, AC, grounding duplex convenience outlet plugs.

- 2) Rear side (low potential) shall contain "knockouts" or "keystones" as follows at locations shown on the Drawings:
 - a) Knockouts for signal cables one 1-inch diameter and two ³/₈-inch diameter with rubber bushing grommets for each knockout.
 - b) Four RJ-45 keystone, snap-in retainers for low potential plug-in signal connections.
 - c) The Contractor shall provide the type of outlet(s) at each poke-thru location as required by the low voltage-signal Contract Documents.
- 3) Alternately where specifically indicated on the Drawings, the front and rear cover plates shall be supplied with knockouts for 1.0-inch flexible conduit "Furniture" connection, one per cover plate.
- 4) The pedestal shall provide 0.25-inch or greater protective over-hang (drip-lip) of the device coverplates. Provide stainless steel device coverplates.
- d. Non-Pedestal Poke-Thru flush in floor type; (internal divided high potential and low potential sections) die cast, flush with finish floor, metal cover flip-open, locking, hinged access covers. Open-close die cast aluminum port-covers for plug-in portable cable connections. ADA compliant, wide trim matching flange.
 - 1) Two 20-amp, 120 volt, 60Hz, AC, grounding duplex convenience receptacles for high potential power connections.
 - 2) Four RJ-45 keystone, snap-in retainers for low potential plug-in signal connections. The Contractor shall provide the type of outlet(s) at each poke-thru location as required by the Low Voltage-Signal Contract Documents.
 - 3) Cover shall close and lock after portable plug-in cables have been inserted into respective connections, under the cover.
 - 4) UL wet mop, scrub water rated for carpeted and non-carpeted floors.
- e. Die cast aluminum cover, nominal 8-inch diameter metal housing flush in "corehole", outlet metal body size.
- f. Flush with floor or pedestal type as indicated on Drawings. As manufactured by Wiremold/Legrand# Evolution Poke-Thru 8AT Series, Smoke and Fire Rated Poke-Through fittings; no known equal.
- 4. Floor Boxes for Flush Floor Outlets (non-pedestal), recessed concealed inside outlet box, plug-in receptacles.
 - a. Provide cast-in-floor with concrete pour pan, rated for on grade to prevent direct earth contact, cast-in-place concrete floors on-grade and above-grade; adjustable "leveling-feet" for box.
 - b. UL wet mop, scrub water rated for carpeted and non-carpeted floors. UL-File E171211 installation fire rating and/or UL-Fire Resistance Classified.
 - c. Floor boxes shall contain dual services:
 - 1) High potential with not less than two 120 volt 60Hz AC 20-amp grounding duplex convenience receptacles.
 - 2) Low potential for low voltage system outlets and signal circuits with up to and including eight RJ-45 plug-in keystone snap-in retainer receptacles. The Contractor shall provide the type of outlet(s) at each poke-thru location as required by the low voltage-signal Contract Documents.
 - 3) Internal isolating barrier between high and low potential circuits and sections of box.

- 4) Also refer to Drawings for additional outlet Requirements.
- d. Conduit knockouts in bottom of box and in each side walls of box. Not less than one 1.25-inch and one 0.75-inch knockouts for both low potential and high potential conduits connections on each opposing box sides. Include the same configuration of knockouts on the bottom of the box, for high potential section and low potential sections.
- e. Floor box cover:
 - Flush tamper resistant "lock-down" removable main cover. Independent hinged "flip-out" port in the removable cover, to allow main box cover to be in a fully closed position with "plug-in" cords connected into box when the lockdown cover is closed. Main cover "lock-down" to prevent non-authorized access into box interior.
 - Brass, removable recessed main cover, rated for carpet, or tile for floor finish, brass overlapping trim cover finish. Cover recess depth 0.25-inch, 0.5-inch or 0.75-inch as required to match respective floor covering thickness and type. ADA compliant, wide trim matching flange.
- f. Floor box with metal body, nominal box size 10-inches by 12-inches by depth to match floor, but not less than 3.0-inches deep box.
- g. Floor box as manufactured by FSR #FL-500P Series; no known equal.

2.02 PULL BOXES

- A. General
 - 1. Sizes as indicated on the Drawings and in no case of less size or material thickness than required by the Governing Code and AHJ.
 - 2. Exercise care in locating pull boxes to avoid installation in drain water flow areas and to clear existing condition interferences.
 - 3. UL listed and labeled for electrical circuits.
- B. General Purpose Sheet Metal Pullbox
 - 1. General purpose sheet steel pull boxes: Install only in dry protected locations with removable screw attached covers. Manufacturer's standard rust proofing and baked enamel finishes.
 - 2. Weatherproof sheet steel pull boxes: Fabricate of Code gauge steel. All surfaces interior and exterior hot-dip galvanized steel. Gasketed weathertight cover of same material.
- C. Concrete Pull Boxes and Hand-Holes for Electrical
 - 1. AASHTO H-20 traffic loading rated box and cover, pre-cast concrete, steel reinforced pull boxes and hand-holes. Provide complete with pulling irons, hot-dip galvanized metal traffic cover with hot-dip galvanized metal cover frame, pull-box concrete base with sump. Four cable full height wall racks with porcelain cable support blocks.
 - 2. Boxes shall be "Intercept" type with Multiple Box Sections. Extension cable-intercepts at both ends of box. Refer to Drawings for box size.
 - 3. Covers shall be flush bolt down. Covers weighing more than 40-pounds shall be split cover type "Torsion-Sping" assist, hinged open-close.

- 4. Box covers shall comply with Federal ADA, UL, State and Local AHJ for slip resistance. Provide cast-or-bead weld on cover of pull box to indicate services within pull box (i.e., "480/277-VOLT, 3-PHASE, 4-WIRE ELECTRICAL" OR "SIGNAL/TEL/P.A./CLOCK/FIRE ALARM" etc.).
- 5. Shall be set on a machine-compacted pea gravel base 12-inches thick with gravel base extend 6-inches beyond box base on all sides. Provide a 0.75-inch by 10-feet copper clad ground rod through the box bottom with 9-inch projection into box, for grounding all metal parts and frames with continuous #10 AWG copper bond wire.
- 6. Seal all box joints and seal box between cover and frame with a mastic compound similar to Parmagum or Dukseal. After cables have been pulled, connected, tested and inspected, seal box cover and bolt-close cover.
- 7. As manufactured by Jensen Precast; or Oldcastle Precast.

2.03 SWITCHES, WIRING DEVICES

- A. General
 - 1. Provide wiring device circuit switches totally enclosed, electrical insulating Bakelite or electrical insulating composition base, manual operator type with 277 volt 60Hz AC rating for full capacity contacts rated for incandescent lamp loads, fluorescent lamp loads and motor loads. Switch mounting-ears for screw attachment to outlet box. Switches shall be UL listed and labeled; conform to NEMA-WD1 and WD6.
 - 2. Switch controlling (on-off) rated for all lighting loads and all non-lighting loads; switch ratings shall be 20-amp; unless indicated otherwise on Drawings.
 - 3. Color as selected by Owner's Representative. Switches and wiring devices controlling circuits connected to emergency power shall be red.
 - 4. All switches shall be of the same Manufacturer.
 - 5. Where switches are mounted in multiple gang assembly and are operating at 277 volts and/or 277 volts and 120 volts or emergency/non-emergency and mounted in same outlet box, there shall be an insulating barrier installed between each switch.
 - 6. Devices shall additionally be listed and labeled as UL-All Weather-Resistant wet-location for the following install locations:
 - a. Devices indicated on Drawings as Weather-Proof (W.P.).
 - b. Devices installed in outdoor locations
 - c. Installed in classified wet or damp area locations both indoor and outdoor.
 - 7. Wiring devices shall be listed and labeled for connection of both "solid" and "stranded" copper circuit conductors.
 - 8. Switches with ampere and voltage ratings different than described herein. The different rated switches shall have the same characteristics and performance as the respective described switches, except for differing ampere and voltage characteristics.
- B. Switches Heavy Duty (Toggle Type)
 - 1. Single Pole Switches 20 amp at 277V

 <u>Manufacturer</u>
 <u>Toggle Type</u>

 Hubbell
 #HBL1221

 Legrand/P&S
 #20AC1

	Leviton Cooper-Arrow/Hart	#12 #AF	21 11221	#1221-L #AH1221-L	
2.	Double Pole Switch – 20 amp	o at 277V			
2.	<u>Manufacturer</u> Hubbell	Tog	<u>gle Type</u> BL1222	<u>Lock Type</u> #HBL1222-L	
	Legrand/P&S	#20	AC2	#20AC2-L	
	Leviton	#12	22	#1222-L	
	Cooper-Arrow/Hart	#AH	1222	#AH1222-L	
3.	Three-Way Switches – 20 am	p at 277V			
	Manufacturer	Tog	<u>gle Type</u>	Lock Type	
	Hubbell	#HE	BL1223	#HBL1223	
	Legrand/P&S	#20	AC3	#20AC3-L	
	Leviton	#12	23	#1223-L	
	Cooper-Arrow/Hart	#AH	1223	#AH1223-L	
4.	Four-Way Switches – 20 amp	at 277V			
	<u>Manufacturer</u>	Tog	<u>gle Type</u>	Lock Type	
	Hubbell	#HE	3L1224	#HBL1224-L	
	Legrand/P&S	#20	AC4	#20AC4-L	
	Leviton	#12	24	#1224-L	
	Cooper-Arrow/Hart	#AH	1224	#AH1224-L	
5.	Momentary Contact Switche	s – 20 amp at 3	277V		
	Manufacturer		osition Regular	3-Position Lock	<
	Hubbell	#HE	BL1557	#HBL1557-L	-
	Legrand/P&S	#12	51	#1251-L	
	Leviton	#12	51	#1251-L	
	Cooper-Arrow/Hart	#AH	l (extra)	#AH (extra)	
6.	Maintained Contact Switches	(Double Thro	w, Center Off) – 20	amp at 277V	
		Toggle	е Туре	Lock Type	
	<u>Manufacturer</u>	<u>1-Pole</u>	<u>2-Pole</u>	<u>1-Pole</u>	<u>2-Pole</u>
	Legrand/P&S	#1225	#1226	#12250L	#1226-L
	Hubbell	#HBL1385	#HBL1386-L	#HBL1385-L	#HBLM1386-L
	Leviton	#1385	#1386		
	Cooper-Arrow/Hart	#AH(extra)	#AH (extra)	#AH (extra)	#AH (extra)

7. Pilot lights used in conjunction with circuit switches shall be LED type with red jewel.

C. Switches – Shall be Decorator ("Rocker" type operations) Style, for residential locations only.

- 1. 120 volt 60Hz AC, rated 15 amp for lighting loads and rated 20 amp for non-lighting loads, unless indicated otherwise on Drawings.
- 2. Single Pole Switches

<u>Manufacturer</u>	Rocker Type
Legrand/P&S	#TM870
Hubbell	#RSD115
Leviton	#5621-2
Cooper-Arrow/Hart	#7501

3.	Double Pole Switch	
	<u>Manufacturer</u>	Rocker Type
	Legrand/P&S	
	Hubbell	#RSD215
	Leviton	#5622-2
	Cooper-Arrow/Hart	#7502(extra)
4.	Three-Way Switches	
	<u>Manufacturer</u>	<u>Rocker Type</u>
	Legrand/P&S	#TM873
	Hubbell	#RSD315
	Leviton	#5623-2
	Cooper-Arrow/Hart	#7503

5. Four-Way Switches

<u>Manufacturer</u>	<u>Rocker Type</u>
Legrand/P&S	#TM874
Hubbell	#RSD415
Leviton	#5624-2
Cooper-Arrow/Hart	#7504

6. Momentary Contact Switches

Manufacturer	3-Position Regular
Legrand/P&S	#TM870(extra)
Hubbell	#RSD(extra)
Leviton	#5624-2
Cooper-Arrow/Hart	#7521

7. Maintained Contact Switches (Double Throw, Center Off).

	Rocker Type		
<u>Manufacturer</u>	<u>1-Pole</u>	<u>2-Pole</u>	
Leviton	#5685-2	#5686-2	

- 8. Pilot lights used in conjunction with circuit switches shall be LED type with red jewel.
- D. Weather-Proof (W.P.) Switches
 - 1. Outdoor switches provide heavy-duty, tamper resistant gasketed weather proof metal, hinged door cover for each switch.
 - 2. Cover door shall be key locking-type or padlock-type.
- E. Other Switches, Receptacles, Devices, and Outlets
 - Special devices outlets and outlet locations shall be as indicated on the Drawings. Modify device and outlet characteristics to accommodate the actual install location conditions for each outlet.

2.04 ELECTRIC RECEPTACLE WIRING DEVICES

- A. General
 - 1. All receptacle wiring devices in flush type outlet boxes shall be installed with a bonding jumper to connect the box to the receptacle ground terminal. Grounding through the receptacle mounting straps is not acceptable. The bonding jumper shall be sized in accordance with the branch circuit protective device as tabulated herein under

"Grounding". Bonding jumper shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws 6-32 or larger (except isolated ground receptacles). For receptacles in surface mounted outlet boxes direct metal-tometal contact between receptacle mounting strap (if it is connected to the grounding contacts) and outlet box may be used. Receptacle mounting-ears for screw attachment to outlet box. Receptacle shall be UL listed and labeled; conform to NEMA-WD1 and WD6.

- 2. All receptacles shall be a product of the same Manufacturer.
- 3. Receptacle color as selected by Owner's Representative. Receptacles connected to emergency power circuits shall be red.
- 4. Tamper Resistant Receptacle
 - a. Devices shall additionally be listed and labeled as tamper resistant, provide tamper resistant receptacles in buildings containing: dormitories, condominiums, guest-rooms, housing/residences, apartments, dwellings, hotels/motels, classrooms, secondary schools K through 12th grade, childcare/daycare/kindergarten, hospital pediatric-care units and other locations required by AHJ.
 - b. The electrical receptacles shall be rated "Tamper-Resistant-Receptacle" (TR), UL-TR (RTRT). Spring loaded shutters shall automatically open-close (unblock-block) the receptacle slots, when the plug-in (cap) insertion and removal occurs.
 - c. Typical for 15-amp and 20-amp receptacles. Modify Manufacturer's catalog number description to include tamper resistant receptacle function.
- 5. Wiring devices shall be listed and labeled for connection of both "solid" and "stranded" copper circuit conductors.
- 6. Duplex convenience receptacles and 120-volt single phase branch circuits.
 - a. Duplex (convenience) receptacle, wiring device with two single receptacles with the same electrical rating, integrated into a single assembly by the Manufacturer.
 - b. 20-amp branch circuits with a single duplex convenience receptacle connection on each circuit, receptacles shall be rated for 20-amp.
 - c. 15-amp and 20-amp branch circuits with two or more duplex convenience receptacle connections each circuit, receptacle shall be rated 15-amp or 20-amp.
- 7. Devices shall additionally be listed and labeled as UL-All Weather-Resistant, provide weather resistant receptacles for the following install locations. Modify Manufacturer's catalog number descriptions, shall include all-weather-resistant UL listing and labeling:
 - a. Devices indicated on Drawings as Weather-Proof (W.P.).
 - b. Devices installed in outdoor locations.
 - c. Devices installed in classified as damp or wet locations both indoor and outdoor.
 - d. All GFCI (ground-fault) receptacles all locations.
- 8. Receptacles with ampere and voltage ratings different than described for duplex convenience receptacles. The different rated receptacles shall have the same characteristics and performance as the respective duplex convenience receptacles, except for differing ampere and voltage characteristics. Refer to "Floor Boxes" for Additional Receptacle Requirements".

- 9. Receptacles shall be GFCI type for the following locations:
 - a. located within 84-inches of a sink or hosebib shall be GFCI receptacles.
 - b. Devices installed in outdoor locations.
 - c. Devices installed in classified as damp or wet locations both indoor and outdoor.
 - d. Devices indicated on Drawings as GFCI or Weather-Proof (W.P.).
- 10. "Split-wire" duplex convenience receptacles. Each split-wire receptacle plug connects on independent common circuit. Provide nameplate or graphic on face of receptacle describing the receptacle function and control source. Comply with California Title-24 and ASHRAE-90.1, latest revisions.
- B. Duplex convenience receptacles.
 - 1. Shall be grounding type, 120 volt and shall have two current carrying contacts and one grounding contact which are internally connected to the frame. Outlet shall accommodate standard parallel blade cap and shall be side wired. Receptacles shall be tamper resistant–TR, UL-TR.
 - 2. GFCI receptacles shall be all Weather-Resistant and wet location rated. Duplex, rated 120 volt 60Hz AC, 20 amp, unless indicated otherwise on Drawings.
 - 3. Heavy Duty Industrial Grade

<u>Manufacturer</u>	<u>NEMA 5-15R</u>	<u>NEMA 5-20R</u>	NEMA 5-20R-GFCI
Legrand/P&S	#5262	#5362	#2095HG
Leviton	#5262	#5362	#W7899
Hubbell	#CR5252	#5362	#GFR8300
Cooper-Arrow/Hart	#AH5262	#AH5362	#WRVGF20

- C. Isolated Ground Receptacles-IGR
 - 1. The receptacle insulation barrier shall isolate the receptacle ground contact system from ground. Connect the ground plug contact to a separate dedicated insulated ground-bonding conductor. The receptacle ground plug contact shall not be grounded to the raceway or outlet box. Isolated ground duplex convenience receptacle 20-amp minimum, with two current carrying contacts and one grounding contact, or as noted on the Drawings.
 - 2. High-abuse, heavy-duty industrial grade, NEMA 5-20R, duplex convenience receptacles.
 - 3. Identify receptacle with an orange triangle on the receptacle face and orange receptacle body. Red body for receptacles connected to emergency power.

<u>Manufacturer</u>	<u>NEMA 5-20R</u>
Legrand/P&S	#IG6300
Leviton	#5362IG
Hubbell	#CR5352IG
Cooper-Arrow/Hart	#IG5362

- D. Hospital Grade Duplex Convenience Receptacles
 - 1. Receptacles shall be Underwriters Laboratories listed hospital high abuse, heavy-duty rated grade.
 - 2. Duplex convenience receptacles shall be grounding type 120 volt with two current carrying contacts and one grounding contact which is internally connected to the frame. Outlets shall accommodate standard parallel blade cap and is side wired.

3. Ground Fault Circuit Interrupter (GFCI or GFI) 20-amp duplex convenience receptacles with test-reset buttons and visual pilot. Shall be all Weather-Resistant and wet location rated.

<u>Manufacturer</u>	<u>NEMA5-15R</u>	<u>NEMA5-20R</u>	NEMA5-20R-GFCI
Legrand/P&S	#8200HG	#8300HG	#2095HG
Leviton	#8200HG	#8300HG	#HG-7899
Hubbell	#8200	#8300	#GFR8300
Cooper-Arrow/Hart	#AH8200	#AH8300	#TRVGFH20

- E. Weather Proof (W.P.) Receptacle
 - 1. Outdoor receptacles shall be duplex convenience GFCI type rated 20-amp 120 Volt 60Hz AC weatherproof, GFCI, unless indicated otherwise on Drawings. Test-reset buttons and visual pilot.
 - 2. GFCI receptacles shall be wet location and Weather-Resistant rated weatherproof, gasketed, key locking tamper resistant, wet location.
 - Outdoor, flush mount outlet with hinged, key-locking, weather-proof cover (CEC/NEC 406.8 compliant). As manufactured by Pass and Seymour/Legrand #4600 Series; or C.W. Cole #310 Series.
 - 4. On exposed conduit runs, provide weatherproof ground fault circuit interrupter type GFCI receptacles installed in "FS" condulet water tight cast metal body, with weatherproof spring door type covers, gasket water tight. Door shall be key locking-type or padlock-type.
- F. Duplex convenience receptacles, for residential locations only.
 - 1. Receptacles shall be "Decorator" type, grounding type, 120 volt, 60Hz AC, and shall have two current carrying contacts and one grounding contact which are internally connected to the frame.
 - 2. Outlet shall accommodate standard parallel blade cap and shall be side wired.
 - 3. GFCI receptacles shall provide test-reset buttons and visual pilot. Rated 120 volt 60Hz AC, unless indicated otherwise on Drawings. GFCI receptacles shall be wet location and all Weather-Resistant rated.
 - 4. Tamper Resistant Receptacles
 - a. All the electrical receptacles shall be rated "Tamper Resistant Receptacles" for 120 volt, 15-amp and 20-amp (TR), UL-TR (RTRT). Spring-loaded shutters shall automatically open-close (unblock-block) the receptacles slots, when the plug-in (cap) insertion and removal occurs.

<u>Manufacturer</u>	<u>NEMA 5-15R</u>	<u>NEMA 5-20R</u>	NEMA 5-20R-GFCI
Legrand/P&S	#885TR	#TR26362	#2095TRWRW
Leviton	#T5325	#T5825	#W7899TR
Hubbell	#RRD15STR.	#RRD20STR	#GFTR20
Cooper-Arrow/Hart	#TR1107	#TR6350	#TWRVG20

- G. Other Switches, Receptacles, Devices, and Outlets.
 - Special devices, outlets and outlet locations shall be as indicated on the Drawings. Modify device and outlet characteristics to accommodate the actual install location conditions for each outlet.

2.05 PLATES

- A. Metal Cover Plates for Devices
 - 1. Provide cover plates for every line voltage and low voltage switch, receptacle, telephone, computer, television, signal and other device outlets.
 - a. All line voltage circuit plates shall be metal, 0.040-inch stainless steel Type 302 alloy, composed of 18% chromium and 8% nickel.
 - b. Plates for low voltage signal systems may be metal or non-metal. Non-metal plates shall be high-abuse, hard-service and high-impact resistant.
 - 2. Plates shall be as manufactured by P&S; or Hubbell; or Leviton; or General Electric.
- B. Residential Location Project non-metal cover plates for line voltage and low voltage devices.
 - 1. Provide plates for every line voltage and low voltage switch, receptacle, telephone, computer, television, signal and other device outlets. Non-metal, heavy-duty, high-abuse and high-impact resistant plates.
 - 2. Plates shall be same Manufacturer as the respective wiring device.

2.06 VANDAL-PROOF FASTENINGS

Provide approved vandal-proof type screws, bolts, nuts where exposed to sight throughout the Project. Screws for such items as switch plates, receptacle plates, fixtures, communications equipment, fire alarm, blank covers, wall and ceiling plates to be spanner head stainless steel, tamperproof type. Provide Owner with six screwdrivers for this type.

2.07 STRUCTURAL AND MISCELLANEOUS STEEL

Structural and miscellaneous steel used in connection with electrical work and located out-ofdoors or in damp locations, shall be hot-dip galvanized unless otherwise specified. Included are underground pull box covers and similar electrical items. Galvanizing averages 2.0 ounce per square foot and conforms to ASTM A123.

2.08 FLASHING ASSEMBLIES

- A. General
 - 1. Flashing shall be compatible with the material being penetrated and with the pipe passing through the flashing. Coordinate with and comply with Manufacturer's recommendations, for both the flashing and the material being penetrated.
 - 2. Provide lead metal flashing assemblies at all roof penetrations, unless recommended otherwise by Manufacturer.
 - 3. Seal the joint between the flashing and pipe passing through the flashing with waterproofing compound.
 - 4. Lead flashing for roof penetrations, as manufactured by: Santa Rosa Lead Products; or Semco; or Flashco.
- B. Storm Collars
 - 1. In addition to penetration flashing, provide a storm-collar counter-flashing for each roof penetration flashing. Shall attach to the structure of the penetration and form a water-tight "umbrella" counter flashing over the roof penetration flashing.
 - 2. As manufactured by: STD-Storm collars; or ASI-Storm collars.

2.09 RELAYS, CONTACTORS AND TIMESWITCHES

- A. Individual Control Relays (HVAC Plumbing of the Control Functions)
 - Individual control relays shall have convertible contacts rated a minimum of 10-amp, 600 volts regardless of usage voltage. Coil voltage, number and type of contacts shall be verified and supplied to suit the specific usage as shown in the wiring diagrams and/or schedules on the Electrical and Mechanical Drawings. Coil control circuit shall be independently fused, sized to protect coil. Relays shall be installed on prefabricated mounting strips. Each relay shall have a surge suppressor to limit coil transient voltages. Furnished in the NEMA Type I enclosure unless indicated otherwise.
 - 2. The following relays are approved:

<u>Manufacturer</u>	<u>Type</u>
Cooper-Arrow/Hart	IMP
General Electric	Class CR 2811
Square D Co.	Class 8501, Type A
Westinghouse	Bul. 16-321, Type NH
Allen Bradley	Approved Equal

- B. Contactors and/or Relays
 - 1. Contactors and/or relays for control of lighting shall be 600 volt AC, electrically operated, and mechanically held units, open type for panel mounting with number of poles and of size as indicated on the Drawings. Provide auxiliary control relay for operation of each contactor and/or relay with a 2-wire control circuit.
 - 2. Contactors and/or relays shall be mounted in panelboards in barriered section under separate hinged lockable doors or in contactor and/or relay cabinets as called for on the Drawings. Contactors and/or relays shall be installed on Lord sound absorbing rubber mounts.
 - 3. Contactors and/or relays shall be Automatic Switch Co. Bulletin #920 Series for 2-pole and 3-pole, Automatic Switch Co. Bulletin 917 Series with poles as indicated on Drawings. Coil control circuit shall be independently fused, sized to protect coil.
 - 4. Contactors and/or relays shall be equipped with a switch, in the proper configuration, to disconnect the control circuit controlling the coil of the respective device. Control circuit disconnect switch shall be labeled showing function of device.
- C. Time-Switches
 - All timeswitches shall have synchronous motor drive for operation on 120 or 277 volts, 60Hz, AC and shall be furnished with a 10-hour, spring-driven, reserve-power motor. Contacts shall be rated 40-amp per pole.
 - a. Exterior lighting timeswitches for control of individual circuits or electrically operated relays shall have astronomic dial and shall be Tork 7000ZL Series or approved equal by Paragon or Intermatic.
 - b. Interior lighting timeswitches for control of individual circuits or electrically operated relays shall be Tork 7000 Series or approved equal by Paragon or Intermatic.
 - c. Timeswitches for control of air conditioning or plumbing equipment shall have seven day dial and shall be Tork WL Series or approved equal by Paragon or Intermatic.

- 2. All timeswitches shall be mounted in separate section in top of panelboards under separate lockable door unless otherwise indicated on Drawings. Clear opening for time-switch shall be a minimum of 12-inches by 12-inches.
- D. Contactors and/or Relays/Timeswitch Cabinet
 - 1. Contactors, relays, and/or timeswitches not indicated to be mounted in electrical panels shall be mounted in a cabinet, size as required, with hinged lockable door keyed same as panelboards. Construction of cabinet shall be similar to terminal cabinets.
 - 2. Each contactor, relay or timeswitch mounted in the contactor cabinet shall be barriered in its own compartment, and shall be installed on Lord sound absorbing mounts.
 - 3. Contactor cabinets shall be of the same Manufacturer as the panelboards.
 - 4. Where relays and/or contactors occupy the same enclosure as timeswitches they shall have a clear acrylic shield installed over each relay or contactor to guard line exposed parts from accidental contact by nonauthorized personnel.

2.10 DISCONNECTS (SAFETY SWITCHES)

- A. General
 - 1. Disconnect switches shall all be rated:
 - a. 600 volt 60Hz AC for all disconnect safety switches.
 - b. NEMA Type HD, quick-make, quick-break, H.P.-rated.
 - c. Fused Class "R", in NEMA Type I indoor location enclosure. Where enclosure is indicated outdoor or W.P. (Weather-Proof) switches shall be rain tight NEMA 3R enclosure. Lockable access door.
 - d. Number of poles horse power rating and amperage as indicated on the Drawings.
 - 2. Provide internal neutral bus, ground-lug and conductor landing lugs, size to match conductors shown on Drawings. Switch access door shall be interlocked with switch to prevent access inside switch when switch is "on" closed position.
 - 3. Maximum voltage, current and horsepower rating clearly marked on the switch enclosure and switches having dual element fuses shall have rating indicated on the nameplate.
 - 4. Disconnect switch and fuses ampere rating shall also comply with Manufacturer's recommendation for the connected load.

2.11 SPARE FUSE CABINETS

Provide a cabinet in each room where a switchboard or motor control center is installed and contains fuses. Cabinets shall be as specified for "Terminal Cabinets" and shall be of sufficient size to contain all spare fuses hereinbefore specified. Provide clips (two per fuse) for each spare fuse. Mount clips in plywood backboard in cabinet. Label cabinet "SPARE FUSES".

2.12 CONCRETE WORK (ADDITIONAL REQUIREMENTS)

- A. Portland Cement
 - 1. ASTM C33-(latest revision), Type II, Low Alkali Cement. Composed of Portland cement, coarse aggregate, fine aggregate, and water.

- a. Concrete for use as electrical equipment footings, lighting pole bases and equipment slabs on grade, concrete shall attain minimum 28-day compressive strength of 4000psi, using not less than 5.75 sacks of cement per cubic yard of wet concrete.
- b. Concrete for underground duct/conduit encasement, the minimum 28-day compressive strength shall be 2000 psi. Provide a minimum of 10-pounds of red oxide concrete coloring per yard of concrete.
- c. Mix shall obtain a 6-inches slump, measured with standard slump cone per ASTM C143/C143M (latest revision).
- 2. Coarse Aggregate: Uniformly graded between maximum size not over 1½-inch and not less than 0.75-inch and minimum size #4, crushed rock or washed gravel. For concrete encased conduit only, maximum aggregate size shall be ½-inch.
- 3. Fine Aggregate: Clean, natural washed sand of hard and durable particles varying from fine to particles passing ¾-inch screen, of which at least 12% shall pass fifty mesh screens.
- B. Water: Clean and free from deleterious quantities of acids, alkalis, salts, or organic materials.
- C. Reinforcement
 - 1. Bars: Intermediate Grade Steel conforming to ASTM A615/A615M Grade 60, with pattern deformations.
 - 2. Welded Wire Fabric: ASTM A185/A185M.
 - 3. Bending: Conform to Requirements of ACI 318.
- D. Form Material: For exposed work, use PS 1-66 "B-B Concrete Form" plywood forms, or equal. Elsewhere, forms may be plywood, metal, or 1-inch by 6-inch boards. Forms for round lighting pole bases shall be sono-tube.

2.13 SURGE PROTECTION DEVICE (SPD) – DIRECT CONNECT

- A. General
 - The unit shall be modular in construction and operate in parallel with 60Hz AC line voltage, 4-wire or 5-wire, grounded or ungrounded systems, as applicable; voltage, kVA and ampere capacity as indicated on the Drawings. Suitable for direct connection through an external circuit breaker or combination switch/fuse protective device rated 30-amp, continuous duty, rated for Service Entrance equipment connection. Electrical surge protection sequences shall include circuit configurations as follows:
 - a. Line-to-Line (Phase-to-Phase).
 - b. Line-to-Ground (Phase-to-Ground).
 - c. Line-to-Neutral, where neutral is present.
 - d. Ground-to-Neutral, where neutral is present.
 - 2. The unit shall operate correctly with any combination of resistive, inductive, or capacitate loads. The unit shall automatically shunt to ground the electrical transients and EMI/RFI noise occurring above the specified values. The unit shall automatically reset after transient condition has passed. Operating temperature minus 40° centigrade to plus 85° centigrade.
 - 3. Provide one or more individual self-contained protection module(s) for each line voltage phase, ground and neutral, suitable for direct connect with line-side C/B protection and

disconnect. Provide one spare individual plug-in protection module. Provide incoming line, neutral and ground conductor termination lugs rated CU/AL #14 through #4 AWG. Lugs shall be barriered from and prewired to the respective protection modules.

- 4. Provide a NEMA twelve housing to contain all unit modules, devices and conductor terminations. The housing shall include a hinged pad-lockable access door.
 - a. Flush housing for mounting internally inside related equipment.
 - b. Surface mounted, with conduit entrance knockouts for external mounting. Maximum housing size shall not exceed 36-inches wide by 72-inches high by 8inches deep.
- 5. As manufactured by Total Protection Solutions Model #ST-SPD; or MCG Electronics; or Advantage Protection Technologies, Inc.
- B. Operational Characteristics
 - 1. Surge protection device, testing, listing and certification.
 - UL 1449 (latest edition) and CSA listed and labeling, for Surge Protection Device Suppresser, UL 1283 for surge protection voltage electrical noise attenuation, ANSI/ IEEE C62.45, C62.1 for C62.41, (latest edition) bi-directional transient clamping voltages for both Normal Mode and Common Modes against Category A and B ring wave and Category B impulse wave.
 - b. The unit connected to the service entrance shall also withstand a minimum of 2,000sequential ANSI/IEEE C62.41 Category C surges without failure following IEEE Test procedures in C62.1, C62.41 and C62.45.
 - 2. Surge protection device, EMI noise rejection, and RFI noise rejection shall be provided for Common Mode (line-to-neutral and line-to-ground), Normal Mode (line-to-line) and neutral to ground.
 - 3. EMI and RFI noise rejection.

Conducted line noises interference both Electromagnetic (EMI) and Radio Frequency (RFI) shall be reduced by the unit over a continuous spectrum of 0.5MHz to 1.0MHz. The basis for reduction shall be a standardized 50-OHM insertion loss MIL -STD-220A test. Provide Spectrum Analysis Test dB attenuation reports showing RFI filtering over specified frequencies. Test data based on calculated or computer simulation is not acceptable.

4. Three phase and grounded "WYE" Performance Requirements.

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<u>Characteristics</u>	<u>208/120 Volt</u>	<u>480/277 Volt</u>		
Nominal line-to-line	208 Volt	480 Volt		
Nominal line-to-neutral	120 Volt	277 Volt		
Internal capacitance (Microfarads)	2.5	2.5		
Maximum response time	1-nano second	1-nano second		
EMI/RFI noise rejection	25-35dB	25-35-dB		
Nominal peak clamp voltage Line-to- neutral				
and line-to-ground	500 Volts	900 Volts		
Minimum transient energy dissipation per phase				
(at 8x20 microseconds waveform)	1000 Joules	1500 Joules		
Peak transient withstand (at 8x20 micro-seconds				
waveform) without failure of the unit	50,000 amp	60,000 amp		

• Category-C3	300,000 amp	500,000 amp
 Category-B3 	100,000 amp	150,000 amp
• Category-A3	60,000 amp	80,000 amp

- C. Diagnostic Indicators
 - 1. Shall display the "Normal" and "Fault" status of each line suppression circuit, along with protection circuit "on" indication.
 - 2. Shall provide a sonic audible fault alarm with silence push-button.
- D. Surge Protection Device Categories
 - 1. Surge protectors shall comply with ANSI C62.41 (Latest Revision) Standard Protection Categories for "impulse" and "ringwave" transients, based on the installation locations shown in the Contract Documents.
 - a. Service entrance, main switchboard or substation locations Category "C3", high exposure, Type-1.
 - b. Mid building, distribution panels, distribution panels over 400-amp main bus rating locations Category "B3", high exposure, Type-1.
 - c. Branch circuit panelboards 400-amp or less main bus rating Category "A3", high exposure, Type-1.
 - 2. The SPD short circuit current withstand rating shall exceed the actual short circuit current available at the SPD installation location

2.14 PLUG STRIP SURGE PROTECTION DEVICE SUPPRESSOR

- A. General:
 - Point-of-Use Type-3 self-contained unit rated 15-amp, nominal 120 volt plus-or-minus 10%, 60Hz, AC, 1875 watts full continuous load. Internal 15 amp resettable overload protection circuit breaker. Red illuminated on-off switch. 6-foot, 14 AWG 3-conductor, grounded, heavy duty jacketed AC line cord with NEMA 5-15 cap. Multi-outlet receptacles, suitable for use with the following types of plug in loads, data processing equipment, audio/video equipment, test instruments, medical equipment, photo graphic equipment and "switching type" power supplies.
 - 2. Protected outlets shall be NEMA 5-15R 15-amp, AC 60Hz receptacles. Provide four protected outlet plugs on each plug strip, as indicated on the Drawings. Each group of two receptacles (duplex) shall be connected to separate protected load isolated filter banks. Each duplex shall be isolated from the other output receptacles, minimum isolation of 25dB at 1MHz line to line, line to neutral, line to ground and neutral to ground.
 - 3. Non-blocking plug-in locations/orientation for plug-in "power-brick" power supplies, without obstructing adjacent receptacles.
 - 4. As manufactured by TRIPP LITE-Isobar Series; or Advanced Protection Technologies; or equal.
- B. Operation:

Self-contained RFI and EMF shielded housing with mounting slots for temporary mounting of the unit. Protected outlet receptacles shall supply filtered, electrical line voltage power to the connected equipment. Line noise RFI and EMI interference filtering suppression, surge

protection device and spike protection shall occur in all three modes of operation line to ground, line to neutral and neutral to ground rated as follows:

- 1. 13,000-amp, 210 joules (watt-seconds) peak withstands capacity.
- 2. Transient response time less than five nano seconds.
- 3. 140-volt AC RMS initiate spikes suppression 330 volt maximum let through.
- 4. RFI and EMI Suppression-Provide Spectrum Analysis Test dB attenuation reports showing RFI filtering over specified frequencies.

50KHz greater than 20dB

150KHz greater than 40dB

1MHz greater than 80dB

- 5. Diagnostic indicator lights located on the SPD housing shall provide alarm alert for each of the following conditions:
 - a. Loss of AC power.
 - b. Damage, malfunction in the SPD suppression circuits.
 - c. Improper AC electrical outlet wiring.
- 6. Standards Testing, Listing, Labeling and Certification Compliance, latest revisions:
 - a. IEEE 587 A and B compliance.
 - b. UL 1449 surge suppressers.
 - c. UL 1363 temporary power taps.
 - d. UL 1283 electromagnetic interference filters.
- C. Rack Mounted SPD
 - 1. SPD units installed in equipment racks shall comply with all of the same Performance Requirements, except as follows.
 - a. EIA/TIA Equipment rack mount style (19-inches or 24-inches as applicable).
 - b. Minimum of two front mounted receptacle outlets and not less than six rear mounted receptacle outlets.
 - c. 20 amp 120 volt 60Hz AC electric circuit rating, instead of 15 ampere..

2.15 WIREWAY

- A. General:
 - 1. Unobstructed lay in type, metal wireway, fittings and connectors UL listed for use as wireway and auxiliary gutter. Length, elbows and "T-S" as shown on Drawings. Minimum cross-section size 4-inches by 4-inches, but not less than shown on the Drawings. Suitable for mounting in any position orientation.
- B. Construction:
 - 1. Minimum metal gauge shall not be less than 14-gage.
 - 2. Cover shall be hinged entire length of cover. Cover shall be held in the closed position with bolts and nuts.
 - 3. Provide spring nuts on all hardware fastener penetrations into the interior of the wireway to protect against wire insulation damage.
 - 4. The inside of 90-degree corners in the wireway shall be a 45-degree bevel.

- 5. Grounding continuity between wireway sections and fittings shall be continuous the entire length of the wireway.
- C. Finish:
 - 1. Indoor non-raintight, rust inhibitor phosphatizing base coating and baked enamel finish, Manufacturer's standard color.
 - 2. Raintight outdoor-galvanized metal, with corrosion resistant phosphate primer and baked enamel finish, Manufacturer's standard color, NEMA 3R construction.
 - 3. All hardware shall be plated to prevent corrosion.

PART 3 - EXECUTION

3.01 GROUNDING (ADDITIONAL REQUIREMENTS)

- A. Grounding shall be executed in accordance with all applicable Codes and Regulations, both of the State of California and Local Authorities Having Jurisdiction.
- B. Each pull box or any other enclosure in which several ground wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.
- C. The Maximum Resistance to Ground shall not exceed 5 ohms.

3.02 OUTLET AND JUNCTION BOXES

- A. General:
 - 1. Accurately place boxes and securely fastens to structural members. Where outlets are shown at same location but at different mounting heights, install outlets in one vertical line. Where outlets are shown at same location and mounting height, mount outlets as close together in a horizontal row as possible. Where the outlet boxes for switches and receptacles are shown at the same location and mounting height, mount in common outlet box with barriers between devices. Provide single piece multi-gang cover plate for close mounted outlet boxes. Where switches are shown on wall adjacent to hinge side of doors, box shall be installed to clear door when door is fully opened.
 - 2. Flush mounted boxes shall be attached to not less than two parallel studs or structure members by means of metal supports. The supports shall span between and attach to the structure members.
 - 3. Boxes above accessible ceilings shall be attached to structural members. Where boxes are suspended, they shall be supported independently of conduit system by means of hanger rods and/or preformed steel channels. Boxes shall be supported independently of all piping, ductwork, equipment, ceiling hanger wires and suspended ceiling grid system.
 - 4. Surface mounted outlets shall be attached to concrete or masonry walls by means of expansion shields.
 - 5. Floor boxes shall be installed level with finish floor and within adjustable limits of floor ring. Where outlets are shown at same or adjacent location, use multi-gang boxes.

- a. Provide cut-outs in the sub-floor assembly, to accept the recess depth of each electrical floor box. Provide added "fire-proof" applications on the bottom of each floor box location extending through the sub-floor. The "fire-proof" application shall be equal to the floor fire-assembly withstand rating.
- b. Poke-thru floor outlets, core drill floor for installation of poke-thru. Install "splitbox" in the ceiling space of the floor below. If the ceiling space of the floor below is not accessible ceiling type (lift-out), then provide 12-inches round removable firerated stainless steel access panel and trim-ring in the finish ceiling for hand-access to poke-thru "split-box" above the ceiling.
- 6. Outlet Box Horizontal and Vertical Separation: Outlet boxes and device outlet rings installed flush in walls shall be horizontally and vertically separated by not less than 24-inches (edge of box to edge of box) from device outlet boxes and rings in common wall surfaces located on the opposite (back) side of the same wall.
 - a. Where the separation cannot be maintained, provide a solid backing behind and completely enclosing each outlet box.
 - b. The backing shall extend the width of the wall cavity (i.e., between "studs" or masonry cells) behind the box and 12-inches above and below the outlet box center-line, completely enclosing the outlet box.
 - c. The backing shall consist of the following:
 - 1) %-inch thick gypsum board anchored in place for "stud" wall construction.
 - 2) Solid "mortar" to completely fill the outlet box "cell" behind the box in masonry construction.
- 7. Provide metal outlet box for each device. Install devices in metal outlet boxes. Typical for all wiring devices including, switches, receptacles, line voltage devices, and low voltage/signal system devices.
- B. Fire Wrap:
 - 1. In fire rated walls and ceilings provide fire rated "box-wrap" around the outside of each outlet box placed in fire rated wall or ceiling. Install the fire wrap on exterior of box inside the wall or ceiling, to maintain the fire rating of wall or ceiling with the installed outlet boxes.

3.03 SWITCHES AND RECEPTACLES-DEVICES

- A. General
 - 1. Provide outlet boxes for all devices, switches, receptacles, both line-voltage and low-voltage.
 - 2. Devices installed in wireways shall be installed flush in wireway assembly.
 - 3. Install and screw attach devices into outlet boxes and wireways.
 - 4. Provide ground circuit connections to all devices.
 - 5. Provide branch circuit connections to all devices.
 - 6. Provide testing and commissioning for proper operation and phase/ground connectors.
 - a. Test each GFCI devices and ARC-Fault devices after installation and circuit connection is complete.
 - b. Test all devices for correct polarity and proper electrical energization.

- c. Test On-Off operation of automatically controlled outlets and receptacles.
- 7. Install and adjust all coverplates to be flush and level, with correct device and circuit identification.
- 8. Were one or more device occurs at the proximity with other similar devices, all of the devices shall be "granged" under one common coverplate as follows:
 - a. Duplex convenience receptacles with other proximity (within 18-inches) duplex convenience receptacles.
 - b. Lighting control switches not exceeding 20-amp switch rating with other proximity (within 18-inches) similar switches.
- B. Line-voltage Plug-In Type Receptacle Installation Orientation:
 - 1. The "ground-pin" shall face "up" at the receptacle top location (double duplex) 4-plex, individual and vertically mounted individual duplex receptacles.
 - 2. The "neutral-blade" shall face "up" at the receptacle top location on horizontally mounted duplex receptacles.

3.04 CONCRETE WORK

- A. Form:
 - 1. Space forms properly with spreaders and securely tie together. Do not use twisted wire form ties. Keep forms wet to prevent joints from opening up before concrete is placed. Replace improper construction as directed. Do not use wood inside forms.
 - 2. Build in and set all anchors, dowels, bolts, sleeves, iron frames, expansion joints and other materials required for the Electrical Work. Place all items carefully, true, straight, plumb, and even.
 - 3. Carefully remove all exposed forms. Cut nails and tie wires below face of concrete and fill all holes. Rubbish will not be allowed to remain in, under, or around concrete.
- B. Mixing: Use batch machine mixer of approved type. After ingredients are in mixer, mix for at least 1½-minutes.
- C. Transit Mixing: In lieu of mixing at site, transit mixing may be used if rate of delivery, haul time, mixing time, and hopper capacity is such that concrete delivered will be placed in forms within 90-minutes from time of introduction of cement and water to mixer.
- D. Placing of Concrete
 - 1. Before placing concrete, remove wood, rubbish, vegetable matter and loose material from inside forms. Thoroughly wet down wood forms to close joints.
 - Clean reinforcement; remove paint, loose rust, scale and foreign material. Bars with bends not called for will be rejected. Hold securely in place to prevent displacement. Lap bar splices 24-diameters, min; lap fabric one mesh min. Tie intersections, corners, splices with 16-gallon annealed wire, or as otherwise called for.
 - 3. Place concrete immediately after mixing. Do not use concrete that has begun to set; no tempering will be allowed. If chuting is used, avoid segregation. In placing new concrete against existing concrete, use bonding agent per Manufacturer's directions.
 - 4. Give careful and thorough attention to curing of concrete. Keep concrete and forms wet for a minimum of 10-days, after placing concrete.

- E. Concrete Finish
 - 1. Finish of Exposed Concrete: Horizontal surfaces, steel troweled monolithic finish; vertical surfaces, smooth and free of fins, holes, projection, etc.
 - 2. Exposed lighting pole bases shall be filled and sack finished to a smooth finish.
 - 3. Remove concrete pour-forms.

3.05 SURGE PROTECTION DEVICE INSTALLATION (SPD)

- A. Direct Connect SPD Installation
 - 1. Install unit cabinet to insure a maximum connected circuit length of less than 5-feet from the equipment the surge protection unit is connected to, approximately plus 48-inches on wall.
 - 2. Alternately, factory install SPD unit directly into respective equipment, instead of remote from equipment. Install SPD inside respective switchgear, switchboards, distribution panels, panelboards, etc.
 - 3. Connect between surge protection unit and supply equipment with not less than 1.25inch conduit containing 5#4 AWG, copper conductor, 600 volt THHN /THWN insulation, connection circuit.
 - 4. Provide a subfeed overcurrent protective device in the respective panel or switchboard to supply the SPD connection circuit, whether or not shown on the Drawings. The protective subfeed device shall be a thermal magnetic circuit breaker rated not less than 30-amp 3-pole or a safety switch and fuse unit rated not less than 60-ampere 3-pole, voltage and short circuit fault interrupting class to match the respective circuit voltage.
 - 5. Connect surge protection unit to main building ground bus or electric distribution equipment ground bus (whichever is closer distance), with 1.25-inch conduit 1#4 AWG copper conductor 600 volt, THHN/THWN insulation.
- B. Plug-in type SPD
 - 1. Install in respective equipment racks.
 - 2. Install at respective workstation locations, cabinets and furniture.
 - 3. Connect to respective equipment and wall electrical outlets.
- C. Install, Connect, and Test each SPD Unit in Accordance with Manufacturer's recommendations.

3.06 WIREWAY INSTALLATION

Wireway hangers shall provide clamp type, hanger rod type, direct bolted bracket type from ceiling or walls as indicated on the Drawings and required for field installation locations. Supports shall be installed a minimum of 5-feet on center.

END OF SECTION 26 05 01 032519/212253

SECTION 26 05 30 CONDUIT AND WIRE

PART 1 – GENERAL

1.01 SCOPE

- A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Examine all other Sections for work related to those other Sections and required to be included as work under this Section.
 - 2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. Submit product data sheets for all wire, supports, conduit, fittings and splicing materials.
- B. Submit material list for all conduit and conduit fittings.
- C. Submit details and structural engineering calculations for conduit support systems.

PART 2 - PRODUCTS

2.01 CONDUIT

- A. General
 - 1. The interior surfaces of conduits and fittings shall be continuous and smooth, with a constant interior diameter. Conduits and conduit fittings shall provide conductor raceways of fully enclosed circular cross section. The interior surfaces of conduits and fittings shall be without ridges, burrs irregularities or obstructions. Conduits and fittings of the same type shall be of the same uniform weight and thickness.
 - 2. Type of conduit, type of conduit fittings and conduit supports shall be suitable for the conditions of use and the conditions of location of installation, based on the Manufacturer's recommendations and based on applicable Codes.
 - 3. All fittings for metal conduit shall be suitable for use as a grounding means, pursuant to the applicable Code Requirements. All metal conduit and metal conduit fittings shall provide 3 second duration ground fault current carrying ratings, when installed and connected to the respective conduit, as follows:
 - a. RMC and EMT conduit fittings.
 - 1) 0.5 inch through 1.5 inch conduit/fitting size 10,000 amp RMS.
 - 2) 2.0 inch and larger conduit/fitting size 20,000 amp RMS.
 - b. FMC and LTFMC Conduit Fittings
 - 1) 0.5 inch through 1.25-inch conduit/fitting size-1,000 amp RMS (without external bonding jumper).
 - 2) 1.5 inch through 4.0-inch fitting size-10,000 amp RMS with bonding jumper.

- 4. Protective corrosion resistant finish for metal conduit fabricated from steel and metal conduit fittings fabricated from steel, shall be as follows:
 - a. Clean all metal surfaces (including metal threads) with acid bath "pickle" prior to coating, to remove dirt, oil and prepare surfaces for galvanizing.
 - b. Hot-dip galvanized zinc coating on all interior and exterior steel surfaces. Minimum finish zinc coating thickness shall not be less than 0.002 inches.
 - c. Threads shall be hot-dip zinc coated after machine fabrication.
 - d. Exterior metal surfaces shall be finished with clear organic polymer topcoat layer, after galvanizing.
 - e. The inner metal surfaces of conduit fittings shall be finished with a lubricating topcoat after galvanizing, to facilitate conductor pulling through the conduit/fitting.
- 5. Threads for metal conduit and metal conduit fittings shall be taper-pipe-thread, National Pipe Standards (NPS) and shall comply with ANSI-B1.20.1.
- 6. Metal conduit termination connector fittings shall be provided with a Manufacturer installed, insulating throat bushing inside the fitting. The bushing shall protect the wire conductor insulation from cutting, nicks and abrasion during conductor installation and electrical load "cycling" after installation is complete. The bushing shall comply with UL 94V-0 flammability.
- 7. Provide conduit bonding/grounding jumper from metal enclosures with "concentric ring" knockouts, to positively ground/bond each respective conduit(s) to the metal enclosure.
- 8. Metal conduit fittings connecting to PVC coated metal conduit shall be PVC coated to match the conduit.
- 9. The conduit and fittings shall be watertight and airtight without cracks and pinholes.
- B. Rigid Metal Conduit (RMC)
 - 1. Rigid metal, round tubing, machine threaded at both ends.
 - a. The conduit and conduit fittings shall comply with the Requirements for an equipment grounding conductor, pursuant to applicable codes.
 - 2. RMC raceway types shall be as follows:
 - Rigid Galvanized Steel conduit (RGS), minimum yield strength shall be 35,000 PSI. Shall comply with NEMA Standard 5-19 (latest revision); ANSI C80.1 and ANSI-C80.4 (latest revision); UL 514-B and UL 6 (latest revisions); National Pipe Standard Specification (latest revision).
 - b. Intermediate steel Conduit (IMC). Shall comply with NEMA Standard 5-19 (latest revision) ANSI-C80.6 (latest revision); UL 2142 (latest revision).
 - 3. RMC fittings:
 - a. Fittings shall be compatible with RGS and IMC.
 - b. Fittings shall be rated "liquid tight".
 - c. Fittings imbedded in concrete shall be rated "liquid tight" and "concrete tight".
 - d. Connectors and couplings for terminating, connecting and coupling to RMC conduit shall be threaded metal.
 - e. Fittings shall comply with ANSI C80.4 and ANSI C33-84 (latest revision); NEMA FB1 (latest revision); UL 514 (latest revision).

- f. Conduit seal fittings:
 - 1) Conduit seals shall prevent the passage of gasses, liquids and vapors past the location of the seal installation in the conduit.
 - 2) Conduit seals shall be suitable for installation in both vertical and horizontal conduit locations.
 - 3) Conduit seals shall be visible and accessible for inspection after installation is complete.
 - 4) Conduit seals shall be rated for the following locations:
 - a) Wet locations
 - b) Classified hazardous location materials NEC Class 1 Division 1.
 - c) Temperature ranges from 0 degrees centigrade through 90 degrees centigrade.
 - 5) Conduit seals, sealing compound and sealing compound dam shall be the products of the same Manufacturer.
- 4. RMC fittings as manufactured by:
 - a. For threaded enclosure, termination connection.
 - 1) Thomas & Betts 106 Series bonding locknut, 5302 series sealing ring with stainless steel retainer.
 - b. For non-threaded enclosure, termination connector.
 - Thomas & Betts 370 Series watertight threaded sealing hub, 106 series threaded bonding lock nut, Sta-Con Series enclosure bonding jumper and 3870 Series threaded ground bushing.
 - 2) Emerson-OZ/Gedney-CHMT/CHT watertight threaded hub with bonding locknut and GH50G Series enclosure bonding jumper.
 - c. For RMC to RMC conduit-to-conduit coupling
 - 1) Thomas & Betts/Erickson 674 (threaded) Series
 - 2) Emerson-OZ/Gedney Type TPC (threaded) Series
 - 3) Threaded RMC conduit couplings, product of the same Manufacturer as the RMC conduit.
 - d. For RMC Conduit Seals
 - 1) Emerson-OZ/Gedney-EYA and EYAM (threaded) Series
 - 2) Appleton-EYF and EYM (threaded) Series
- C. Electrical Metallic Tubing (EMT)
 - 1. Rigid metal round tubing, "thin wall" steel construction, with non-threaded ends.
 - a. The conduit and conduit fittings shall comply with the Requirements for an equipment grounding conductor pursuant to applicable codes.
 - b. The conduit shall be watertight and airtight without cracks and pinholes.
 - 2. EMT shall be allowed for conduit size ranges from 0.5-inch through 4.0-inches.
 - 3. Comply with ANSI C80.3, C80.4, and ANSI C33.98 (latest revisions); UL 594 and UL 797 (latest revisions); CEC Section 12500 (latest revision).
 - 4. EMT fittings:
 - a. Connectors and couplings for terminating, connecting and coupling to EMT conduit shall be non-threaded steel fabrication.

- b. EMT termination connector fittings shall be as follows:
 - 1) Set screw type "concrete tight" when installed in dry interior locations.
 - 2) Compression types "raintight" and "concrete tight" when installed in wet or damp locations, outdoors and in concrete or masonry construction.
- c. Fittings shall comply with ANSI C33.84 (latest revision); UL 514 (latest revision); NEMA FB-1.
- 5. EMT fittings as manufactured by:
 - a. For threaded and non-threaded enclosure, termination connector
 - 1) Thomas & Betts-TC721A (set screw type) Series (with locknuts).
 - 2) Emerson-OZ/Gedney-TC500I (set screw type) Series (with locknuts).
 - 3) Thomas & Betts-5123 (compression type) Series (with two locknuts).
 - 4) Emerson-OZ/Gedney-TC600I (compression type) Series (with locknut).
 - 5) Thomas & Betts-4240 (compression type) Series (90 degree angle with locknut).
 - 6) Emerson-OZ/Gedney-TWL (compression type) Series (90 degree angle with locknut).
 - b. For EMT to EMT conduit-to-conduit coupling:
 - 1) Thomas & Betts-TK121A (set screw type) Series (with locknut).
 - 2) Emerson-OZ/Gedney-5000 (set screw type) Series (with locknut).
 - 3) Thomas & Betts-5120 (compression type) Series.
 - 4) Emerson-OZ/Gedney-TC600 (compression type) Series.
 - c. For EMT to RMC conduit to conduit combination coupling:
 - 1) Thomas & Betts-HT221 (set screw type) Series.
 - 2) Emerson-OZ/Gedney-ESR (set screw type) Series.
 - 3) Thomas & Betts-530 (compression type) Series.
 - 4) Emerson-OZ/Gedney-ETR (compression type) Series.
- D. Flexible Metal Conduit (FMC)
 - 1. Round flexible conduit, fabricated from a single continuous steel strip. The steel shall be factory formed into continuous interlocking convolutions to form a complete lock between steel strips and provide raceway flexibility.
 - 2. Metal to metal grounding contact shall be maintained throughout the length of the FMC conduit.
 - 3. FMC shall be allowed for conduit size ranges from 0.5 inch through 4.0-inches.
 - 4. FMC shall comply with ANSI-C.33.84 and ANSI C33.92; NEMA FB-1; CEC 12-1100.
 - 5. FMC Fittings
 - a. FMC fittings shall be malleable iron construction or steel construction.
 - b. Fitting shall automatically cause the FMC raceway throat opening to be centered with respect to the fitting throat opening.
 - c. Straight and angled connector termination fittings shall be threaded on one end and shall include a threaded locknut, suitable for connection to threaded and unthreaded enclosures.
 - d. The attachment of the fittings to FMC shall be angled saddle type, to engage and interlock with the FMC spiral groove, and shall be unaffected by vibration. Direct bearing screw type fittings shall not be used.

- e. Direct FMC conduit-to-FMC conduit coupling of FMC shall not be permitted.
- f. Shall comply with ANSI C33.9, and ANSI C33.92 (latest revision); NEMA FB1 (latest revision); U.L. 514.
- 6. FMC fittings as manufactured by:
 - 45 and 90 Degree Angle Connectors Straight Termination Connectors a. Thomas & Betts-3130 Series Thomas & Betts-3110 Series (with locknut) (with locknut)
 - b. FMC to EMT conduit combination coupling: Thomas & Betts 503TB Series.
- Ε. Liquid Tight Flexible Metal Conduit (LTFMC)
 - The metal conduit core of LTFMC shall comply with the same Requirements as FMC 1. conduit, with the addition of a thermoplastic exterior flexible jacket over the metal core.
 - 2. The exterior jacket shall be positively locked to the metal core to prevent jacket "sleeving".
 - The LTFMC shall be rated for installation and operating service temperatures of between 3. minus 20 degrees centigrade through plus 90 degrees centigrade.
 - The LTFMC jacket shall be suitable for continuous exposure to sunlight, rainwater, water 4. vapor, mineral oils and liquid solvents, without penetrating into the conduit and without deteriorating the jacket.
 - LTFMC sizes from 0.5-inch through 1.25-inch shall include an additional internal ground 5. conductor, fabricated by the Manufacturer, as an integral part of the conduit core.
 - 6. Direct LTFMC conduit-to-LTFMC conduit coupling of LTFMC shall not be permitted.
 - 7. LTFMC shall be allowed for conduit size ranges from 0.5-inch through 4.0-inches.
 - 8. In addition to the Requirements for FMC conduit, LTFMC shall also comply with ANSI C-33.84 (latest revision); NEMA-FB1 (latest revision); CEC 12-1400 (latest revision).
 - 9. LTFMC fittings
 - a. Fittings shall include an external mechanical ground/bond wire connector.
 - b. The attachment of the fitting to LTFMC shall be threaded compression type onto the conduit core with locknut and liquid tight jacket compression seal. The fitting shall automatically prevent "sleeving" of the jacket.
 - Straight and angled termination connector fittings shall be threaded on one end and C. shall include locknut suitable for connection to threaded and unthreaded enclosures.
 - 10. LTFMC fittings as manufactured by:
 - Termination connector fittings: a. Straight 45 & 90 Degree Angle Connectors 1) Thomas & Betts-5331 GR Series. Thomas & Betts-5341GR & 5351GR Series.
 - 2) Appleton-STB & STN-L Series with preformed "knockouts".

Emerson-OZ/Gedney-4Q Series

Appleton-STB-L Series; STN-L Series for use for use with preformed "knockouts".

- 3) Emerson- OZ/Gedney-4Q Series.
- b. LTFMC to RMC conduit to conduit combination coupling fittings:
 - Thomas & Betts-5271 GR Series. 1)
 - 2) Emerson-OZ/Gedney-4Q Series

- F. Rigid Non Metallic Conduit (RNMC)
 - 1. General
 - a. Conduit and fittings shall be 90 degree centigrade conductor rated. Fabricated from homogeneous material, free from visible cracks, holes or foreign inclusions, with integral "end-bell". The conduit and conduit fittings shall be watertight and airtight.
 - b. Conduit, conduit fittings and conduit fitting assembly "solvent cement" shall all be the product of the same Manufacturer. Conduit fittings shall be solvent cement welded watertight.
 - c. Conduit and fittings shall be identified with legible markings showing ratings, size and Manufacturers name.
 - d. RNMC and fitting shall be corrosion resistant, watertight.
 - e. Conduit shall be suitable for conductor operating temperatures from minus 20 degrees centigrade to 90 degrees centigrade.
 - f. RNMC shall comply with NEMA TC-2 (PVC 40 conduit, latest revision) NEMA TC-6 (EB conduit latest revision) and NEMA TC-3 (fittings, latest revision); UL 514 and UL 651 (latest revision).
 - 2. Polyvinyl Chloride (PVC)-RNMC
 - a. PVC-Schedule 40 heavy wall construction.
 - b. PVC-Schedule 80 extra heavy wall construction.
 - c. PVC-Type EB.
 - 3. RNMC fittings connecting to metallic raceways shall be provided with a ground/ bond jumper connection.
- G. Combi-Duct
 - Rigid nonmetallic conduit combining a continuous linear outer raceway (duct) with factory installed (inside the outer duct) multiple, segregated inner raceway (ducts). Rigid, Schedule 40 PVC construction. Shall be modular lengths of 20-feet for each duct segment.
 - 2. The conduit shall be suitable for use with signal/telecommunications, fiber optic, telephone and computer/data circuits, operating at 100 volts or less, UL listed and labeled.
 - 3. Outer Duct, outer enclosing Schedule-40 PVC duct size. The outer enclosing duct shall be 4.2-inches inside nominal duct diameter and 4.5-inches outer duct nominal diameter.
 - 4. Inner-ducts (contained inside the enclosing outer duct), non-metallic SDR-19 or Type-C/ CAO-8546:

Triple Combi-Duct

a. Quantity of three continuous round rigid inner linear ducts, nominal size inside diameter 1.5-inch for each inner duct.

Quad Combi-Duct

- b. Quantity of four continuous round rigid inner linear ducts, nominal size inside diameter 1.19-inch for each inner duct.
- 5. Manufacturer's standard bends and offsets, minimum 72-inches radius.
- 6. Combi-duct and combi-duct fittings shall be airtight and watertight. Approved for direct burial in earth and approved for encasement in concrete.

- 7. As manufactured by Carlon # Multi-Guard/Multi-Cell Series; American Pipe and Plastic (AMTEL) #Multi-Bore Series; or equal.
- H. Expansion Joint, Deflection Joint and Seismic Joint Conduit Fittings
 - 1. Expansion Conduit Fitting Fitting shall provide for a minimum of 2-inches straight line movement between two connecting conduits in each direction (total 4-inches conduit expansion and Contraction) parallel to the respective conduit lengths. Fitting shall be watertight.
 - 2. Deflection Conduit Fitting Fitting shall provide for a minimum of 30 degrees angular deflection movement ("Shear" deflection) between two connecting conduits, in any direction perpendicular to the length of the respective conduits. Fitting shall be water-tight.
 - 3. Combination Expansion/Deflection Conduit Fitting Fitting shall provide the combined "expansion" and "deflection" movement capacity between two connecting conduits as described for separate "expansion" and "Deflection" conduit fittings. Fitting shall be approved for installation concealed in both masonry/concrete construction and exposed non-masonry/concrete construction. Fitting shall be watertight.
 - 4. Fittings shall comply with UL.
 - 5. Fittings as manufactured by:
 - a. Conduit expansion fittings exposed or concealed locations as manufactured by:
 - 1) Emerson-OZ/Gedney AXB-8 Series for RMC conduit.
 - 2) Emerson-OZ/Gedney TX Series for EMT conduit.
 - Appleton AXB or XJ8 Series for RMC conduit and EMT conduits. Provide RMC to EMT combination conduit coupling fittings for each end of the expansion fitting.
 - b. Combination expansion/deflection conduit fittings exposed or concealed conduit locations as manufactured by:
 - 1) Emerson-OZ/Gedney AXDX Series for RMC conduit.
 - 2) Emerson-OZ/Gedney AXDX Series for EMT conduit.
 - 3) Appleton-DX Series for RMC conduit.
 - 4) Provide RMC to EMT combination conduit coupling fittings for each end of the expansion/deflection fitting.
 - c. Conduit expansion/deflection fittings for FMC and LTFMC conduit.
 - 1) Provide a minimum of 12-inches of "slack" LTFMC in each FMC or LTFMC conduit at building and structure seismic or expansion joint conduit crossings.
 - 2) Note: Each FMC "slack" expansion/deflection location, shall be considered as not less than a 90 degree conduit bend location, for compliance with the maximum quantity of conduit bends allowed in a raceway.
 - 6. Conduit fitting bonding jumper:
 - a. The grounding/bonding path of metal conduit shall be maintained by the fitting.
 - b. Provide a bonding jumper at each expansion, deflection and combination expansion deflection conduit fitting.
 - c. The jumper shall be a bare flexible copper "braid". The copper braid electrical current carrying capacity shall be equal to the metal conduit.

- d. Provide a factory terminated ground clamp on each end of the braid with adjusting steel conduit grounding clamps and connect to each respective conduit end.
- e. The jumper braid length shall be 8-inches longer than the respective conduit fitting.
- f. Bonding jumper for FMC and EMT fittings as manufactured by:
 - 1) Emerson-OZ/Gedney BJ and BJE Series
 - 2) Appleton BJ/XJ Series
- I. Conduit Bodies Conduit Fitting
 - 1. Conduit bodies shall provide conductor access with a removable conduit body cover and wiring area enclosed in metal housing. The conduit body shall facilitate pulling conductors.
 - 2. In-line form "C" conduit bodies shall be prohibited.
 - 3. The interior space "length" of 90 degree "elbow" conduit bodies shall not be less than six times the diameter size of the largest conduit connecting to the conduit body.
 - 4. Conduit body covers shall be removable, gasketed; watertight "domed" metal covers "Mogul-Type" with threaded screw attachment to the conduit body.
 - 5. Lubricated, reusable, wire roller guards inside the conduit body shall protect wire from insulation damage during wire "pulling".
 - 6. Conduit body fittings shall comply with UL 514.
 - 7. Conduit bodies as manufactured by:
 - a. For RMC Conduit
 - 1) Hubbell/Killark LB/Mogul (90-degree elbow) Series threaded body.
 - 2) Emerson-OZ/Gedney LB 6X/Mogul (90 degree elbow) Series threaded body.
 - 3) Appleton NEC6X-LB/Mogul (90 degree elbow) Series threaded body.
 - b. For EMT Conduit
 - 1) Same as for RMC conduit. Provide EMT to RMC conduit combination coupling fitting for each outlet body connection.

2.02 PVC COATING

- A. PVC coatings shall be provided as described for specified metal products.
- B. PVC coating shall be factory applied, to comply with NEMA-RN1 and 5-19.
- C. The adhesion of the PVC coating to the coated metal shall exceed the strength of the coating itself, based on 0.5-inch "strip-pull" test.
- D. Uniform coating thickness shall be continuous without "breaks" or "pinholes" and shall not be less than the following:
 - 1. Exterior metal surfaces, 40-millimeter coating thickness.
 - 2. Interior metal surfaces, 10-millimeter PVC or urethane coating thickness (i.e. interior of conduits, interior of conduit fittings etc.).

2.03 CONDUIT SUPPORTS

- A. General
 - 1. Conduit Supports, hangers and fasteners for metal conduit shall be steel, hot dip zinc galvanized.

- 2. Conduit supports, hangers and fasteners for PVC coated conduit shall be PVC coated to match the conduit PVC coating.
- 3. Threaded hardware shall be continuous, free running threads.
- 4. Conduit support systems, including support channels, pipe clamps, braces, anchors, hardware, fasteners, shall be sized to support the full capacity circuit conductors weight, plus the installed conduit weight, plus the conduit fitting weight and support hardware weight, plus a 300% additional weight capacity safety factor.
- 5. Provide lock washer at each "bolted"/threaded connection.
- 6. Conduit supports, fasteners, channels, braces, hardware, anchors, pipe clamps, and hangers as manufactured by Unistrut or Kindorf.
- 7. Supports shall be free of "BURRS" and sharp edges.
- 8. Metal supports cut in the field shall be zinc galvanized after cutting to prevent rust.
- B. Conduit Hangers
 - 1. Threaded steel hanger rods.
 - a. Hanger rods smaller than 0.375-inches in diameter shall not be used for support of individual conduits.
 - b. Hanger rods smaller than 0.5-inches in diameter shall not be used for support of multiple conduits.
 - 2. Conduit hanger wires shall be not less than 12-gauge steel.
 - 3. Conduit hangers shall attach to structure fasteners with steel "Clevis" or "Swing" hangers and shall provide a minimum of 45 degrees of angular movement in any direction at the point of the conduit hanger attachment to the structure fasteners.
 - 4. Conduits individually suspended by conduit hangers shall fasten to the respective hangers with "Clevis" type pipe hangers. The pipe hangers shall be steel, adjustable to fit conduit size and shall completely enclose the conduit circumference.
- C. Conduit Support Channels
 - 1. "C" channels shall be factory preformed with a minimum 12 gauge thickness metal. The channel shall be factory "punched" with regularly spaced slotted holes for fastener attachments along the length of the channel.
 - 2. The "C" channel shall not deflect more than 0.1 inch between channel supports at maximum installed design load, including required safety factor.
 - 3. Channels shall comply with ANSI-1008 (latest revision) and ASTM-A569 latest revision).
 - 4. Channels shall provide "turned lips" at longitudinal edges to hold (lock-in) fasteners.
 - 5. Conduit support channels suspended from conduit hangers shall attach to conduit hangers with treaded connections. Provide a minimum of two hangers (trapeze style) connected to each channel.
 - 6. Non-suspended conduit support channels shall connect to structure fasteners with threaded connectors.

- D. Fasteners, Seismic Earthquake Rated
 - 1. Channel fasteners:
 - a. Channel fasteners shall "prelocate" and lock into the channel "turned lips" and channel "walls".
 - b. A separate metal strap shall "tie" each conduit to each channel with conduit channel fasteners.
 - 2. Structure fasteners:
 - a. Structure fasteners for wall and floor mounted conduit attachments shall attach to existing masonry and concrete structures with structure fasteners using drilled, mechanical, expansion shield anchors.
 - b. Structure fasteners for wall and floor mounted conduit attachments shall attach to new masonry and concrete structures with structure fasteners using steel threaded inserts precast into the structures.
 - c. Structure fasteners shall center the support load above or below the beam flanges and reduce torsion-rotation forces exerted on the structural beam. Attach to steel structural members with "swing-beam clamps", with set-locking screw structure fasteners.
 - 1) Beam clamps shall include integral safety rod, strap or "J"-hook to secure the attachment clamp to the beam flanges on both sides of the beam, with integral hanger rod attachment.
 - 2) Or double-ended beam clamp to secure the attachment clamp to the beam flanges on both sides of the beam, with integral hanger rod attachment.
 - d. Structure fasteners for wall and floor mounted conduit attachments shall attach to wood structural members with flush "through-bolted" wood beam/ wood framing stud structure fasteners.
 - e. Structure fasteners for wall mounted conduit attachments shall attach to steel framing studs and steel structural elements with spot welded steel structure fasteners or drilled and bolted structure fasteners.
- E. Brace Connectors
 - 1. Provide lateral brace connectors to resist horizontal, lateral and vertical movement of suspended conduits during seismic earthquakes.
 - 2. The braces shall connect from each conduit support, attach as close to the conduit as possible, and attach to fixed rigid, nonsuspended building "main" structural elements with fixed anchoring.
 - 3. Brace attachment connectors and fasteners shall be rigid preformed steel channels or flexible #10 gauge steel hanger wire.
 - 4. Connect and attach the brace connectors to fixed structural elements in the same manner as conduit support hangers. The connection of braces to structural elements shall be independent of the conduit support hanger structure fasteners.

2.04 ELECTRICAL POWER WIRE AND CABLE

- A. General
 - All wire and cable shall be single-conductor, annealed copper, insulated 600 volt, #12AWG minimum unless specifically noted otherwise on the Drawings.

- 2. Conductors #10AWG and smaller shall be solid. Conductors #8AWG and larger shall be stranded.
- 3. Insulation of conductor connected to circuit protection devices required to be "100%" rated, shall be 90 degree centigrade rated insulation.
- 4. Insulation of conductors installed outdoors, on grade or underground, insulation shall be rated for wet locations.
- 5. Insulation of conductors installed outdoors, installed exposed to the sun, installed in exposed conduits, insulation shall be rated for high-temperature 90 degrees centigrade.
- 6. Insulation of branch circuit conducts installed in light fixtures, insulation shall be rated for 90 degrees centigrade.
- 7. Conductor exposed to oil, insulation and jacket shall be oil resistant, complying with "Oil Resistant-1" and "Oil Resistant-2" UL 83.
- B. Conductor Insulation
 - 1. 600 Volt AC and/or DC insulated conductors installed entirely inside conduits, or enclosed inside wireways, or enclosed inside raceways, insulation shall be rated as follows.
 - 2. Indoor above Grade locations either concealed or exposed.
 - a. Dual rated THHN and THWN
 - b. Individually rated THHN-2
 - c. Individually rated THWN-2
 - d. XHHW-2
 - 3. Outdoor above Grade either concealed or exposed.
 - a. XHHW-2
 - b. THWN-2
 - c. THW-2
 - 4. Outdoor below Grade or outdoor on Grade.
 - a. XHHW-2
 - b. THWN-2
 - c. THW-2
 - 5. All other enclosed raceway locations not described above.
 - a. XHHW-2
 - b. THWN-2
 - c. THW-2
 - 6. Health Care facilities all circuits insulation shall be XHHW-2, rated Hospital-Grade.
 - 7. 600 Volt AC and/or DC insulated conductors installed in open cable tray or open wireway or exposed insulation also shall be rated for exposed install locations.
- C. Insulation Color Coding and Identification
 - 1. The following color code for branch circuits:
 - a. Neutral . . . White (Tape feeder neutrals with white tape near connections)

- b. Normal Power:
 - <u>120/208 Volt</u>
 - Ground Green
 - Phase A Black
 - Phase B Red
 - Phase C Blue
- c. Isolated ground insulation shall be green with a longitudinal yellow stripe.
- d. Emergency power same insulation color as normal power except as follows:
 - <u>120/208 Volt</u>

Provide a continuous stripe on each conductor insulation, orange or yellow, except ground

- 2. When individual neutral conductors are shown for each branch circuit, the color code for the neutral conductors shall be as follows:
 - a. 120/208 volt; Phase A White with Black stripe; Phase B White with Red stripe; Phase C White with Blue stripe.
- 3. Feeders identified as to phase or leg in each, switchboard, switchgear, panelboard and junction location with printed identifying tape.
- 4. Fire alarm conductors: Use 600-volt, type THHN-2/THWN-2 conductors and color-coded per Equipment Manufacturer's recommendations and approved and listed for use on fire alarm systems by the State Fire Marshal.
- 5. Color coding for mechanical and plumbing control wiring shall be an agreed upon color code between the Mechanical/Plumbing Contractor and the Electrical Contractor, and color code shall be submitted to the District's Representative in writing for approval prior to installation.
- D. Panel Feeders, Copper or Aluminum:
 - 1. Wire size shown on the Drawings is for copper conductors, unless specifically indicated otherwise.
 - 2. If aluminum wire is proposed, increase wire size to ampere capacity of copper wire and voltage drop not to exceed that of copper feeders indicated on Drawings. Increase conduit size and quantity as required by code. Provide feeder calculation sheet, eight copies, if aluminum wire is proposed, showing feeder number, length, size and voltage drop in percentage for original copper feeders and for equal aluminum feeders.
 - 3. Aluminum Conductors (600 Volt or Less Only): Contractor has the option of using aluminum conductors in lieu of copper conductors for feeders only to panels, distribution boards/panels, switchboards, switchgear, transformers, motor control centers, and dimmer switchboard.
 - 4. Aluminum Conductors shall be Aluminum Association AA-8000 Series Alloy, compactstranded, with the same insulation as called for under copper conductors.
 - a. Aluminum conductor larger than 750 MCM shall not be used.
 - b. Aluminum conductors smaller than #2AWG shall not be used.
 - 5. If the conductor termination is to be made on a bus bar or similar flat surface, a Burndy Type YA-A HYPLUG compression terminal intended for the specific conductor size, factory filled with oxide inhibitor compound shall be used. Terminal must be installed

using a hydraulic compression tool equipment with a die head for the particular terminal used. Only Burndy Hypress tools shall be used for compression.

- 6. If the conductor termination is to be made into a circuit breaker or similar insert compartment it shall be terminated by use of a Burndy AYP HYPLUG compression connector intended for the specific conductor size, factory filled with oxide inhibitor compound. Connector must be installed using only Burndy Hydraulic compression tool specifically approved for each respective connector.
- 7. Connector aid shall be used for all terminations and connections. Connector aid shall be Burndy Pentrox A, NO-OX-1D Grade "A".
- 8. When an aluminum lug is terminated to a copper bus with a steel or copper stud or bolt, place aluminum lug on stud or bolt followed by a flat steel washer, a Belleville washer, and steel or copper nut, in that order.

2.05 CHEMICAL GROUND ROD

- A. General
 - Self-contained ground rod(s) using chemically enhanced grounding shall be provided where specifically indicated on the Drawings. As manufactured by Lyncole XIT Grounding Systems, 22412 South Normandie Avenue, Torrance, CA. Telephone #(800) 962-2610; or Superior Grounding Systems, Irwindale, CA. Telephone #(800) 747-7925; or ERICO – Eritech Chemical Ground Electrode.
 - 2. The ground rod shall operate from changes in atmospheric pressure pumping air through the ground rod, hygroscopically extracting moisture from the air to activate the ground electrolytic chemicals and improve the ground rod performance.
 - 3. Ground rod system shall be UL-467 listed.
 - 4. Ground rod system shall be 100% self-activating, sealed and maintenance free. The addition of chemical or water solutions shall not be required.
- B. Ground Rod
 - 1. Ground rod shall consist of a 2-inches nominal diameter hollow, copper tube. The tube shall be permanently capped on the top and bottom. Air breather holes shall be provided in the top of tube. Drainage holes shall be provided in the bottom and sides of the tube for electrolyte drainage into the surrounding soil.
 - 2. The ground rod shall be chemically filled at the factory with environmentally nonhazardous water-soluble metallic salts to enhance electrical grounding performance.
 - 3. Ground rod shall be a minimum of 10-feet long for straight (vertical) installation; or "L" shape minimum 20-feet long for horizontal installation.
 - Ground wire clamping "U-Bolt" with pressure plate on the top end of the tube sized for 1#2 through 500 MCM AWG ground electrode conductor connections, and stranded 4/ 0AWG copper pigtail exothermically welded to the side of rod for ground electrode conductor connection.
- C. Ground Box
 - 1. Precast concrete box with slots for conduit entrances. Approximately 10-inch diameter by 12-inches high. Cast iron grate flush cover with "Breather" slots XIT Box #XB-12.

- D. Backfill Material
 - 1. Natural volcanic, non-corrosive Bentonite Clay backfill material.
 - 2. Shall absorb water at a minimum of thirteen times its dry volume or approximately 14 gallons for 50 pounds of clay.
 - 3. PH value 8-10 with maximum resistivity of 2.5 OHMS-M at 300% moisture content by weight.

2.06 FLEXIBLE CORDS AND PORTABLE CABLES

- A. General
 - 1. Multi-conductor insulated flexible cable with jacket rated extra heavy duty, extra harduse and high abuse duty; ozone, sunlight, grease, oil resistant-UL 83 and water resistant; rated for indoor/outdoor use.
 - 2. Quantity of conductors and conductor sizes as indicated on the Drawings but in no case less than five 16AWG.
 - 3. Characteristics:
 - a. Conductors stranded copper, soft annealed conforming to ASTM-B-174 and ASTM-B-172. 600 volt individually insulated and color-coded. Separate green insulated ground conductor. Aluminum conductors shall not be permitted for cords and cables.
 - b. Insulation rubber conforming to UL 62; temperature range plus 105° Centigrade to minus 50° Centigrade.
 - c. Flame resistance shall conform with MSHA-P123-103.
 - d. Jacket black for equipment connections and yellow for outlet connections. Rated for temperature range plus 105° Centigrade to minus 50° Centigrade, water, sunlight and ozone resistant. Permanently mark jacket a minimum of 40-inches on center with rated voltage, Manufacturer's name, wire/insulation type, AWG conductor size and quantity (minimum 24-inches on center).

2.07 CABLE RACKS

- A. Cable racks, installed on the vertical walls of the structure, including hooks and porcelain insulator cable cradles, shall be sufficient to accommodate the cables and splices.
- B. Vertical racks shall be installed on all walls of the structure a minimum of 24-inches on center within 6-inches of floor and top of wall. A rack shall be installed within 18-inches of each corner of each wall. Additional racks spaced equally on each wall shall be installed; spacing between vertical wall racks shall not exceed 24-inches.
 - 1. Wall racks shall be slotted to accept removable hooks and lock hooks into place.
 - 2. Non-metallic, 50% (minimum) glass reinforced nylon or non-metallic material of the same characteristics.
 - 3. The installed cable racks, cable support hooks with arms and wall anchor bolts shall support the following minimum loads for each hook/arm, with a 200% minimum safety factor.

Based on multiple hook/arms located not less than 9-inches on center along the entire vertical length of the support rack:

		Min. Weight Each	Max. Allowable
Ho	ok/Arm Length	Hook/Arm Supported	Hook/Arm Deflection
a.	8-inches	450 pounds	0.25-inch
b.	14-inches	350 pounds	0.37-inch
c.	20-inches	250 pounds	0.37-inch

(Based on load concentrated 1-inch from the end of each hook/arm)

4. Racks shall be bolted to the precast and cast-in place structure walls, within 3-inches of each rack end and not less than 9-inches on center. Provide cast-in place or after-set drilled expansion concrete anchors.

PART 3 - EXECUTION

3.01 TRENCHING, FOOTINGS, SLEEVES

- A. Provide trenching, concrete encasement of conduits, backfilling, and compaction for the underground electrical work, in accordance with applicable Sections of this Specification.
- B. Provide footings for all post and/or pole-mounted lighting fixtures: concrete shall conform to the applicable Sections of this Specification.
- C. Sleeves
 - 1. Provide sleeves for raceways, conduit and wire/cables passing through the following construction elements:
 - a. Concrete and masonry foundations, floors, walls and slabs.
 - b. Gypsum, Lath, and plaster walls and ceilings.
 - c. Building structures (i.e., foundations, walls, floors, ceilings, beams, and roofs) with a fire rating exceeding 20-minutes.
 - 2. Sleeves shall extend 1.5-inch above and below floors, except under floor standing electrical equipment. Sleeves shall be flush with wall ceiling foundations and partitions exposed to public view and extend approximately 0.5-inch past penetration in fire rated construction. Sleeves shall be installed at exact penetration locations and angles to accommodate wire/cable, raceway and conduit routings.
 - 3. Joists, girders, beams, columns or reinforcing steel shall not be cut or weakened. Where construction necessitates the routing of conduit or raceways through structural members, framing or footings, written permission to make such installation shall first be obtained from the District's Representative. Such permission will not be granted, however, if any other method of installation is possible.
 - 4. The layout and design of raceways and conduits located in or routed through masonry or reinforced beams or the District's Representative shall review walls before any work is performed. All sleeving shall be accomplished according to the instructions of the District's Representative and shall be accepted before any concrete is poured.
 - 5. Sleeves, raceways and conduit shall be located to clear steel reinforcing bars in beams. Reinforcing bars in walls shall be offset to clear piping and sleeves.

- 6. Provide a continuous clearance between the inside of a sleeve and exterior of wire/ cables, conduits and raceways passing through the sleeve not less than the following:
 - a. 0.5-inch clearance except as required otherwise.
 - b. 1.0-inch clearance through outside walls below grade.
 - c. 3.0-inch clearance through seismic joints.
- 7. Sleeves set in fire rated construction shall be caulked between sleeve and building structure, additionally sleeves shall be caulked between the sleeve and the wire/cables, conduits/raceways passing through the sleeve. The caulking shall be a fireproof sealant, equal to the fire rating and temperature being penetrated. Clearance between components inside of sleeve and exterior of components passing through sleeve and between components inside the sleeve shall comply with Fireproof Sealant Manufacturer's recommendations.
- 8. Sleeve material:
 - a. In floor construction: Schedule 40 black steel pipe, with upper surface to be sealed watertight.
 - b. In concrete or masonry walls roofs or ceilings: Schedule 40 black steel pipe. When installed in roofs or outside walls, seal outer surface watertight.
 - c. In fire rated construction; 24 gauge galvanized iron or steel.
 - d. Sleeves through waterproof membranes: Cast iron or Schedule 40 steel with flashing clamp device and corrosion resistant clamping bolts. Caulk space between pipe and sleeve and surfaces between sleeve and conduits sealed watertight.

3.02 GROUNDING

- A. Grounding shall be executed in accordance with all applicable Codes and Regulations, both of the State and Local Authorities Having Jurisdiction.
- B. Where nonmetallic conduit is used in the distribution system, the Contractor shall install the proper sized copper ground wire in the conduit with the feeder for use as an equipment ground. The electrical metallic raceway system shall be grounded to this ground wire.
- C. The maximum ground/bond resistance to the grounding electrode shall not exceed 1 ohms from any location in the electrical system. The maximum ground resistance of the grounding electrode to earth shall not exceed 5 ohms.
- D. Ground/Bond Conductors
 - 1. Provide an additional, dedicated, green insulation equipment ground/bond wire inside each conduit type and raceway as follows. Size the ground/bond conductors to comply with CEC/NEC Requirements. The metal conduit or raceway shall not be permitted to serve (function) as the only (exclusive) electrical ground return path:
 - a. All types of nonmetallic conduit and all types of non-metallic raceways including but not limited to: RNMC Rigid Nonmetallic Conduit.
 - b. FMC Flexible Metal Conduit.
 - c. LTFMC Liquid Tight Flexible Metal Conduit.
 - d. Metal and non-metal raceways.
 - e. RMC Rigid Metal Conduit.
 - f. EMT Electrical Metal Tubing.

- 2. The equipment ground/bond wire shall be continuous from the electrical circuit source point of origin to the electrical circuit end termination utilization point as follows:
 - a. Every conduit and raceway path containing any length of the above identified conduits or raceway.
 - b. Every conduit path and raceway path connected to any length of the aboveidentified conduits and raceways.
- 3. The equipment ground/bond wire shall be sized as follows, but in no case smaller than indicated on the Drawings. Install equipment ground/bond wire in each conduit/race-way, with the respective phase conductors:

Feeder, Subfeeders & Branch Circuit Protection	<u>Min. Equip. Grnd Wire Size</u>
15 amp	#12
20 amp	#12
30 to 60 amp	#10
70 to 100 amp	#8
101 to 200 amp	#6
201 to 400 amp	#2
401 to 600 amp	#1
801 to 1000 amp	2/0
1001 to 1200 amp	3/0
1201 to 1600 amp	4/0
1601 to 2000 amp	250 MCM
2001 to 2500 amp	350 MCM
2501 to 4000 amp	500 MCM

- 4. Isolated grounds Raceways containing branch circuit or feeder phase conductors connected to panelboards equipment, or receptacles with isolated grounds or isolated ground bus shall contain a dedicated insulated ground conductor connected to the isolated ground system only. The isolated ground conductor shall be continuous the length of the raceways and connected only to the isolated ground terminals in addition to and independent of the equipment bonding/ground conductor. The isolated ground conductor shall be sized as indicated above, for equipment ground/bond wire.
- 5. Splices in ground/bond wires shall be permitted only at the following locations:
 - a. Ground buses with listed and approved ground lugs.
 - b. Where exothermic welded ground/bond wire splices are provided.
- 6. Provide ground/bond wire jumpers for conduit fittings with ground lugs, expansion and deflection conduit fittings at conduit fittings connecting between metallic and non-metallic raceways and to bond metal enclosures to conduit fittings with ground lugs.
- E. Where conductors are run in parallel in multiple raceways, the grounding conductor shall be run in parallel. Each parallel equipment-grounding conductor shall be sized on the basis of the ampere rating of the overcurrent device protecting the circuit conductors in the raceway. When conductors are adjusted in size to compensate for voltage drop, grounding conductors, where required, shall be adjusted proportionately in size.
- F. Ground conductors for branch circuit wiring shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws, 6-32 or larger.
- G. Each panelboard, switchboard, pull box or any other enclosure in which several ground wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure.

a.

The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

- H. UFER Ground
 - 1. In addition to all cold water and structural steel grounds provided to meet this Specification, there shall be a main ground system of the UFER ground style.
 - 2. The UFER ground electrodes shall be a minimum of two 20-feet lengths of #4/0 AWG bare stranded copper cable embedded horizontally in the cast in place concrete footing, extending in opposite directions in the footings. All portions of the ground electrodes shall be placed inside the concrete, between 2-inches and 4-inches from the earth surrounding the concrete.
 - 3. The lengths of cable shall extend in opposite directions in the footings, with the center end of each cable terminated onto the main electrical service ground bus for the main electrical service equipment.
 - 4. All wire cable connection terminations onto the ground bus shall be exothermic weld type.
 - 5. The "UFER" grounding electrode, embedded in concrete, shall be exothermically welded to each steel reinforcing bar (rebar) and each steel anchor bolt located within 18-inches of the grounding electrode inside the concrete. Note: Reinforcing steel (rebar), in concrete foundations, attached with metal "tie-wraps" and in direct physical contact to other adjacent rebar that is in turn exothermic welded to the UFER grounding electrode, may be classified as attached to the UFER grounding electrode, and does not require additional exothermic weld connections to the UFER grounding electrode.
- I. Provide a separate ground/bond insulated grounding electrode conductor, copper wire from the main electrical service ground bus to each of the following locations. The ground/bond conductor shall be sized to comply with Applicable Codes and as indicated on the Drawings, but in no case smaller than the following:
 - 1. Main service entrance equipment ground bus:
 - a. Services smaller than 1200 amp 1.5-inch conduit with 1#4/0.
 - b. Services 1200 amp and larger 2.5-inches conduit with 1#500MCM.
 - c. Where a separate ground bus is not required, connect ground to electrical equipment metal housing
 - 2. Each telephone backboard and signal system backboard location, 1.25-inch conduit with 1#1.
 - 3. Metal cold water pipe located inside the building, 1.5-inch conduit with 1#4/0.
 - 4. Outdoor underground metal cold water pipe, make connection five feet from the building, 1.5-inch conduit with 1#4/0.
 - 5. Each service entrance ground bus and each separately derived ground rod system:
 - a. Services smaller than 1200 amp 1.5-inch conduit with 1#4/0.
 - b. Services 1200 amp and larger 2.5-inches conduit with 1#500MCM.
 - 6. Separate 1.25 inch conduit with 1#2 (AWG) bonding conductor to each interior metal pipe system located in the same building, including but not limited to, the following:
 - a. Fire sprinkler system each stand pipe location (water based and non-water based).

- b. HVAC chilled water supply and return, at each pump location.
- c. Roof drains.
- d. Waste liquid disposal systems.
- e. Metal gas pipe service entrance and service meters.
- f. Hydraulic elevator hydraulic pipes.

3.03 CONDUIT

- A. General
 - 1. The sizes of the conduits for the various circuits shall be as indicated on the Drawings, but not less than the conduit size required by Code for the size and quantity of conductors to be installed in the conduit.
 - 2. Conduits shall be installed concealed from view. Install conduits concealed in walls, concealed below floors and concealed above ceilings, except as specifically noted otherwise.
 - a. Conduits shall not be installed in concrete floors.
 - 3. The following systems shall be considered as circuits 100 volts and less, all other circuits shall be considered to be over 100-volts (power circuits) unless specifically noted otherwise: Fire alarm, energy management control, telephone, public address, data, computer, television, intercom, intrusion alarm and nurse call.
 - 4. Conduits shall be provided complete with conduit bends, conduit fittings, outlet boxes, pullboxes, junction boxes, conduit anchors/supports, grounding/bonding for a complete and operating conductor/wire raceway system.
 - 5. Metal and nonmetal conduits shall be provided mechanically continuous between termination connection points. Metal conduit shall be provided electrically continuous between termination connection points.
 - 6. Individual conduit paths and home runs shown on the Drawings shall be maintained as separate individual conduits for each homerun and path.
 - 7. Conduits, conduit fittings and installation work occurring in classified hazardous materials locations shall comply with applicable code Class 1 Division 1 Requirements, unless specifically noted otherwise.
 - 8. Transitions between conduits constructed of different materials and occurring in above grade locations shall be allowed only at outlet boxes, junction boxes, pull boxes, and equipment enclosures unless specifically indicated otherwise. Provide outlet boxes and junction boxes.
 - 9. Metal conduit terminating to nonmetal enclosures; terminating into metal enclosures with "concentric ring" knockouts; terminating into metal enclosures with knockout reducing washers, including but not limited to equipment housings, outlet boxes, junction boxes, pull boxes, cable trenches, manholes, shall be provided with a ground/ bonding lug integrated with the conduit termination conductor fitting construction, by the Fitting Manufacturer. The lug shall provide for connection of a grounding/bonding conductor (insulated or uninsulated). The grounding lug shall be located on the fitting, inside the termination enclosure.

- 10. The type of conduit, type of conduit fittings, and type of conduit supports and method of conduit installation shall be suitable for the conditions of use and conditions of location of installation based on the Manufacturer's recommendations; based on the applicable Codes and based on the Requirements of the Contract Documents.
- B. RMC Installation Locations

RGS, IMC conduits and RGS, IMC fittings shall be installed in the following locations:

- 1. Embedded in floors, walls, ceilings, roofs, foundations, and footings constructed with concrete.
- 2. Embedded in walls and foundations constructed with brick and masonry.
- 3. Interior of buildings, within 9-feet of finish floor lines for exposed conduit locations.
- 4. Exterior of building for exposed conduit locations.
- 5. Damp or wet locations, exposed or concealed locations.
- 6. Exposed on roofs.
- 7. In hazardous materials areas and locations; below hazardous materials areas and locations; above hazardous materials areas and locations.
- 8. Exposed on utility service poles, for pole risers less than 9-feet above finish grade.
- 9. RMC conduit and RMC fittings may be installed in any location where EMT and FMC conduit is permitted to be installed.
- C. PVC Coated RMC Installation Locations

PVC coated RMC conduit and PVC coated RMC fittings shall be installed in the following locations:

- 1. Underground conduit locations for elbows and bends with a radius of less than 36-times the conduit diameter.
- 2. Underground vertical risers extending above grade.
- 3. Entire length of underground conduits for the following circuits:
 - a. Audio microphones
 - b. Lighting dimming controls
- 4. Installed in contact with earth or corrosive materials.
- 5. Exposed in "cold" rooms and "refrigerated" rooms, rooms with a maintained temperature below 65 degrees Fahrenheit.
- D. EMT Installation Locations

EMT conduit and EMT fittings may be installed in the following locations, for circuit conductors operating below 600 volts to ground; locations containing only "non-hazardous materials"; only dry locations:

- 1. Concealed in hollow non masonry/non-concrete, metal stud frame and wood stud frame walls and floors.
- 2. Concealed above ceilings.
- 3. Exposed inside interior enclosed crawl spaces.
- 4. Exposed interior locations placed 9-feet or higher above finished floors (except as described in paragraph below at lower heights).

- 5. Exposed on walls and ceilings (any height) in the following dedicated function areas, interior enclosed room locations:
 - a. Indoor enclosed electrical equipment rooms and closets.
 - b. Indoor enclosed data and telecommunication terminal rooms and closets.
 - c. Indoor enclosed HVAC equipment rooms and closets.
- 6. Any location where FMC is described to be installed, except as the final connection to rotating or vibrating equipment.
- E. FMC Installation Locations

FMC conduit and FMC fittings may be installed in the following locations for circuit conductors operating below 600 volts to ground; locations containing only "non-hazardous materials"; only dry, interior locations:

- 1. Concealed in hollow non-masonry metal stud frame and wood stud frame fully enclosed walls.
- 2. Concealed above fully enclosed ceiling spaces.
- 3. FMC conduit shall be installed in continuous lengths between termination points. FMC shall not be "spliced" or coupled directly to FMC or any other conduit type under any circumstance.
- 4. The maximum continuous length of FMC that shall be installed between termination end points is 15-feet. Circuits requiring continuous conduit lengths exceeding 15 feet between termination end points shall be installed using either RMC or EMT conduits. FMC lengths shorter than 16-inches are prohibited.
- 5. The minimum size FMC conduit shall be as shown on the Drawings but not be less than the following:
 - a. FMC lengths of 6-feet or less, minimum FMC conduit size shall be 0.50-inch.
 - b. FMC lengths exceeding 6-feet, minimum FMC conduit size shall be 1.0-inch.
- F. LTFMC Installation Locations

LTFMC conduit and LTFMC fittings shall be installed in the following locations for circuit conductors operating below 600 volts to ground; locations containing only "non-hazardous materials":

- 1. Final electrical connection to vibrating or rotating equipment; control and monitoring devices mounted on vibrating and rotating equipment including the following. Minimum conduit length shall not be less than 24-inches:
 - a. Motor, engines, boilers, solenoids, and valves.
 - b. Fixed mounted "shop" (manufacturing) production equipment.
 - c. Fixed mounted food preparation equipment and "kitchen" equipment.
- 2. All locations where exposed flexible conduit connections are required, both indoor and outdoor.
- 3. Final connection to indoors electrical transformers. Minimum conduit length shall not be less than 24-inches; maximum conduit length shall not exceed 72-inches.
- 4. Do not install LTFMC located in environmental air plenums.

G. RNMC Installation Locations

RNMC conduit and RNMC fittings shall be installed in the following locations containing only "non-hazardous material":

- 1. Underground, concealed below earth grade, unless specifically noted or specified otherwise.
- 2. Exposed on utility service poles, for pole risers at 9-feet or higher above finish grade, Schedule 80 PVC only.
- 3. RNMC type "EB" conduit(s) shall be concrete encased along the entire length of the conduits for all installation locations.
- 4. Non-metal type raceways and RNMC type conduit shall not be installed inside buildings.
- H. Combi-Duct Installation Locations

Combi-duct conduits shall be installed where shown on the Drawings. Combi-duct shall be installed underground (below grade) as follows:

- 1. Do not install exposed or inside buildings above grade.
- 2. Provide a 0.25-inch pull rope in each inner duct.
- 3. Radius and elbows shall be rigid non-metallic, PVC, Manufacturer factory fabricated, in lieu of PVC coated RMC conduit.
- 4. Inner ducts shall be supported by internal spacers inside the enclosing outer duct.
- Provide end bell and three hole "snug-plugs" at each entrance end of Combi-duct into pullboxes, manholes, equipment cabinets stubups and Combi-duct terminations. Compression type "snug-plugs" shall provide watertight and airtight seal between inner and outer ducts and around future cables installed in inner duct.
- I. Conduit Installation
 - 1. Conduit Supports
 - a. Securely and rigidly support all raceways/conduits from the building structure. Raceways/Conduits shall be supported independent of all piping, air ducts, equipment ceiling hanger wires, and suspended ceiling grid systems. Secure conduit to structural element by means of UL listed and approved hangers, fasteners, "C" channels and pipe clamps.
 - b. Provide conduit supports spaced along the length of the conduit as follows:
 - 1) RMC and EMT conduit, maximum not to exceed 96-inches on center; within 24inches of each conduit bend and conduit termination location.
 - 2) FMC and LTFMC conduit, maximum not to exceed 24-inches on center; within 6-inches of each conduit bend and conduit termination location.
 - c. Suspended conduit methods:
 - Individual, suspended raceways/conduits separated by more than 12-inches from any other conduit and suspended from ceilings and roofs shall be supported as follows:
 - a) Conduits smaller than 1.5-inches by means of hanger rods or hanger wires.
 - b) Conduits 1.5-inches and larger by means of hanger rods.
 - c) The conduit shall attach to the hangers with pipe clamps.

- 2) Suspended raceways/conduits positioned within 24 inches of any other conduit shall be grouped and supported by hanger rods using trapeze type conduit support channels ("C" channels). Conduits shall individually attach to common channels side-by-side, with pipe clamps.
- d. Non-suspended conduit methods:
 - 1) Individual raceway/conduits placed against wall/ceiling/floors, placed inside hollow wall/ceiling construction or structure framing (i.e., "dry- wall" or plaster hollow wall construction), shall be secured by means of individual pipe clamps and fasteners attached to the framing studs or other structural members and the conduit/raceway.
 - 2) Provide common "C" channel supports for all multiple raceway/ conduits placed against vertical or horizontal surfaces and positioned within 24-inches of other raceways/conduits. Attach channels to the framing studs or other structural members. Attach the conduits/raceway individually to common channels, side-by-side, with pipe clamps.
 - 3) The use of toggle bolts is prohibited.
- e. Conduit rising from floor for motor connection shall be independently supported if extending over 18-inch above floor. Support shall not be to a motor or ductwork, which may transmit vibrations.
- f. Provide conduit anchoring, conduit support and conduit bracing systems conforming to Earthquake Requirements. The conduit support/anchoring system capacity shall include the weight of the conduits, conduit fittings, conduit supports and conductors / wires / cables installed in the conduits plus a 300% safety factor. Submit Shop-Drawing details showing each typical conduit anchor, conduit support and conduit brace location. Submit structural calculations performed by and signed by a Professional Structural Engineer (P.E.) with a P.E. License, Registered in the State of California, U.S.A.
- 2. Conduit separation:
 - a. Conduit installed underground or below building slab without full concrete encasement: Shall be separated from adjacent conduits of identical systems (i.e. signal to signal, data to data, power to power, control to control etc.) by a minimum of 3-inches. Conduits of non-identical systems (i.e. signal to power; data to power; power to control; signal to control, etc.) shall be separated by a minimum of 12inches.
 - b. Conduit installed underground with full concrete encasement; shall be separated from adjacent conduits of similar systems (100 volt and less) by a minimum of 2-inches; conduits for non-power systems (100 volts and less to ground) shall be separated by a minimum of 6-inches from power circuits (over 100 volts to ground); conduits for power circuits shall be separated from adjacent conduits of similar power systems (over 100 volts to ground) by a minimum of 3-inches.
 - c. Separation of conduits entering termination points or crossing other conduits may be reduced as required within 60-inches of the termination or crossing points.
 - d. Conduits containing Utility Company service circuits (i.e. electrical power, telephone, or cable television) shall be separated a minimum of 12-inches from all other utilities and conduits, with or without concrete encasement; metallic or non-metallic conduit, above grade or underground conduit locations.

- e. Conduits shall be separated from hot water piping, exhaust flues/ chimneys, steam piping, boilers, furnaces, ovens by a minimum of 12-inches.
- 3. Conduit stubs:
 - a. Branch circuit and telephone conduits turned up from floor at the following locations shall terminate each conduit in a flush conduit coupling at the floor and then extend into partition or to equipment. Refer to District's Representative's Drawings for location of walls and partitions.
 - 1) Interior demountable partitions.
 - 2) Below, into or adjacent to equipment not installed directly adjoining to a wall.
 - 3) Up from below the floor into hollow stud frame walls.
 - b. From each panel, and signal cabinet which is wall mounted, stub up from top of the panel/cabinet a minimum of three 1-inch conduits to the nearest accessible ceiling spaces or other accessible location. Where the floor below the panel is accessible or is a ceiling space, stub an additional three 1-inch conduits from the bottom of the panel into the accessible space below the panel. Cap conduits for future use.
 - c. Conduits stubbed underground outside of building line for future use shall be terminated a minimum of five feet clear (whichever distance is greater) of building or adjacent concrete walks and AC paving. The stubout conduit shall be capped. Provide concrete monuments, 6-inches by 6-inches by 15-inches deep, buried flush with grade over the capped ends. The face of monument shall be furnished with 3-inch square brass plates securely mounted and engraved with the number and size of conduits and type of service (i.e., "POWER", "TEL.", etc.).
 - d. Conduits stubbed into ceiling or floor spaces from outlets for telephone, video, computer/data or television shall be provided with an insulated throat bushing, on the end of each conduit stubout.
 - e. Conduit stubouts from outlet boxes and equipment located in hollow stud walls, into ceiling and floor spaces, shall be EMT or RMC conduit. The stubouts shall terminate into the ceiling and floor spaces with a conduit termination connector fitting.
 - f. Empty conduit stubs into building spaces and equipment shall be individually identified with an "ID-tag" located at each end of the conduit. The ID-tag shall state the origination point and termination point of the respective conduit (i.e., "from PNL-A/to Room #121"; "from outlet #24/to outlet #17 in Room #120"; etc.).
 - g. Provide a conduit termination fitting with insulated throat bushing and mechanical ground lugs at each conduit "stub-up" location.
- 4. Conduit concrete encasement:
 - a. Conduits which are run underground exterior to building slab shall be continuously concrete encased except, 15-amp and 20-amp power branch circuit conduits underground do not require concrete encasement.
 - b. PVC rigid-non-metallic-type EB conduit, of any size and any location shall be continuously concrete encased the full length of the conduit installation, including under building slab.
 - c. Concrete for encasement of underground conduits shall be 2000-PSI 28-days cure strength with a mix of cement, sand, water and maximum of ¾-inch gravel.
 Concrete encasement of conduits shall be continuous without voids. The encasement shall extend 3-inches past the edges of all conduits on all sides of the

circuit. Provide 10-pounds of red oxide cement coloring uniformly mixed with each cubic yard of concrete for conduit encasement.

- d. Conduits located below or adjacent to structural foundations shall be separated from the foundation by a minimum of 12-inches. Conduits located below structural foundations shall be fully and continuously concrete backfilled and encased between the bottom of the foundation to the bottom of the conduits. The concrete shall be 4000 PSI 28 day cure strength instead of 2000-PSI concrete.
- e. Conduits of any size and type (including 15 amp and 20 amp power branch circuits) located under roads, paved areas and "transit-system" right of way shall be concrete encased.
- 5. Underground conduits:
 - a. Three or more underground conduits larger than 1-inch in size and occupying the same trench shall be separated and supported on factory fabricated, non-metallic, duct/conduit support spacers. The spacers shall be modular, keyed interlocking type, "built-up" to accommodate quantity, size orientation and spacing of installed conduits. The spacers shall maintain a constant distance between adjacent conduit supports and hold conduits in place during trench backfill operations. Minimum support spacer installation interval along with length of the conduits shall be as follows:
 - 1) Concrete encased conduits, not less than 8-feet on center.
 - 2) Non-concrete encased conduits, not less than 5-feet on center.
 - b. Provide trenching, excavation, shoring and Backfilling required for the proper installation of underground conduits. Tops of backfill shall match finish grade.
 - c. Bottoms of trenches shall be cut parallel to "finish grade" elevation. Make trenches 12-inches wider than the greatest diameter of the conduit.
 - d. Back-filling Trenches for Conduits without Concrete Encasement Requirements
 - Conduits which are not required by the Contract Documents to be concrete encased and are located exterior to building slab, shall be set on a 3-inch bed of damp clean sand. Conduit trenches shall be backfilled to within 12-inches of finished grade with damp sand after installation of conduit is completed. Remainder of backfill shall be native soil.
 - Conduits located under a building which are not required by the Contract Documents to be concrete encased, shall be completely backfilled and compacted with clean damp sand to the same level as the building foundation pad.
 - 3) Provide a continuous yellow 12-inches wide flat plastic tracer tape, located 12inches above the conduits in the trench. The tracer tape shall be imprinted with "Warning-Electric Circuits" a minimum of 24-inches on center.
 - e. Backfilling trenches for conduits under paved areas:
 - 1) In addition to the Requirements of conduit concrete encasement, conduits under walkways, roads, parking lots, driveways, and buildings shall be cast in place concrete "slurry mix" backfill. The slurry mix shall cover each side and top of conduits and conduit concrete encasement. The slurry mix shall be continuous to the underside of the finish subgrade surface.

- f. Backfilling trenches for conduits with Concrete Encasement Requirements by the Contract Documents:
 - 1) Trenches with all conduits concrete encased shall be backfilled with clean damp sand when located under building pads.
 - 2) Trenches with all conduits concrete encased and not located under a building pad and not located under paved areas shall be backfilled with clean damp sand or native soil.
- g. Backfill material:
 - 1) Sand and native soil backfill of trenches shall be machine vibrated in 6-inch lifts to provide not less than 90% compaction of backfill.
 - 2) Soil backfill shall have no stones, organic matter of aggregate greater than 3-inches.
 - 3) Concrete and slurry mix (2000-PSI) shall be machine vibrated during installation to remove "air-voids".
 - 4) The slurry mix shall consist of concrete, clean rock, clean sand and clean water mixture. Maximum shrinking of slurry mix shall not exceed 5% wet to dry.
- h. Do not backfill until District's Representative has approved Installation and As-Built Drawings are up to date. Promptly install conduits after excavation has been done, so as to keep the excavations open as short a time as possible. Excess soil from trenching shall be removed from the site.
- i. Install underground conduit, except under buildings, not less than 24-inches below finished grade in non-traffic areas and 30-inches below finished grade in traffic areas, including roads and parking areas. Not less than 48-inches below finished grade under public/private transit system right of way and railroad right of way. Dimensions shall be measured to the top of the conduit.
- j. Conduit crossing existing underground utilities shall cross below the bottom depth of the existing utilities. If the top portion of the existing utility depth below finish grade exceeds 72-inches and the specified separation and depths are maintained when crossing over the top of the existing underground utility, the conduit may cross above the existing underground utility.
- k. Provide long radius horizontal bends (minimum radius of 36-times the conduit diameter) in underground conduits where the conduit is in excess of 100-feet long.
- I. Conduits installed below grade and on grade below buildings, shall not be smaller than 0.75-inches. Conduits for circuits exceeding 600-volts shall not be smaller than 5.0-inches.
- m. Underground conduits entering a building shall be sloped. The conduit direction of slope shall be away from the building, and shall prevent water in the conduit from "gravity draining" towards the building. The conduit slope "high point" shall originate from the building, out to the first exterior pullbox, manhole etc. exterior conduit termination "low point". The minimum slope angle shall be a constant 8-inches (or greater) of fall for each 100-feet of conduit length.
- n. Dewatering:
 - 1) Provide pumping to remove, maintain and dispose of all water entering the excavation during the time the excavation is being prepared, for the conduit laying, during the laying of the conduit, and until the backfill at the conduit zone has been completed. These provisions shall apply on a continuous basis.

Water shall be disposed of in a manner to prevent damage to adjacent property. Trench water shall not be drained through the construction. Groundwater shall not be allowed to rise around the pipe until joining compound has firmly set.

- 2) The District's Representative shall be notified 48 hours prior to commencement of dewatering.
- 6. Raceway/Conduits, which are installed at this time and left empty for future use, shall have 0.25-inch diameter polyvinyl rope left in place for future use. The pull rope shall be 500-pound minimum tensile strength. Provide a minimum of 5-feet of slack at each end of pull ropes.
- 7. Unless otherwise restricted by Structural Drawings and Specifications, the maximum size conduit permitted in concrete slab on-grade, walls, ceilings and roofs constructed of masonry or concrete shall not be greater than 20% of the concrete/masonry thickness. Conduits installed in these locations shall not cross.
 - a. Conduits shall not be installed in cast-in-place concrete floors.
- 8. Provide openings in building structures for conduit penetrations:
 - a. New construction shall be provided with conduit sleeves, to provide conduit penetrations.
 - b. Existing construction shall be drilled (core drill masonry and concrete) and provide conduit sleeves installed after drilling, to provide conduit penetrations.
 - c. Where the structure penetrations for underground conduits penetrating through foundations will not comply with the (restriction/penetration) shown in the Contract Documents, install the conduits below and clear of the foundation lowest point.
- 9. Conduit bends risers and offsets:
 - a. The minimum bend radius of "factory or field" fabricated conduit bends shall not be less than the following. The bend radius shall be measured at the surface, inside radius of the conduit wall:
 - 1) FMC and LTFMC conduit conduit minimum bend radius 12-times the conduit diameter.
 - 2) RMC and EMT conduit minimum bend radius conduit for power circuits over 100 volts and less than 600 volts, 8-times conduit diameter. Conduit for power circuits over 600 volt, 12-times conduit diameter. Conduit for low voltage, signal and fiber optic circuits, 10-times conduit diameter.
 - 3) RNMC conduit conduit minimum bend radius 36-times the conduit diameter. Under building reduce minimum bend radius to 10-times the conduit diameter. Conduit bends and offsets in RNMC with less than 36-times conduit diameter bend/offset radius shall be RNMC PVC schedule 80 or PVC coated RGS.
 - 4) Conduits for Utility Company conductors. Conduit minimum bend radius shall comply with the respective Utility Company Requirements.
 - b. Bends and offsets in conduits shall be kept to an absolute minimum. The total summation of all bends and offsets permitted in a conduit segment, occurring between two conduit termination/connection end points, shall not exceed the following, including conduit fittings:
 - 1) RMC and EMT conduit 360 angular degrees
 - 2) FMC and LTFMC conduit 180 angular degrees

- 3) RNMC conduit 270 angular degrees
- c. Each field fabricated conduit offset, bend and elbow which are not the standard product of the Raceway/Conduit Manufacturer shall be mandrel tested. The test shall be conducted after the conduit installation is complete and prior to pulling-in any wire, in the same manner as for underground conduits.
- d. Factory manufactured angle connector conduit fittings shall be installed in exposed conduit locations only. Installation in locations normally concealed from view shall not be permitted. Not more than one factory manufactured angle connector shall be permitted in any length of conduit between conduit termination end points.
- e. RNMC conduit risers from below grade shall be PVC coated RGS. Conduit risers, bends or offsets entering into a building shall be PVC coated RGS.
- f. If three or more conduit-bends of the same conduit size and same conduit material type, installed, as part of the Contract Work, fail to comply with the required minimum conduit bend radius or conduit angular degree limits. The following corrective actions shall occur:
 - 1) The Contractor shall remove all the non-complying conduit bends and the respective wire in the conduit from the project site. Provide new conduit and wire, complying with the Contract Documents.
 - 2) Where the conduit bends similar to the non-complying conduit bends are installed concealed in walls, floors, above ceilings or below grade, the Contractor shall expose the conduit bends to allow visual observation.
 - 3) The Contractor shall remove the non-complying conduit bends and dispose of the Project Site. The Contractor shall provide new conduit bends and conductors complying with the Contract Documents.
 - 4) All the costs to correct the deficient material and work along with costs to repair the direct, indirect, incidental damages and Contract delays shall be the sole responsibility of the Contractor and shall be included in the bid price.
- 10. Expansion joint, deflection joint and seismic joint fittings.
 - a. Provide a conduit expansion fitting for each conduit length and conduit type as follows (Note The installation of specified combination expansion/deflection fittings at seismic joints shall satisfy this Spacing Requirement also):

	<u>Conduit Type</u>	<u>Conduit</u>	Fitting Length Spacing
1)	RMC and EMT	Exposed exterior locations	200-feet
			_

- 2) RMC and EMT Interior weather protected locations 200 feet
- b. Provide a conduit combination expansion/deflection fitting for each conduit, crossing the following elements:
 - 1) At each building or non-building structure seismic joint.
 - 2) At each building on non-building structure expansion joint.
 - 3) At each conduit penetration of a "sound-rated" wall, floor or ceiling.
- 11. Provide two locknuts and an insulated throat bushing at each metal conduit terminating at enclosures, including but not limited to outlet boxes, junction boxes, terminal cabinets, switchgear, transformers, switchboards, distribution panels and panelboards.
- 12. Provide metallic or plastic closure caps on all conduit ends during construction, until installation of conductors in the respective conduit.

- 13. Conduit run exposed, shall be run at right angles or parallel to the walls or structures. All changes in directions, either horizontally or vertically, shall be made with conduit outlet bodies as manufactured by Crouse Hinds, OZ or equal. Conduits run on exposed beams or trelliswork shall be painted to match surrounding surfaces.
- 14. Conduit exposed on roof:
 - a. Conduits installed exposed on roofs shall be installed on conduit sleepers. Place the conduit sleepers a maximum 5-foot on center along the entire length of the conduit; under conduit expansion/deflection fittings; under each junction box and within 24-inches of each conduit bend.
 - b. Provide a conduit support "C" channel continuous along the top length of the sleeper and rigidly bolted to the sleeper. Conduits shall be loosely fastened to each sleeper "C" channel with pipe clamps to allow for relative movement between the sleeper and conduit.
 - c. Conduits shall not block or interfere with roof hatches, doors, ventilation openings, dampers, equipment access panels/doors, roof water drainage.
 - e. Conduit sleepers shall be fabricated from "clear" solid redwood 4-inches by 4-inches (nominal) size. Sleeper length shall extend a minimum of 9-inches past the conduits attached to the sleeper, but in no case shall the length of the sleeper be less than 24-inches.
 - f. Provide a pad under each sleeper; sleepers shall not be installed in direct contact with the roofing. Sleeper pads shall extend a minimum of 6 inches past each side of the sleeper. The sleeper pad shall be semi-rigid mineral surfaced composition board, not less than 0.375-inch thickness, bituminous impregnated, manufactured for application on the specific roofing material. Remove roofing "ballast" (gravel) under pad, prior to installation of sleeper pad. Do not puncture roof membrane.
 - g. Position the "length" of the conduit sleepers' perpendicular to the roof slope, to prevent obstruction of roof drainage water flow. Where the conduit routing prevents placing the conduit sleeper parallel to the roof slope, provide two separate sleeper pads for the conduit sleeper, with a continuous 3-inches wide water drainage gap between the sleepers. Align the water drainage gap to allow unimpeded water travel along the roof slope drainage flow line between the pads.
 - h. Sleepers and sleeper pads shall be set in nonhardening mastic, a minimum of 0.25inch thickness. Mastic shall be inorganic, nonhardening, and complying with ASTM-D1227. Mastic shall be applied with continuous uniform coverage, minimum 0.25inch thickness, on all the surfaces of each conduit sleeper and on the sleeper pad contact surface with the roof.
- 15. Rigid steel conduit or electrical metallic tubing shall not be strapped or fastened to equipment subject to vibration or mounted on shock absorbing bases.
- 16. RMC conduit threads:
 - a. Machine cut threads on RMC conduit required for field fabrication shall comply with NPS and ANSI-B1.20.1.
 - b. The length of bare metal exposed during thread fabrication shall be completely covered by conduit couplings and fittings. Additionally, the thread length shall insure that conduit joints will reach "torque" tightness and become secure before

conduit ends "butt" together and before conduit ends "butt" into the "shoulders" of other conduit fittings.

- c. Running threads or right/left handed threads shall not be used to connect RMC.
- 17. RNMC conduit:
 - a. Joints and fittings shall be solvent welded to RNMC conduit. Joints and fittings shall be watertight and airtight after fabrication.
- 18. Tighten each conduit fittings and fitting appurtenance, to the "torque" (allowable tolerance \pm 5%) value recommended by the Fitting Manufacturer and applicable code. If three or more conduit fittings are found to not be in compliance with the Manufacturer's "torque" (tightness) recommendations, the following corrective actions shall occur:
 - a. The Contractor shall tighten "re-torque" the defective fittings and all similar conduit fittings installed as part of the Contract Documents in the presence of the District's Representative.
 - b. If the respective conduit fittings similar to the deficient "torque tightness" fittings are installed concealed in walls, floors, above ceilings or below grade, the Contractor shall expose the fitting, to allow retightening each similar conduit fitting to the Manufacturers recommended "torque" values.
 - c. All the cost to repair the direct, indirect, incidental damages and Contract delays resulting from complying with these Requirements shall be the sole responsibility of the Contractor and shall be included in the bid price.
- 19. Horizontal directional boring for underground conduit:
 - a. Provide a directional guided horizontal "bore-hole" underground conduit installation where one or more of the following conduits occur:
 - 1) Continuous trenching excavation and backfill for conduit installation is not permitted by the Contract.
 - 2) Where continuous trenching excavation due to the existing surface and below grade conditions and restrictions, is not possible or practical to excavate a trench.
 - b. Provide "path-tracing" of the underground bore head, from the surface, along the entire horizontal bore length. Path tracing shall use electronic transmitters and receivers, continuously communicating the underground bore head locations and depth to the bore equipment operator. The directional boring system shall employ active tracking and directional position/steering control of the bore equipment drill head location. The active tracking system shall provide a portable receiver/transmitter unit for tracking the position of the moving drill head; a sensor "Sonde" unit on the drill head for tracking signals to the receiver/transmitter; and a drill head tracking data view display located at the boring equipment operator position to view the drill head position information sent from the portable receiver/transmitter. As manufactured by SPX-Radiodetection Company or similar products.
 - c. Provide vertical pilot excavations not more than 50-feet on center along the path of the bore-hole to intercept the horizontal bore-hole routing, provide excavations at the beginning and end terminals staging points of the horizontal bore-hole.
 - d. Provide full-depth "shoring" of the vertical pilot excavations. Remove the shoring, backfill, compact and repair the excavations when conduit installation is complete.

- e. "Drilling-fluid" shall be used during "back-reaming" and "pullback", pumped through the drill pipe to the bore drill head.
- f. Directional guided horizontal drilling shall employ equipment specifically designed and manufactured for the process. The Equipment Manufacturer shall train bore equipment operating personal in the proper operation of said equipment.
- g. Locate the position, size, depth and identify all underground "cross-bore" existing underground utilities, pipes, structures and conflicts along the entire bore path of each underground bore, prior to initiating directional boring work. Notify respective agency for each "cross bore" potential crossing. Comply with the recommendations of the Cross Bore Safety Association (CBSA).
- h. Horizontal, directionally guided boring equipment, as manufactured by Ditch Witch; Vermeer Manufacturing; or Case Corporation.
- J. Conduit Seals
 - 1. Provide conduit seal fittings at each location where a conduit transitions or passes through the following areas and where indicated on the Drawings:
 - a. Refrigerated areas.
 - b. Temperature control rooms including warming rooms, steam rooms, saunas etc.
 - c. Classified hazardous material areas.
 - d. Water intrusion areas.
 - 2. Provide conduit seals on each conduit entering a building from a below grade area located outside the building (i.e., basement, vault etc.) and connecting to the following types of equipment
 - a. Transformers
 - b. Panelboards
 - c. Motor control centers
 - d. Switchboards
 - e. Switchgear
 - f. Motors
 - g. Terminal cabinets
 - h. Terminal backboards
 - i. Cable trenches
 - 3. Conduit seals shall be installed in locations where the fitting is visible and accessible.
- K. Nailing Shields
 - 1. Provide "nail" shields where FMC conduit and conductors not installed in a conduit are installed through wood stud and wood frame construction. The nail shield shall provide a barrier resistant to "nailing" fasteners through the stud, and penetrating into the FMC and conductors.
 - 2. The nail shields shall be flat nominal 1.5-inch by 3-inches, 14-gauge steel, and hot dip zinc galvanized with "nailing spurs".
 - 3. Provide nailing shields on the front face and rear face of each FMC penetration. The shield shall be centered on each penetration through the respective framing, stud framing blocking, and stud framing plates.

- L. Conduit Bodies
 - 1. Conduit bodies shall be installed in exposed conduit locations only or above accessible ceilings.
 - 2. Conduit bodies shall be accessible for removing body cover and pulling wire through the conduit body.
 - 3. Conduit bodies shall not be installed inside enclosed walls.
- M. Preparation of Reuse of Existing Conduits
 - 1. Prepare existing conduits shown to be reused as part of Contract Work as follows:
 - a. Complete the required work prior to installing any conductors or cables in respective existing conduits.
 - b. "Rod" out existing raceways to be used under this contact, with approved test and flexible mandrels to remove all obstructions to clear debris from inside conduits.
 - c. Use test mandrels at least 12-inches long, 0.25-inch less than diameter of duct at center, tapering to 0.5-inch less than duct size at ends.
 - 2. If test mandrels cannot be pulled through raceways, Contractor shall perform the following to clear the existing raceways:
 - a. Force rigid or semi-rigid rods through the raceways to clear the obstructions from one to both ends of the raceway.
 - b. Force a power driven rotating router device through the conduit from one or both ends of raceways. Device shall incorporate small diameter cutting blades. Repeat the "router" process in incremental stages to a cutting blade diameter approximately ¹/₈-inch smaller than the raceway inside diameter.
 - 3. After clearing the raceway of obstructions, pull a test mandrel or brush through the raceway to clear the remaining debris from the raceway.

3.04 WIRE AND CABLE

- A. Branch circuit and fixture joints for #10AWG and smaller wire shall be made with UL-approved connectors listed for 600 volts, approved for use with copper and/or aluminum wire. Connector to consist of a cone-shaped, expandable coil spring insert, insulated with a nylon shell and two wings placed opposite each other to serve as a built-in wrench or shall be molded one-piece as manufactured by 3M-"Scotchlok".
- B. Branch circuit joints of #8AWG and larger shall be made with screw pressure connectors made of high strength structural aluminum alloy and UL-approved for use with both copper and/or aluminum wire as manufactured by Thomas & Betts. Joints shall be insulated with plastic splicing tape, tapered half-lapped and at least the thickness equivalent to 1.5-times the conductor insulation. Tapes shall be fresh and of quality equal to Scotch.
- C. Use UL listed pulling compound for installation of conductors in conduits.
- D. Correspond each circuit to the branch number indicated on the panel schedule shown on the Drawings except where departures are approved by the District's Representative.
- E. All wiring, including low voltage, shall be installed in conduit.
- F. Control wiring to conform to the wiring diagrams shown on the Mechanical Drawings and the Manufacturer's Wiring Diagrams.

- G. All splices in exterior pull boxes and light poles shall be cast resins encapsulated.
 - 1. Power conductor splices 3M Scotchcast Series 82/85/90; Plymouth or equal.
 - 2. Control and signal circuits 3M Scotchcast series 8981 through 8986, Plymouth or equal.
- H. Neatly group and lace all wiring in panelboards, motor control centers and terminal cabinets with plastic ties at 3-inch on centers. Tag all spare conductors.

3.05 CHEMICAL GROUND ROD

- A. General
 - 1. Install ground rod system in compliance with Manufacturer's instructions.
 - 2. Install rods vertically. Where subterranean hard rock conditions prevent vertical installation horizontal "L" shape ground rod shall be installed.
 - 3. Where ground rod is installed in an indoors dry location set ground box flush with finish floor. Where ground rod is installed outdoors set the top of the ground box four inches above finish grade.
 - 4. Do not remove sealing tape from ground rod holes until time of installation in ground.
 - 5. Separate ground rods from all other grounding electrodes and from each other by not less than 12-feet horizontal distance.
- B. Excavation
 - 1. Vertical installation bore a 12-inches diameter vertical hole in the ground six inches deeper than ground rod length.
 - 2. Horizontal installations excavate a 12-inches wide trench, slope rod and trench to insure end cap of rod is 2-inches lower than the elbow.
- C. Backfill
 - 1. Surround the entire rod with a minimum of 10 inches of bentonite clay mixed with water at six times volume to form a paste. Approximately 14-gallons for each 50-pounds of clay. Remove any excavation liners from the rod excavation area.
 - 2. Install ground box and complete backfill.
- D. Connect grounding electrode conductor(s) to ground rod.

3.06 CABLE RACKS

- A. General
 - 1. Provide cable racks in precast and cast-in place concrete pullboxes, manholes and cable trenches.

3.07 TESTING

A. Testing Conduit and Conduit Bends

The Contractor shall demonstrate the usability of all underground raceways, and field fabricated conduit bends installed as part of this Contract.

1. A round tapered segmented semi-rigid mandrel with a diameter approximately ¼-inch smaller than the diameter of the raceway, shall be pulled through each new raceway.

- 2. The mandrel shall be pulled through after the raceway installation is completed. Conduits which stubout only, may have the mandrel pulled after the concrete encasement is completed, but prior to completing the backfill.
- 3. District's Representative shall witness the raceway testing for usability. A Representative of the respective Utility Company shall witness the raceway testing where applicable.
- 4. Contractor shall repair/replace any conduit and conduit bend provided under this Contract which will not readily pass the mandrel during this test.
- B. Refer to Section 26 05 00 Common Work Results for Electrical item 1.13 for Testing Requirements.

END OF SECTION 26 05 30 032519/212253

SECTION 26 24 16

BRANCH CIRCUIT PANELBOARDS AND TERMINAL CABINETS

PART 1 GENERAL

1.01 SCOPE

- A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Examine all other Specification Sections and Drawings for related work required to be included as work under Division 26.
 - 2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. Provide Manufacturers Catalog Data for Panels, Cabinets, and Circuit Breakers.
- B. Provide Shop Drawing showing Panel Circuit arrangements, size, voltage, ampacity, overcurrent protective devices, etc.
- C. Provide nameplate engraving schedule.
- D. Short Circuit, Coordination and Arc-Flash
 - Perform and submit engineered settings for each equipment location, fuse and adjustable circuit breaker device, showing the correct time and settings to provide the selective coordination within the limits of the specified equipment, per the latest applicable standards of IEEE and ANSI. Provide electrical system short circuit fault analysis, both 3-phase line-to-line and 1-phase line-to-ground calculations as part of the Coordination Analysis recommendations. Provide Electric Arc-Flash Calculations as part of the Coordination Analysis recommendations.
 - 2. The information shall be submitted in both tabular form and on time current log-log graph paper, with an Engineering Narrative. Written narrative describing data, assumptions, analysis of results and prioritized recommendations, six copies.
 - 3. The goal is to minimize an unexpected but necessary electrical system outage and personnel exposure to the smallest extent possible within the fault occurrence location, using the specified Contract Equipment. Shall comply with, but not limited to:
 - a. IEEE-242, Recommended Practices for Protection and Coordination of Industrial and Commercial Distribution.
 - b. IEEE-399, Recommended Practice for Industrial and Commercial Power System Analysis.
 - c. IEEE-1584, Guide to Performing Arc-Flash Hazard Calculations.
 - d. CEC/NEC
 - 4. Electrical equipment including switchgear, switchboards, electrical panels, and control panels, transformers, disconnects, etc., shall each be labeled by the Manufacturer with "Electrical-Arc-Flash" warning signs. The signs shall explain a hazard to personnel may exist if the equipment is worked on while energized or operated by personnel, to wear

the correct Protective Equipment/clothing (PPE) when working "Live", or operating "Live" equipment and circuits.

- 5. The Contractor shall independently contact the serving Utility Company to obtain the current system short circuit amps or available fault current.
- 6. The Contractor shall independently obtain As-Built Drawings for the existing infrastructure to establish lengths. If As-Built Drawings are no available, the Contractor shall research existing conditions and make reasonable but conservative estimates of conductor length. Where existing conductors have been re-used, the Contractor shall confirm conductor quantity, size, and conduit type.

1.03 SEISMIC EARTHQUAKE AND WIND LOADING WITHSTAND, TESTING AND CERTIFICATION. (ADDITIONAL REQUIREMENTS)

- A. General
 - 1. The complete panels and terminal cabinet assemblies; including circuit protection devices, meter, housings/enclosures, accessories, supports/anchors etc., shall be designed, manufactured and tested.
 - a. Wind loading all outdoor equipment locations.
 - b. Earthquake Seismic and CBC/IBC Seismic withstand all indoor and all outdoor equipment locations.
 - 2. Shall withstand, survive and maintain continuous non-interrupted energized operation during the seismic event occurrences and wind event occurrences. Continued normal energized operation after the wind event and seismic event occurrences have abated.
 - 3. Shall include demonstrations of successful operation and run test after completion of seismic event shake-table simulation. Acceptance test seismic qualification shall employ triple axis shake-table simulation of the Required Response Spectrum (RRS) seismic event motion, certified and approved by the AHJ.
 - 4. Provide three dimensional finite element analysis demonstrating anchorage and operational withstand of wind loading not less than as follows and as required by AHJ:
 - a. 110MPH West Coast States USA and Hawaii per ASCE/SEI 7-10.
 - Seismic Test shall be performed by a third party independent Test Laboratory. Wind Analysis and Seismic Testing and Reports shall be certified, signed and "stamped" by PE Professional Engineer licensed and in good standing in the State, Civil Engineer or Structural Engineer.
- B. Refer to General Commissioning Section 01 91 13 for Additional Requirements.

PART 2 - PRODUCTS

2.01 PANELBOARDS AND DISTRIBUTION PANELS

- A. Shall be flush or surface mounting as indicated with group -mount circuit protection devices as shown on panel schedule, hinged lockable doors, index cardholders and proper bussing.
 - 1. Panelboards shall comply with the latest versions:
 - a. NEMA PB1.
 - b. UL 50 and 67.

- c. CEC/NEC.
- d. ASTM-B187.
- 2. Where indicated on the Drawings shall be furnished with subfeed breakers and/or additional conductor lugs, split bussing, contactors, time switches, relays, etc., as required.
 - a. Branch circuit panels up through 42-circuits shall be single section, to accommodate all of the circuits and components.
 - b. Distribution panels shall be single section or multi-section, to accommodate all of the circuits and components.
- 3. Panels shall be "Service-Entrance" equipment rated when the panel main incoming supply feeder originates from one of the following:
 - a. Originates outdoors exterior of the building in which the respective panel is located.
 - b. Originates from an electrical supply source not located in the same building as the respective panel.
- B. Housing and Painting, Panels and Terminal Cabinets
 - 1. Shall be finished with one coat of rust inhibitor zinc chromate and coat of primer sealer after a thorough cleaning.
 - 2. Finish color paint as selected by a District Representative where exposed to public view (e.g., corridors, covered passages, offices, etc.). Prime coated panelboard shall be painted to match surroundings after installation in public areas.
 - 3. Manufacturer's standard color in electrical rooms/closets, janitors, HVAC and storage rooms.
 - 4. Shall be fabricated of sheet steel of the following minimum gauges.
 - a. Full height hinged, locking door. Trim #12 gauge steel; enclosure code gauge steel.
 - b. Panels installed in indoor dedicated electrical equipment rooms and dedicated electrical equipment closets, omit full height hinged locking panel door. Dead front cover behind omitted panel door shall remain.
 - 5. NEMA-1 Metal Housing, for indoor locations.
 - 6. NEMA-3R Metal Housing, tamper resistant, for outdoor locations.
 - 7. Furnish all panels and terminal cabinets with the Manufacturers flush locks and keys except where indicated otherwise herein. Keys and locks shall be interchangeable for all panels. Provide two latches and two locks for door heights exceeding 36-inches.
 - 8. Fasten the trim to panel and terminal cabinets by means of concealed, bolted or screwed fasteners accessible only when the door is open.
- C. Panels 208/120 volt, three phase, 4-wire, S/N or 120/240 volt, single phase, 3-wire, S/N. Branch Circuit Panel as manufactured by:
 - 1. Cutler Hammer "Pow-R-Line 1 or 2" Series
 - 2. General Electric "A" Series
 - 3. Square D "NF/NQ" Series
 - 4. Siemens "P1/P2" Series

- D. Distribution Panels as manufactured by:
 - 1. Cutler Hammer "Power-R-Line 3 or 4" Series
 - 2. General Electric "Spectra" Series
 - 3. Square D "I-Line" Series
 - 4. Siemens "P4/P5" Series
- E. Top and bottom gutter space shall not be less than 6-inches high. Provide 6-inches additional gutter space in all panels where double lugs are required, or where cable ampere size exceeds bus ampere size. Provide 12-inches additional gutter space in all panels for aluminum feeders where used.
- F. Panel Dimensions.
 - 1. Panels with buss sizes 50 amp thru 400 amp
 - a. Shall be 20-inches wide. Surface or flush mounting as indicated.
 - b. Recess mounted type shall have a 20-inches wide (maximum) recess metal enclosure with overlapping edge trim plate cover extending 1-inch on all sides of enclosure.
 - c. Depth shall be 5.75-inches nominal. Height of panel as required for devices.
 - 2. Panels with buss sizes greater than 400 amp
 - Narrow panels 24-inches (maximum) wide by 6.5-inches (maximum) deep units.
 Wide panels 25-inches to 44-inches (maximum) wide by 8-inches to 15-inches (maximum) deep units.
 Nominal 90-inch panel height.
 - b. The wider units shall be used only at locations where the narrow unit is not available with the quantity or size of large-ampere frame branch/subfeed circuit protective devices shown on the panel schedules, or where the main breaker size exceeds the narrow panel maximum.
 - c. Distribution panels shall be floor standing and also supported from behind the panels at walls.
- G. Distribution panels and branch circuit panels maximum load rating
 - 1. Panelboards and Distribution Panels exceeding 800-amp load rating shall not be permitted.
 - 2. Provide Distribution Switchboards instead of Distribution Panels for bus load and circuit load ratings exceeding 800-amp.
- H. Panel Auxiliary Cabinets
 - 1. Panelboards shown on the Drawings with relays, time clocks or other control devices shall have a separate auxiliary metal barrier compartment mounted above panel.
 - 2. Panelboards with circuits controlled by low voltage remote control relays shall be provided with separate auxiliary cabinets to contain the relays, adjacent to the panelboard.
 - 3. Provide auxiliary cabinets with separate hinged locking door to match panelboard.
 - 4. Provide mounting subbase in cabinet for control devices and wiring terminal strips.

- I. Panels shall have a circuit index cardholder removable type, with clear plastic cover. Index card shall have circuit numbers imprinted to match circuit breaker numbers.
 - 1. The panel identification nameplate shall describe the respective panel name and voltage, corresponding to the Contract Documents.
 - 2. The electrical power source, name and location of each panel supply-feeder and supply equipment name shall also be identified and described on the respective panel name-plate.
- J. SPD Surge Protection Device
 - 1. Provide each of the following branch circuit panel and distribution panel types with a SPD and RF filtering:
 - a. 208/120 volt single phase and/or three phase.
 - b. 120/240 volt single phase.
 - c. 480/277 volt single phase and/or three phase.
 - d. All distribution panels.
 - 2. The SPD shall be installed inside the respective panel housing and shall be factory connected to each main phase, ground and neutral bus inside the panel.
 - 3. The SPD monitor/annunciator indicators shall be visible only when the panel access door is in the open position.
 - 4. Provide a 20-amp 3-pole (2-pole for single-phase panels) branch circuit protection device in each panel for SPD connection.
 - 5. The SPD device and panel shall be UL labeled and listed for combined use. See related Specification Sections for additional SPD Requirements.
- K. Seismic Earthquake and Wind Loading Withstand, Testing and Certification (Additional Requirements)
 - 1. The complete panel/panelboard assembly; including circuit protection devices, housings/enclosures, accessories, supports/anchors etc., shall be designed, manufactured and tested for wind loading and Earthquake Seismic withstand.
 - 2. Shall withstand, survive and maintain continuous non-interrupted energized operation (running) during the seismic event occurrences. Continued normal energized operation after the wind event and seismic event occurrences have abated.
 - 3. Shall include demonstrations of successful operation and run test after completion of seismic event shake-table simulation.
 - 4. Provide three dimensional finite element analysis demonstrating anchorage and operational withstand of wind loading as follows:
 - a. 110MPH West Coast States USA and Hawaii, per ASCE/SEI 7-10.
 - 5. Acceptance test seismic qualification of proposed panels and panelboards shall employ triple axis shake-table simulation of the Required Response Spectrum (RRS) seismic event motion, certified and approved by the AHJ.
 - Seismic test shall be performed by a third party independent test laboratory. Wind analysis and seismic Testing and reports shall be certified, signed and "stamped" by PE Professional Engineer licensed and in good standing in the State, Civil Engineer or Structural Engineer.

2.02 SHORT CIRCUIT RATING

A. Circuit protective devices and bussing as indicated on the Drawings. All devices and bussing shall have a short circuit fault withstand and interrupting capacity not less than the maximum available fault current at the panel and as indicated on the Drawings, plus a 25% additional capacity (safety margin). However, in no case shall the short circuit fault interrupting and withstand capacity be less than the following symmetrical short circuit.

and/or Bus Rating	<u>Circuit Voltage</u>	Short Circuit Amp.
400A and less	240V and below	10,000A
400A and less	over 240V and below 600V	/ 14,000A
Over 400A, 800A and below	240V and below	42,000A
Over 400A, 800A and below	over 240V and below 600V	/ 30,000A
	400A and less 400A and less Over 400A, 800A and below	400A and less240V and below400A and lessover 240V and below 600VOver 400A, 800A and below240V and below

- B. Panel short circuit fault rating
 - 1. General
 - a. Provide a "fully rated" for short circuit fault interrupt and full load ampere main circuit breaker in each branch circuit panel and/or each distribution panel. Provide the main circuit breaker whether or not a main circuit breaker is shown otherwise on the Drawings, Schedules or Diagrams. The "utility-source" plus the "motor-load" transient contributions shall be used to establish the available fault duty values, unless indicated otherwise on the Drawings.
 - b. The panel main circuit breaker full load ampere capacity rating shall equal the respective panel main bus ampere rating.
 - c. The panel assembly, buss and circuit protection devices bolted fault short circuit withstand and bolted fault short circuit interrupt ratings shall not be less than 125% greater (including a 25% safety margin) than the available utility-source symmetrical and asymmetrical bolted fault short circuit current when "series combined rated" with the panel main circuit breaker.
 - d. The main circuit breaker rated "bolted-fault" short circuit fault interrupt and withstand short circuit rating shall <u>not</u> be less than 125% (including a 25% safety margin) of the upstream main service entrance "bolted-fault" available (symmetrical and asymmetrical) short circuit current.
 - 2. Distribution Panelboards
 - a. Distribution panel, main circuit breaker, all feeder circuit breakers, and all branch circuit breakers shall be "fully-rated" (plus safety margin) for the available bolted fault short circuit current (including safety margin).
 - b. Shall provide time/current-tripping coordination with downstream equipment and upstream equipment.
 - 3. Non-emergency branch circuit panelboards 400-amp buss and smaller; Non-emergency branch circuit panelboards 400-amp trip main circuit breaker and smaller.
 - a. The branch circuit panel main circuit breaker shall be "fully-rated" (plus safety margin) Current Limiting Circuit Breaker type (CLCB). Shall provide time/current-tripping coordination with upstream equipment.

- b. The branch circuit panel main circuit breaker shall be "series-rated" with the panel downstream branch circuit devices and panel bussing. "The series-rating" shall provide short circuit bolted fault current withstand protection and short circuit bolted fault interrupt rating protection during a downstream 3-phase line-to-line and/or single-phase line-to-ground short circuit bolted faults.
- c. Typical for branch circuit panelboards connected to normal-power (non-emergency) power circuits.
- 4. Emergency branch circuit panelboards 400-amp bus and smaller; Emergency branch circuit panelboards 400-amp trip main circuit breaker and smaller.
 - a. The branch circuit panel main circuit breaker shall be short circuit bolted fault "fullyrated" (plus safety margin) Non-Current Limiting circuit breaker type (non-CLCB).
 - b. The panel bussing shall also be short circuit bolted fault "fully-rated".
 - c. All of the branch circuit panel, branch circuit breakers shall be "fully-rated" nonfused Current Limiting Circuit Breaker Type (CLCB). Shall provide short circuit bolted fault interrupt rating. Coordinated time/current and instantaneous tripping with the upstream circuit protection devices.
 - d. Typical for branch circuit panelboards connected to emergency power circuits.

2.03 PANEL CIRCUIT BREAKERS, CIRCUIT PROTECTION DEVICES

- A. Circuit Breakers General, for Distribution Panels and Panelboards
 - 1. NEMA-AB1 and AB3, comply with latest revision.
 - 2. UL-1087, UL-489 and IEC-60.947.2 rated devices, comply with latest revision.
 - 3. 5Hz AC closing and 3Hz AC trip and clear.
 - 4. Main circuit breakers for distribution panels exceeding 400 amp and larger;
 - a. Shall be Insulated Case Circuit Breaker type ICCB.
 - 5. Main circuit breakers for branch circuit panelboards 400 amp buss and smaller;
 - a. Shall be Current Limiting Circuit Breaker type-CLCB for non-emergency panelboards.
 - b. Shall be Molded Case Circuit Breaker type-MCCB for emergency panelboards.
 - 6. Branch circuit breakers and feeder circuit breakers smaller than 100-amp trip shall be Molded Case Circuit Breakers type-MCCB and/or Current Limiting Circuit Breakers type-CLCB.
 - 7. All circuit breakers 100 amp and larger trip shall employ sensors and solid state digital electronic automatic trip system. Short-time and long-time time/current curve shaping field adjustable functions and adjustable instantaneous trip. Typical for Molded Case Circuit Breaker type-MCCB, Insulated Case Circuit Breaker type-ICCB and Current Limiting Circuit Breaker type-CLCB.
 - 8. Refer to Specification Section 26 24 13 and/or 26 11 00 for additional Circuit Breaker Requirements.
- B. Manufacturer
 - 1. Circuit breakers as manufactured by the following companies only are acceptable:
 - a. Cutler Hammer
 - b. General Electric Co.

- c. Square D Co.
- d. Siemens
- C. Configuration
 - 1. Circuit breakers shall be arranged in the panels so that the breakers of the proper trip settings and numbers correspond to the numbering in the panel schedules on the Drawings.
 - 2. Circuit numbers of breakers shall be black-on-white micarta tabs or other previously approved method. Circuit number tabs, which can readily be changed from front of panel, will not be accepted. Circuit number tabs shall not be attached to or be a part of the breaker.
 - 3. Panelboard circuit protection devices shall be bolt on type for connection to panel bus. Removable and installable without disturbing adjacent devices.
 - 4. Provide conductor wire terminations (lugs) on each circuit protection device for incoming main feeder, branch circuits and outgoing feeder circuits. Dual rated copper/aluminum and compatible with the respective conductor size, type, and quantity.
 - 5. Where 2-pole or 3-pole breakers occur in the panels, they shall be common trip units. Single pole breakers with tie-bar between handles will not be accepted.
 - 6. Branch circuit panels shall be field convertible for bottom entry main incoming feeder or top entry main incoming feeder.
 - 7. Each panel section, the feeder and branch circuit protection devices (3-phase and/or 1-phase) shall be "twin-mount", side-by-side double row construction for the following circuit sizes:
 - a. 480/277 volt, 60-amp circuit size and smaller.
 - b. 240 volt 208/120 volt, 100 amp circuit size and smaller.
- D. Lock-Off and Lock-On
 - 1. All circuit breakers shall be pad-lockable in the "off" position.
 - 2. Where branch circuit breakers supply the power to motors and signal systems, the breakers shall also be furnished with lockout clips, mounted in the "on" position. The breakers shall be able to trip automatically with lockout clips in place.
 - 3. Provide lock-on clips on branch circuit breakers supplying fire alarm equipment and fire alarm panels. Provide identification of the dedicated "fire alarm" circuit function and operation. Color-code the circuit breakers to comply with AHJ Requirements.
 - 4. Locking facilities shall be riveted or mechanically attached to the circuit breaker (submit sample for approval. Other means of attachment shall not be accepted without prior written approval of the District's Representative.
- E. ARC Fault Interrupter Circuit Breaker (AFCI-C/B)
 - 1. AFCI-C/B provides automatic circuit interruption upon detection of any of these conditions: overload, short circuit fault and electric branch circuit arcing protection.
 - 2. The AFCI-C/B shall detect intermittent "arcing" type electrical faults, and provide automatic circuit interruption (tripping).
 - 3. Provide "test-pushbutton" on each C/B for manual AFCI-C/B Testing.

- 4. Single pole, 120-volt, 60Hz AC UL listed and labeled for installation in panelboard, #14 #8AWG solid/stranded AL/CU load conductor.
- F. Switch and Fuse Feeder Protective Devices for Distribution Panels
 - 1. Locations where the Drawings show distribution panels employing switch-fuse circuit protection devices.
 - 2. Fusible Switches: Quick-make, quick-break type with rejection clips for use with Class "R" fuses Current Limiting Fuses (CLF). Switches with ratings up to and including 100 amp at 240 volts shall be twins mounted. Switches rated through 60 amp and 480 volts shall be twins mounted. Provisions for padlocking in the "on" and/or "off" positions. Switches shall be removable from front of panel without disturbing adjacent units or panel bus structure.
 - Fuses shall be time delay current limiting types, UL Class RK-1 unless otherwise indicated on the Drawings. Provide one spare set of fuses of each size and type in each Distribution Panel.
 - 4. Provide auxiliary contact on switch for remote status (on-off) signaling and monitoring. Provide conductor lugs to accept conductor temperature rating, sizes and quantities shown on Drawings.
 - 5. Switch and fuse devices shall be permitted only in distribution panels and only where specifically indicated on the Drawings for feeders.

2.04 PANEL BUSSING

- A. Bus Material
 - 1. Bussing shall be rectangular cross section tin-plated copper or alternately silver or tinplated aluminum.
 - 2. Bussing shall be non-tapped, full length of the enclosure.
- B. Ground Bus
 - 1. Each panel shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.
- C. Provisions
 - 1. Provide space and all hardware and bus mounting attachments for future devices as indicated on the Drawings.
- D. Neutral Bus
 - The ampere rating of the neutral bus of panels and distribution panels shall be a minimum of 100% greater ampere capacity than the ampere rating of the corresponding phase bus, where the panel is indicated to be provided with an "oversize-neutral" or "200%" neutral on the Drawings.

2.05 TERMINAL AND AUXILIARY CABINETS

- A. Cabinets
 - 1. Fabricated of code gauge sheet steel for flush mounting (except where noted as surface) of size indicated on the Drawings, and complete with hinged lockable doors, provide the

quantity of 2-way feed through conductor terminals required for termination of all conductors, plus 15% spares of each type.

- 2. Cabinet locks to operate from same key used for panelboards. The trim to cabinets shall be fastened by means of concealed bolted or screwed fasteners accessible behind door into cabinets. All cabinets shall have ⁵/₈-inch plywood backing, finished with fireproof intumescent primer and finish coat paint. Provide equipment ground bus in each cabinet.
- 3. Cabinets shall be finished with one coat of zinc chromate and one coat of primer sealer after a thorough cleaning. Where exposed to public view (e.g., corridors, covered passages, offices, etc.) finish color paint to match surrounding and Manufacturer's standard gray color in switchboard, janitors, heater and storage rooms.
- 4. Provide grounded metal barriers inside cabinet to isolate and separate line voltage and low voltage from each other inside the cabinet.
- B. Cabinet Dimensions.
 - 1. Unless indicated otherwise on Drawings.
 - a. Shall be 20-inches wide. Surface or flush mounting as indicated.
 - b. Recess mounted type shall have a 20-inches wide (maximum) recess metal enclosure with overlapping edge trim plate cover extending 1-inch on all sides of enclosure.
 - 2. Depth shall be 5.75-inches nominal. Height of cabinet as required for devices, plus 25% spare unused interior space for future use, but not less than 36-inches high.
- C. Terminals
 - 1. Non-digital analog circuits; line and low voltage modular signal systems, 15-amp dual row with isolation barriers, screw-down terminals insulated strips, heavy duty.
 - a. As manufactured by Molex, or ITT-Cannon, or General Electric.
 - 2. Digital circuits; low voltage signal systems, ANSI/EIA/TIA Category-6, 110-Block or 66-Block gas-tight punch down style, heavy duty.
 - a. As manufactured by: Leviton, or Ortronics, or AMP.
- D. Identification (Additional Requirements)
 - 1. Provide engraved nameplate on each cabinet indicating its designation and system (i.e., "Life Safety System Panel 2LS", etc.).
 - 2. Identify each terminal landing with unique circuit number and provide corresponding alphanumeric text-index card inside panel access door

PART 3 - EXECUTION

3.01 MOUNTING

- A. Flush Mounted Panelboards and Terminal Cabinets shall be securely fastened to at least two studs or structural members. Trim shall be flush with finished surface.
 - 1. Panels and cabinets installed flush (recess or semi-recess) into fire rated or smoke rated walls. The wall recess shall be fully wrapped inside the recess with fire/smoke rated materials. The wrap-materials shall provide the same fire and/or smoke protection rating as the respective wall.

- B. Surface Mounted Panels and Terminal Cabinets shall be secured to walls by means of preformed galvanized steel channels securely fastened to at least two studs or structural members.
- C. Panelboards and Terminal Cabinets shall be installed to insure the top circuit protective device (including top compartment control devices) are not more than 6-feet-6-inches above finish floor in front of the panel and the bottom device is a minimum of 12-inches above the floor. Manufacturer shall specifically indicate on Shop Drawing submittals each panel where these conditions cannot be met.

3.02 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

- A. Provide a red and white Bakelite nameplate with ½-inch high letters in each 277/480 volt panel fastened to face of dead-front plate, to read: "DANGER 480 (or as applicable) VOLTS KEEP OUT AUTHORIZED PERSONNEL ONLY".
- B. Manufacturer shall stencil the panel/cabinet number identification on the inside of door to correspond with the designation on the Drawings.
- C. Identification plates and numbers shall be attached with screws or twist lock fasteners. Adhesive attachment of any kind shall not be used.

3.03 SPARE CONDUITS (ADDITIONAL REQUIREMENTS)

Provide three 1-inch conduit only stubs from each panel and terminal cabinet into accessible ceiling space. Where floor level below panel or terminal cabinet is accessible, also provide an additional three 1-inch conduit only stubs into accessible floor space.

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SECTION 26 24 19 MOTOR CONTROL EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

- A. Work Included: All labor, materials, appliances, tools, equipment necessary for, and incidental to, performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
 - 1. Examine all other Specification Sections and Drawings for related work required to be included as work under Division 26.
 - 2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. Provide Schematic "Ladder-Type" Logic Control Wiring Diagrams and "point-to-point" control wiring diagrams showing the control system for HVAC equipment and other electrical equipment.
- B. Provide Nameplate Engraving Schedule.
- C. Submit Full-Scale Time/Current Transparencies on log/log paper for all fuses, circuit breakers, ground fault system devices, and relays.
- D. Short Circuit, Coordination and Arc-Flash
 - Perform and submit engineered settings for each equipment location, fuse and adjustable circuit breaker device, showing the correct time and current settings to provide the coordination within the limits of the specified equipment, per the latest applicable standards of IEEE and ANSI. Provide electrical system short circuit fault analysis, both 3-phase line-to-line and 1-phase line-to-ground calculations as part of the Coordination Analysis recommendations. Provide Electric Arc-Flash calculations as part of the Coordination Analysis recommendations.
 - 2. The information shall be submitted in both tabular form and on time current log-log graph paper, with an Engineering Narrative. Written narrative describing data, assumptions, analysis of results and prioritized recommendations, six copies.
 - 3. The goal is to minimize an unexpected but necessary electrical system outage and Personnel exposure to the smallest extent possible within the fault occurrence location, using the specified Contract Equipment. Shall comply with, but not limited to:
 - a. IEEE-242, Recommended Practices for Protection and Coordination of Industrial and Commercial Distribution.
 - b. IEEE-399, Recommended Practice for Industrial and Commercial Power System Analysis.
 - c. IEEE-1584, Guide to Performing Arc-Flash Hazard Calculations.
 - d. CEC

4. Electrical equipment including switchgear, switchboards, electric panels and control panels, motor control centers, combination motor starters, transformers, disconnects, etc., shall each be labeled by the Manufacturer with "Electrical-Arc-Flash" warning signs. The signs shall explain a hazard to personnel may exist if the equipment is worked on while energized or operated by personnel while energized. The sign shall instruct personnel to wear the correct Protective Equipment/clothing (PPE) when working "Live", or operating "Live" electrical equipment and circuits.

PART 2 - PRODUCTS

2.01 GENERAL

A. Division 24 HVAC/Plumbing

Refer to Division 26 Mechanical and Plumbing Contract Documents and Shop Drawings for Additional Electrical Work and Material Requirements.

- 1. Provide all control devices including timeswitches, relays, auxiliary contacts, voltage transformers, and interlocks.
- 2. Provide all raceways, conduit wire, circuits, outlets, and interconnections of starters as required for HVAC and Plumbing systems.
- B. Special Considerations
 - 1. Mount all auxiliary relays and timeswitches in an isolated compartment inside motor control equipment unless otherwise indicated.
 - 2. Whether or not shown on Mechanical and Plumbing Contract Documents and/or control schedules, where motors are controlled by external devices (i.e., thermostats, relays, float or pressure switches, etc.) or interlocked with other motors, provide each magnetic motor starter with a "Hand-Off-Auto" selector switch in starter cover. Other magnetic motor starters provide a "Start-Stop" push-button station in starter cover.
 - 3. Motor starters, motor controllers and circuit feeder tap devices for motor circuits shall be rated and labeled for control of all electric motor design types A, B, C, D, and E pursuant to the Requirements of the NEC
- C. Seismic Earthquake and Wind Loading Withstand, Testing and Certification (Additional Requirements)
 - 1. The complete motor control equipment assembly; including circuit protection devices, motor controllers, housings/enclosures, accessories, supports/anchors etc., shall be designed, manufactured and tested.
 - a. Wind loading for outdoor locations.
 - b. Earthquake Seismic Withstand and CBC Seismic Withstand all indoor and all outdoor equipment locations.
 - 2. Shall withstand, survive and maintain continuous non-interrupted energized operation (running) during the seismic event occurrences. Continued normal energized operation after the wind event and seismic event occurrences have abated.
 - 3. Shall include demonstrations of successful operation and run test after completion of seismic event shake-table simulation.

- 4. Provide three dimensional finite element analysis demonstrating anchorage and operational withstand of wind loading not less than as follows and as required by AHJ:
 - a. 110MPH-West Coast States USA and Hawaii, per ASCE/SEI 7-10.
- 5. Acceptance Test Seismic qualification of proposed motor control equipment shall employ triple axis shake-table simulation of the Required Response Spectrum (RRS) seismic event motion, certified and approved by the AHJ.
- 6. Seismic test shall be performed by a third party independent Test Laboratory. Wind Analysis and Seismic Testing and Reports shall be certified, signed and "stamped" by PE Professional Engineer licensed and in good standing in the State, Civil Engineer or Structural Engineer.
- D. Motor Control Equipment as Manufactured by:
 - 1. General Electric; or Square D; or Cutler-Hammer; or Allen-Bradley; or Siemens.

2.02 MANUAL MOTOR STARTERS

- A. Provide flush or surface mounting manual motor starters with number of poles and size of thermal overload heaters as required for the motor being controlled (equipped with overload heaters, one for each motor lead). Back boxes shall be supplied with all flush mounting starters, whether they are toggle type requiring only a 4-inch square outlet box or the larger type requiring a special box. Provide cover designed to accept the particular unit.
- B. Unless otherwise noted on the Drawings, all manual starters for single phase motors, smaller than 1 h.p. shall be the compact toggle type. Manual starters for all single phase motors, 1 to 5 h.p. and all three phase motors up to 5 h.p. shall be the heavy-duty type.
- C. Where Manual Motor Starter is shown with pilot light, the pilot light shall be installed in a separate outlet box adjacent to the starter outlet with engraved nameplate to indicate function of pilot light. Pilot lights shall be push-to-test style.

2.03 FEEDER TAP DEVICES

- A. General
 - 1. Feeder tap devices shall be coordinated with the motor starter unit's electrical and mechanical characteristics. Operating handle shall be accessible and operable from the unit front with positive visible indication of the on, off and tripped operating handle positions.
 - 2. Feeder tap devices shall have a short circuit and motor locked rotor interrupting capacity, series rated with the respective motor starter of not less than the maximum available fault current at the device as indicated on the Drawings, but in no case shall the interrupting capacity be less than 30,000 amp symmetrical interrupting for 480/277 volt devices and 42,000 amp symmetrical for 240 volt or 208/120 volt devices. Provide four key interlocking and padlock-off devices on each feeder tap unit.
 - 3. Feeder tap device (i.e. circuit breakers, switch and fuse or motor circuit protector) shall be as indicated on the Drawings. Where feeder tap device type is not indicated, provide switch and fuse type device.
 - 4. Circuit breakers shall provide time overcurrent and instantaneous circuit protection. Motor circuit protectors shall provide instantaneous magnetic only circuit protection.

Feeder tap devices shall be UL component listed and rated with the respective motor starters.

- 5. Feeder tap device shall provide an auxiliary contact to automatically connect and disconnect control power when the feeder tap device is open, tripped or closed.
- 6. Provide an auxiliary contact on feeder tap device for remote status (on-off) signaling and monitoring.
- 7. Provide conductor lugs to accept conductor temperature rating, sizes, and quantities shown on the Drawings.
- B. Feeder Tap Devices shall be as indicated on the Drawings:
 - 1. Circuit breaker feeder tap
 - a. Circuit breakers shall employ a stored energy, quick make-quick break, and trip free operating system on each phase, with common trip. Breakers shall comply with UL 489 and 1087, NEMA AB1 AB3 latest revisions. Circuit breakers noted as "100%" on the Drawings shall be rated to carry the breaker full rated (100%) ampere load continuously.
 - b. Protection performance Requirements for circuit breakers conforming to one or more of the following applications:
 - 600 amp or larger frame size.
 - Larger than 400 amp trip.
 - Service entrance motor control center.
 - Noted as main circuit breakers on the Drawings.
 - 1) Circuit breaker shall employ current sensors and solid state static digital electronic automatic trip system. Three phase, or single-phase operation as noted on the Drawings. Current carrying components shall be completely isolated from the static trip units. The trip unit shall be independent of external power sources. Circuit breaker shall be UL listed for reverse connection.
 - 2) Circuit breaker solid state trip control functions shall provide the following time /current curve shaping field adjustable features;
 - a) Adjustable ampere setting to vary the long-time continuous current carrying capacity, minimum range of 80% through 100% of full load trip rating.
 - Adjustable long-time delay setting to vary the time the breaker will trip under sustained overload conditions. Minimum of three settings, "minimum - intermediate - maximum".
 - c) Adjustable short-time pickup to vary the level of high current the breaker can carry for short periods of time, minimum range of 2 times through 8 times of ampere setting.
 - d) Adjustable short time delay to vary the time of the short-time pickup. Minimum of three settings "minimum-intermediate-maximum".
 - e) Short time "I²t" switch to allow a current-squared multiplied by time ramp function in the short-time system. Two position setting "in-out".
 - Adjustable instantaneous pickup to vary the breaker ampere setting for immediate (instantaneous) interruption of severe overloads (short circuits). Adjustable minimum range of 2.0 times through 13 times of

circuit breaker ampere sensor rating. Circuit breaker shall incorporate adjustable instantaneous trip settings to allow coordinated instantaneous trip settings when protecting energy efficient motors.

- g) Individual fault trip indicators shall provide local indication on the breaker for overload and short circuit (and ground fault where applicable) conditions.
- h) Provide one Manufacturer standard test set for solid state trip circuit breakers.
- c. Protection Performance Requirements for circuit breakers conforming to one or more of the following applications:
 - Smaller than 600 amp frame size.
 - 400 ampere and smaller trip.
 - Larger than 100 amp frame size.
 - Larger than 100 amp trip.
 - 1) Circuit breaker shall employ current sensors and solid-state static digital electronic automatic trip system. Time/current curve shaping field adjustable features.
 - 2) Solid state trip breakers shall conform to the Requirements described above for solid state breakers larger than 400 amp trip. However, only the following field adjustments are required;
 - a) Ampere setting adjustable minimum range of 80% through 100% of full load trip rating.
 - b) Short time pickup adjustable minimum range of 2 times through 8 times of the ampere setting.
 - c) Adjustable instantaneous trip (circuit breaker shall incorporate adjustable instantaneous trip settings to allow coordinated instantaneous trip settings when protecting energy efficient motors).
- d. Performance Requirements for circuit breakers conforming to the following applications:
 - 100 amp frame size and smaller.
 - 100 amp and smaller trip.
 - Circuit breaker shall be fixed or adjustable instantaneous trip with thermalmagnetic trip or with solid-state static digital electronic automatic time/over current automatic trip depending on the results of the Coordination Study.
- e. Current Limiting Circuit Breakers (CLCB):
 - 1) Performance Requirements for circuit breakers conforming to the following applications:
 - 600 amp and smaller trip and identified as Current Limiting (CLCB) on the Drawings.
 - a) Current Limiting Circuit Breakers shall be supplied in unit molded case construction and shall consist of a common trip, thermal-magnetic or solid state trip circuit breaker with an independently operating limiter section in series with each pole.
 - b) The conventional breaker section shall have an over center, trip-free, toggle-type mechanism with quick-make, quick-break action and positive handle indication. A button shall be provided on the cover for

mechanically tripping the circuit breaker. The current limiting breaker shall have permanent trip units containing solid state static digital trip or individual thermal and magnetic trip elements in each pole. Calibrated for 40 degrees C ambient temperature. The limiter section shall consist of three current limiting elements electrically coordinated with the conventional circuit breaker trip elements. The contacts of the limiter section shall be electro-magnetically and electro-dynamically opened and held open until interruption is complete.

- c) Current and Energy Limitations: On high-level fault currents the limiter portion of the circuit breaker shall operate to limit the rise of fault current. Integral resistance shall be introduced into the faulted circuit to dissipate and limit let-through energy and to provide a voltage transient-free interruption at near unity power factor. The Let-through short circuit fault current and energy levels shall be less than that permitted by Underwriters Laboratories to a Value less than I²t of a half cycle wave of the symmetrical prospective current. The CLCB limiter shall limit the Asymmetrical short circuit fault current below the equipment symmetrical short circuit fault current.
- d) On fault currents below the threshold of current limitation, the thermalmagnetic breaker section shall provide conventional overload and short circuit protection.
- 2) Performance Requirements for circuit breakers conforming to the following applications:
 - Trip ratings over 600 amp Identified as Current Limiting (CLCB) on the Drawings.
 - a) Integrally fused circuit breaker integrated with solid state static digital electronic automatic trip. Combined standard circuit breaker providing overload-short circuit protection within its interrupting capacity and ON-OFF switching function and on each phase current limiters internally mounted on the load side of the circuit breaker, of such ratings that their time current limiting characteristics will coordinate with the time current tripping characteristics of the circuit breaker elements.
 - b) The coordination shall result in the interruption by the circuit breaker alone of fault level currents up to the interrupting capacity of the circuit breaker and interruption by the current limiter in conjunction with the circuit breaker of fault level currents above the interrupting capacity of the circuit breaker.
 - c) A removable cover shall be provided over the current limiter section of the integrally fused circuit breaker. The current limiter housing covers shall be interlocked with the breaker tripping mechanism to insure the breaker will trip upon removal of the cover. The cover shall be interlocked with the breaker to insure the circuit breaker cannot be turned to the ON position with the cover removed. Current limiters shall have a spring loaded plunger which, when the limiter blows, is released to actuate the circuit breaker common trip bar mechanism opening all breaker poles simultaneously.

- d) The limiters shall be individually interlocked with the breaker element tripping mechanism to insure the limiter cannot be inserted until the breaker is in the OFF position. The circuit breaker and limiters shall be interlocked to insure the circuit breaker cannot be closed if a limiter is either missing or has blown.
- e) Fuse limiters shall be individually removable from the circuit breaker housing.
- f) The circuit breaker shall be ambient temperature compensating. The circuit breaker shall be provided with thermal magnetic or solid state static digital trip (depending on the coordination study).
- g) The integrally fused circuit breaker shall be capable of interrupting available short circuit currents up to 200,000 RMS symmetrical amperes at voltage up to 600 VAC.
- h) Ratings, clearances and performance of the integrally fused circuit breaker shall be in accordance with applicable Standards of NEMA, IEEE and ASA.
- 2. Switch and fuse feeder tap:
 - a. Fusible Switches: Quick-make, quick-break type with rejection clips for use with Class "R" fuses. Switches shall be removable from front of equipment without disturbing adjacent units or equipment bus structure.
 - b. Fuses shall be time delay current limiting types, UL Class RK-1 for motor circuits unless otherwise indicated on the Drawings. Provide one spare set of fuses of each size and type in each switchboard.
 - c. Provide auxiliary contacts on switch for remote status (on-off) signaling and monitoring.

2.04 MOTOR STARTERS - 50/60HZ AC INDUCTION ELECTRIC MOTORS

- A. General
 - 1. Motor starters shall be horsepower rated for the motor connected to the starter, air insulated, with NEMA rating.
 - 2. Motor starter coils and controls shall be designed to operate on the control voltage indicated on the Control Diagrams and Specifications. The motor starters shall reliably pick-up and seal-in at 80% through 110% of their coil control voltage.
 - 3. Under voltage release for motor starter coil circuit shall automatically drop motor starter off the line when the line voltage drops below normal operating voltage. Under voltage release shall be field adjustable 80% to 95% of nominal voltage with field adjustable dropout delay 0.1 to 3 seconds minimum for starters larger than NEMA Size 1. The under voltage release shall reset automatically when line voltage level returns too normal. The reset time delay shall be a 0.1 to 60-second field adjustable time range for starters larger than NEMA Size 1.
 - 4. Each motor starter control circuit shall be independently fused.
 - 5. Three phase motor starters controlling three phase motors, five horsepower and larger shall provide integral motor single phasing protection. The starter shall automatically "open", turn off electrical power to the connected motor in the event of the loss of one or more circuit phases, lock out and require manual resetting of the single phase protection to restart the magnetic motor starter. Provide single-phase annunciator.

Provide adjustable time delay, minimum range 0.1 to 3 seconds for initiating single phase shut down.

- 6. Starter units shall be equipped with individual control power transformers (grounded type) with secondary and primary control power fuses. One secondary lead shall be grounded in the unit.
 - a. The unit disconnect shall be equipped with a normally open contact to isolate the control circuit from the source when the controller disconnect is open.
 - b. The control power transformer VA load rating shall include the motor starter, additional internal and external control devices connected to the motor starter, to insure control power voltage drop does not exceed 5% of nominal rating.
- 7. Starter units shall be equipped with three motor overload elements, one for each phase, with automatic lockout, external overload indicating flag/pilot light and manual reset external push-button. Trip rating characteristics of the overload elements shall be as recommended by Motor Manufacturer.
 - a. Motor overload protection relays shall be bi-metal (non-melting) "heater-element" type or solid-state type, for motor starters NEMA Size 1 and smaller.
 - b. Motor overload protection relays for motor starters larger than NEMA Size 1 shall be solid-state type.
- 8. Pilot light indicators shall be provided with "Push-to-Test" feature. Provide a capacitor in parallel with the starters stop-start control relay circuit, to permit the motor starter control circuit to "drop-out" (turn-off) and prevent "capacitive-holding" (capacitive coupling) on control circuits with "long" (excessive distance) control circuit wiring.
- 9. Each starter shall be equipped with a minimum of one normally open and one normally closed auxiliary spare contact. Provide additional auxiliary control contacts for interlocking with system control circuits as indicated on the Drawings and specifications. Auxiliary contacts shall be field convertible for normally open or normally closed operation. Contacts shall be rated not less than 10-amp at 120 volt 60Hz, AC, but in no case shall the auxiliary contacts be rated for less ampere or lower voltage than the connected control circuit.
- 10. Motor starters larger than NEMA Size 1, provide a running time meter 0 to 99999 hours minimum range, and an operations counter 0 to 9999 meter minimum operations start count range. Meters shall be field resettable with maintained memory during power outages of any length.
- 11. Minimum starter size shall be NEMA 1, but in no case less than indicated on the Drawings or Specifications.
- 12. Verify the exact motor connection Requirements; motor locked rotor/full load current, NEMA Code letter and voltage characteristics with the supplier of each motor. Motor starters shall comply with the identified Requirements.
- 13. Each starter shall be equipped with "Hand-off-Auto" switch or stop-start push-button as required.
- 14. An auxiliary relay contact for remote alarm annunciation shall provide common trouble annunciation for any of the starter automatic protection systems. The alarm contact shall automatically reset when the starter is reset.

- 15. Provide each motor starter main "start" control relay or starter coil as applicable, with a magnetic coil auxiliary control "pilot" relay. The contacts of the auxiliary control relay shall directly control the starting, running and stopping control voltage of the motor starter main control coil circuit. The coil of the auxiliary relay shall condition and match the voltage and in rush of each motor starter to the Requirements of the incoming control circuit.
- 16. Provide a transient surge suppressor for each motor starter coil, to limit voltage transients induced by the motor starter coil operation and to protect the motor starting circuit from voltage transients.
- 17. Motor starters connected to engine generator emergency power supply source (either direct connection or connection through an automatic transfer switch) shall each be provided with a field adjustable (0.1 180 seconds) "start" (on delay) time delay, to provide "staggered" sequenced starting of the connected motor load.
- B. Full Voltage Non Reversing (FVNR), Unless Noted Otherwise
 - 1. Across the line full voltage magnetic electromechanical motor starter.
 - 2. Provide FVNR motor starter for motor sizes through 50-horsepower (241 to 600 volt) and through 30-horsepower (240 volt and under) where the motor is connected to normal power utility source, unless noted otherwise on Drawings.
- C. Two Speed Motor Starters
 - 1. The two speed motor starters shall be compatible with the connected motor and shall provide automatic two speed control of separate high speed and low speed motor winding or consequent pole two speed motors as applicable. The starters shall be constant horsepower, constant torque or variable torque as applicable for the motor connected to the starter.
 - 2. Low speed compelling control shall compel the motor starter to always start the motor on low speed before switching to high speed. Compelling control shall be manual switch selectable as either "in" or "out" (bypass) of the motor control circuits.
- D. Reduced Voltage Non-Reversing (RVNR)
 - 1. General
 - a. The reduced voltage starter shall reduce both motor starting current and motor starting torque.
 - b. Reduced voltage starters shall be closed transition types.
 - c. Provide RVNR motor starters for motors larger than 30-horsepower (240 volt and below) and larger than 50-horsepower (over 240 volts), reduced voltage type (Where the motor starter circuit is connected to engine generator emergency power source for motors larger than five horsepower, provide each respective motor with RVNR reduced voltage motor starters).
 - d. Starters shall provide field adjustable time periods for acceleration (reduced voltage) and transition (transfer to full voltage) modes, with failure to transfer lockouts and pilot light annunciators. Adjustable time range shall be 0.1 to 15 seconds.
 - e. Duty cycle NEMA rated medium duty, starters shall provide for not less than one 15-second duration starter operation in each 4-minute interval for a 1-hour period, followed by a cool down rest period of 2-hours before the duty cycle is repeated. Provide automatic temperature lockout to prevent exceeding starter duty cycle.

- f. Reduced Voltage Non-Reversing RVNR Motor starters shall be types described in the following paragraphs.
- 2. Autotransformer type reduced voltage starter
 - a. Auto transformers on each phase with field adjustable transformer voltage taps for 50%, 65%, and 80% motor terminal starting voltages.
 - b. Magnetic electromechanical motor contactor type.

2.05 COMBINATION MOTOR STARTERS

- A. General
 - 1. Combination motor starters shall consist of a feeder tap device, motor starter and enclosure. Voltage and amperage rating as indicated on Drawings.
 - 2. Combination motor starter shall not be less than NEMA Size 1, but in no case less than indicated on the Drawings.
 - 3. Unit shall be self-contained floor standing, wall mounted NEMA 1 enclosures or as indicated on the Drawings. Constructed, tested and listed in accordance with NEMA, ANSI and UL Standards.
 - 4. Combination motor starters as manufactured by General Electric, Westinghouse, Square D, Cutler Hammer or equal.
 - 5. Provide incoming line and outgoing load terminations, size and capacity to match connections shown.
- B. Construction
 - 1. NEMA styles metal enclosed, with full height hinged access door. 12-gauge welded frame members and 14 gauge panel members. All parts shall be removable and accessible from the front for ease of maintenance and rearrangement.
 - 2. Provide removable lifting points and permanent anchor mounting points on the enclosure.
 - 3. Hinged doors shall be mounted with removable pin hinges and secured with quarter turn indicating fasteners. A door interlock with manual defeat override shall prevent access to unit interior when the feeder tap device is in the "on" position.
 - 4. Each metal surface shall be phosphatizing prime rust inhibitor painted and Baked Enamel Finish Painted Manufacturer's standard color.
- C. Combination Motor Starter Short Circuit Coordination Protection
 - 1. The combination motor starter shall be constructed and tested to comply with the following Requirements.
 - a. Type 1 Coordination:
 - 1) Under short circuit conditions the contactor/motor starter shall cause no danger to persons or installation. Continued re-use shall be permitted after service, repair or replacement of parts.
 - b. Type 2 Coordination:
 - Under short circuit conditions the contactor/motor starter shall cause no danger to persons or installation. Continued re-use shall be permitted without requiring any service, repair or replacement of parts.

- Motor starters shall also comply with International Electromechanical Committee (IEC) Type-2 short circuit protection, as recommended by the Manufacturer's <u>published</u> protection tables and as certified by UL.
- D. Energy Efficient Motor Protection
 - 1. Where a combination motor starter is connected to a high efficiency motor, provide one of the following modifications to the starters or circuit disconnects. The modification shall prevent unnecessary tripping from locked rotor high inrush motor starting current:
 - a. Circuit breaker or MCP short circuit protection Provide Circuit Breaker/MCP with adjustable magnetic current trip for high inrush motor starting current, or adjustable time delay trip for high magnetic current motor inrush damping.
 - b. Switch and fuse motor short circuit protection Provide fuses with sufficient inherent time delay to allow passage of high magnetic current inrush motor starting current.

PART 3 - EXECUTION

3.01 MOTOR CONTROL AND INDIVIDUAL COMBINATION MOTOR STARTERS

- A. Install Motor Control Equipment in accordance with Manufacturer's written instructions and applicable portions of NEMA "Standards of Installations" for switchboards and motor control centers and individual motor starters.
- B. Bolt Motor Control Equipment to floor and wall where wall exists. Where units are free standing provide preformed steel channel or angle iron bracing to nearest wall or building structural member. Motor control equipment anchoring shall be designed for a 1.0 gravity lateral acceleration of the equipment. Submit structural calculation and details.

3.02 IDENTIFICATION

- A. Provide a red and white bake lite nameplate with ½-inch high letters fastened to face of deadfront plate, to read: "DANGER 480 (actual volts) VOLTS, KEEP OUT, AUTHORIZED PERSONNEL ONLY".
- B. Manufacturer shall stencil the panel number and name of the connected motor circuit on each device and equipment section to correspond to identification on the Drawing.
- C. Identification Plates and Numbers shall be attached with screws or twist lock fasteners. Adhesive attachment of any kind as the only method of attachment shall not be used.

3.03 SETTINGS AND ADJUSTMENTS

- A. Program and Set Control Function Sequences, time delays, and protective device settings for correct system operation.
- B. Test all Timing, Control Sequences and motor rotation direction for proper operation. Correct Deficiencies and Retest until proper operation is confirmed.
- C. Refer to General Commissioning Section 01 91 13 for additional Requirements.

END OF SECTION 26 24 19 032619/212253

ABBREVIATIONS

&	AND
4	ANGLE
@	AT
Q.	CENTERLINE
Ф	DIAMETER OR ROUND
#	NUMBER
AB	ANCHOR BOLT
AC	ASPHALTIC CONCRETE
ACP	
ACT ACOUS	ACOUSTICAL TILE ACOUSTICAL
ACOUS AD	ACOUSTICAL AREA DRAIN
AD	ADHESIVE
AD.J	ADJACENT
AFF	ABOVE FINISH FLOOR
AFP	ACCORDIAN FOLDING PARTITION
AGGR	AGGREGATE
ALT	ALTERNATE
ALUM	ALUMINUM
AMP	AMPERE
ANOD	ANODIZED
APPROX	APPROXIMATELY
ARCH	ARCHITECT
ASB ASSY	ASBESTOS ASSEMBLY
A331	ASSEMIDET
BAT	BATTERY
BBD	BULLETIN BOARD
BD	BOARD
BLDG	BUILDING
BLKG	BLOCKING
BLO	BLOWER
BLR	BOILER
BLW	BELOW
BM	BEAM
BO	BOTTOM OF
BRKR	
BTU BUR	BRITISH THERMAL UNIT BUILT UP ROOFING
DUK	
CAB	CABINET
CARP	CARPET
CAT	CATALOG
СВ	CATCH BASIN
CEM	CEMENT
CF	CURB FACE
CFM	CUBIC FEET PER MINUTE
CHBD	CHALKBOARD
CHEM	CHEMICAL
CHWR	CHILLED WATER RETURN
CHWS CI	CHILLED WATER SUPPLY CAST IRON
CIR	CIRCLE
CJ	CONTROL JOINT
CL	CENTERLINE
CLG	CEILING
CLO	CLOSET
CLRM	CLASSROOM
CMT	CERAMIC MOSAIC TILE
CMU	CONCRETE MASONRY UNIT
CND	CONDUIT
CO	CLEANOUT
COL	
COMP CONC	COMPOSITION
CONC	CONFERENCE
CONN	CONNECTION
CONT	CONTINUOUS
CONTR	CONTRACTOR
COORD	COORDINATE
CORR	CORRIDOR
COV	COVER
CP	CONTROL PANEL
CR	CONDENSATE RETURN
CSWK CT	CASEWORK CERAMIC TILE
CTSK	CERAMIC TILE
CTSK	COUNTERSONK CABLE TELEVISION
CW	COLD WATER
DBL	DOUBLE
DEMO	DEMOLITION
DEPT	DEPARTMENT
DET	DETAIL
DF	
DG	DECOMPOSED GRANITE
DIA DIM	DIAMETER DIMENSION
DIM DISP.	DIMENSION DISPENSER
DISP. DIST.	DISPENSER
DIST. DIV.	DIVISION
D.L.	DEAD LOAD
DN.	DOWN
DS.	DOWN SPOUT
DWG.	DRAWING

(E)	EXISTING
EA.	EACH
E.J.	EXPANSION JOINT
ELEC.	ELECTRICAL
ELEV.	ELEVATION
EMER.	EMERGENCY
ENCL.	ENCLOSURE
ENG	ENGINEER
ENGY	ENERGY
ENTR	ENTRANCE
EP	EPOXY ENAMEL
EQ.	EQUAL
EQUIP.	EQUIPMENT
EST.	ESTIMATE
E.W.C.	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EXH	EXHAUST
EXIST.	EXISTING
EXP.	EXPANSION
EXPSD.	EXPOSED
EXT.	EXTERIOR
F	FACTORY FINISH
F.A.	FIRE ALARM
FC	FOOTCANDLE
F.D.	FLOOR DRAIN
FDC	FIRE DEPARTMENT CONNECTION
FDN	FOUNDATION
F.E.	FIRE EXTINGUISHER
F.E.C.	FIRE EXTINGUISHER CABINET
F.F.	FINISH FLOOR
F.G.	
F.H.	FIRE HYDRANT
FIN.	FINISH
F.L.	FLOW LINE
FLASH.	FLASHING
FLR.	FLOOR
FLUOR.	FLUORESCENT
F.O.	FACE OF
F.O.C.	FACE OF CONCRETE
F.O.F.	FACE OF FINISH
F.O.M.	FACE OF MASONRY
F.O.S.	FACE OF STUD
FPP	FOLDING PANEL PARTITION
FPW	FOLDING PANEL WOOD DOOR
F.R.	FIRE RETARDANT
F.R.A.	FIRE RATED ASSEMBLY
F.R.P.	FIBERGLASS REINFORCED PANEL
F.S.	FLOOR SINK
FT.	FOOT OR FEET
FTG.	FOOTING
FURR.	FURRING
FXTR	FIXTURE
G.	GAS
GA.	GAGE
GALV.	GALVANIZED
GB	GRAB BAR
G.I.	GALVANIZED IRON
GL.	GLASS
GLU.LAM.	GLUE LAMINATED
GND.	GROUND
GPM	GALLONS PER MINUTE
GR.	GRADE
GYP.	GYPSUM
0111	
H.B.	HOSE BIBB
HCN	HOLLOW CORE NATURAL FINISH
HCP	HOLLOW CORE PAINT FINISH
HDBD.	HARDBOARD
HDBD. HDR	
	HEADER HARDWARE
HDW.	
HDWD.	HARDWOOD
HGT.	HEIGHT
H.M.	HOLLOW METAL
HORIZ.	HORIZONTAL
HP	HORSEPOWER
HR.	HOUR
HTG.	HEATING
HTWR	HOT WATER RETURN
HTWS	HOT WATER SUPPLY
HVAC	HEATING, VENTILATING, AIR
	CONDITIONING
HVY	HEAVY
HW	HOT WATER
I.D.	INSIDE DIAMETER
I.E.	INVERT ELEVATION
INSUL.	INSULATION
INT.	INTERIOR
INV.	INVERT
IW	IRRIGATION WATER
JAN.	JANITOR
JCT.	JUNCTION
JT.	JOINT

KITCHEN KIT. KNOCKOUT KILOVOLT AMPERE KVA LAB. LABORATORY LAM. LAMINATED LAVATORY POUND LANDING LDG LIVE LOAD LIGHT LINOLEUM TILE FLOORING LTG LIGHTING LEVEL LVL LOUVER LVR MAINT MAINTENANCE MAN MANUAL MAS MASONRY MATL. MATERIAL MAXIMUM MAX. MCC MOTOR CONTROL CENTER MECH. MECHANICAL MED MEDIUM MEZZANINE MEZZ MFR. MANUFACTURER MANHOLE MINIMUM MIN. MIRROR MISC. MISCELLANEOUS MKR MARKER MTL. METAL MOUNTED MTD. MULLION MVBL MOVABLE NEW NATURAL NAT. NEGATIVE NEG N.I.C. NOT IN CONTRACT (NOT PART OF DSA APPROVAL) NO. NUMBER NOM. NOMINAL N.T.S. NOT TO SCALE 0.A. OVERALL 0.C. ON CENTER 0.D. OUTSIDE DIAMETER OVERFLOW DRAIN 0.F. OWNER FURNISHED-CONTRACTOR OFCI INSTALLED OFFICE OFF OFOI OWNER FURNISHED-OWNER INSTALLED OPNG. OPENING OPP. OPPOSITE OVHD OVERHEAD PART PARTITION PULL BOX PARTICLEBOARD PORTLAND CEMENT PLANTER DRAIN PERF PERFORATED PERP PERPENDICULAR PAINT EGGSHELL PAINT FLAT PAINT GLOSS PANIC HARDWARE POST INDICATOR VALVE PROPERTY LINE P.L. PLATE PLASTIC LAMINATE P.LAM. PLAS. PLASTER PLAT. PLATFORM PLBG PLUMBING POUNDS PER LINEAR FOOT PLF PLYWD. PLYWOOD PANEL POS POSITIVE PAIR PREFAB PREFABRICATED PREFIN PREFINISHED PRELIM PRELIMINARY PROJ PROJECT POUNDS PER SQUARE FOOT PSG PAINT SEMI-GLOSS POUNDS PER SQUARE INCH POLYVINYL CHLORIDE PVC QUARRY TILE QTY QUANTITY

KIP (1000 LB)

K

KO

LAV

LB.

LL

LTF

MH

MUL

(N)

PBD

PC

P.H.

PIV

PL.

PNL

PSF

PSI

Q.T.

RISER R. RAD. RADIUS ROOF DRAIN R.D. RDWD. REDWOOD REFERENCE REF. REFR. REFRIGERATOR REG. REGISTER REINFORCING REINF. REQD. REQUIRED RESIL. RESILIENT RETURN RET REV. REVERSE RFG ROOFING ROOM RM. R.O. ROUGH OPENING R.T.F. RUBBER TILE FLOORING S.B. SPLASH BLOCK SOLID CORE S.C. SCHED. SCHEDULE SOLID CORE NATURAL FINISH SCN SOLID CORE PAINT FINISH SCP SOLID CORE P.LAM FINISH SCPL STORM DRAIN S.D. SECT. SECTION SQUARE FOOT SF SHT. SHEET SIM. SIMILAR SLR SEALER SPEC. SPECIFICATIONS SUPPLY SPLY SQUARE SQ. SERVICE SINK S.SK. SST. STAINLESS STEEL STREET ST STAG STAGGERED STC SOUND TRANSMISSION CLASS STANDARD STD. STEEL STL. STAIN FINISH STN STOR STORAGE STRUCT. STRUCTURAL SURF SURFACE SUSP. SUSPENDED SV SHEET VINYL SWBD SWITCHBOARD SWGR SWITCHGEAR SWR SEWER SYM. SYMBOL SYS SYSTEM TREAD T. & B. TOP AND BOTTOM T. & G. TONGUE AND GROOVE T.C. TOP OF CURB TRENCH DRAIN TD TECH TECHNICAL TELEPHONE TEMP. TEMPERATURE TOP OF GRATE T.G. THICK THK THRES. THRESHOLD THROUGH THRU TACKBOARD TKBD TOP OF T.O. T.O.P. TOP OF PARAPET TOT TOTAL T.P. TOP OF PAVING TRNSF. TRANSFORMER TOP OF WALL TW TYP. TYPICAL UGND UNDERGROUND UNFINISHED UNFIN. U.N.O. UNLESS NOTED OTHERWISE UNDERSIDE OF STRUCTURE U.O.S. UR. URINAL UTILITY UTIL VOLT V VACUUM VAC VARIABLE AIR VOLUME VAV VINYL COMPOSITION TILE V.C.T. VERT. VERTICAL VEST. VESTIBULE VFWC VINYL FABRIC WALL COVERING WATT W W/ WITH WATER CLOSET W.C. WOOD WD. WINDOW WDW. WHSE WAREHOUSE WIND LOAD WL WELDED WLD WORKING POINT WP WATERPROOFING WPG WATER RESISTANT WR WSCT. WAINSCOT WEIGHT WT WELDED WIRE FABRIC W.W.F. XFMR TRANSFORMER

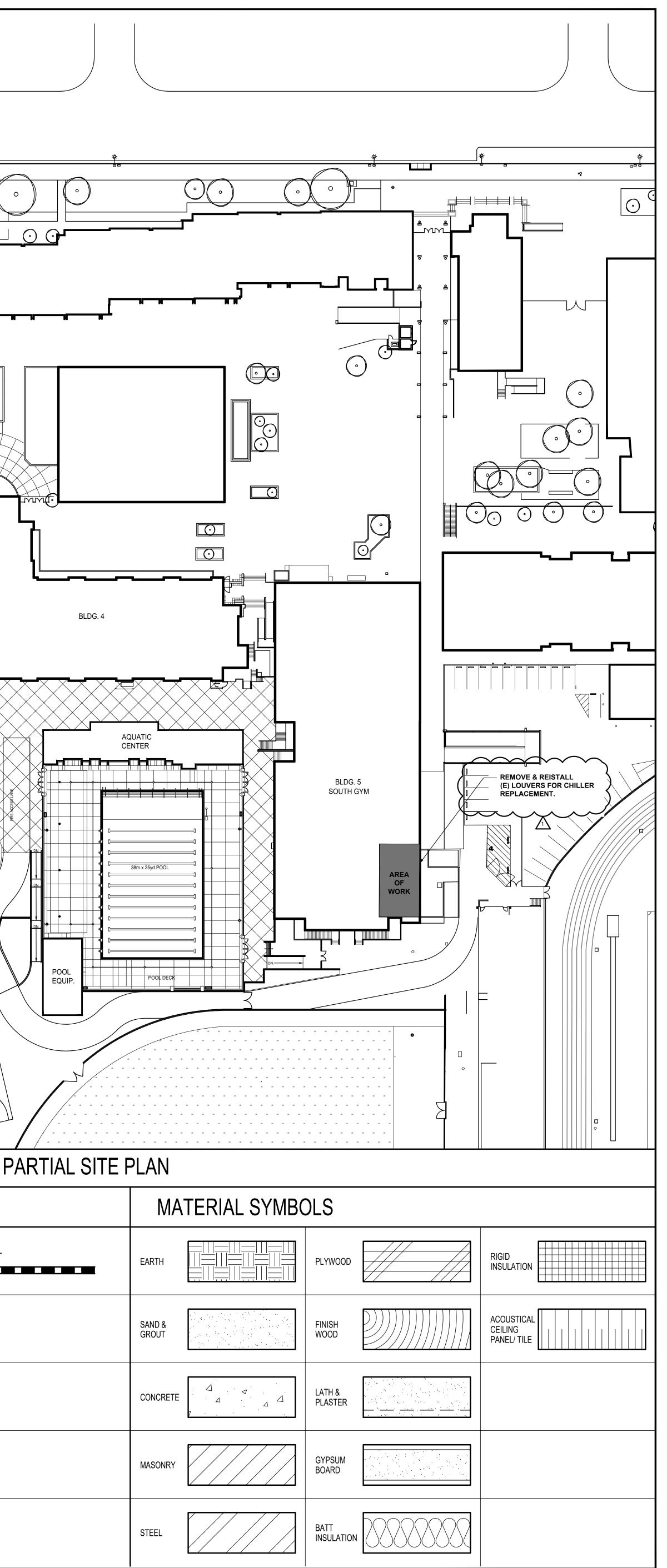
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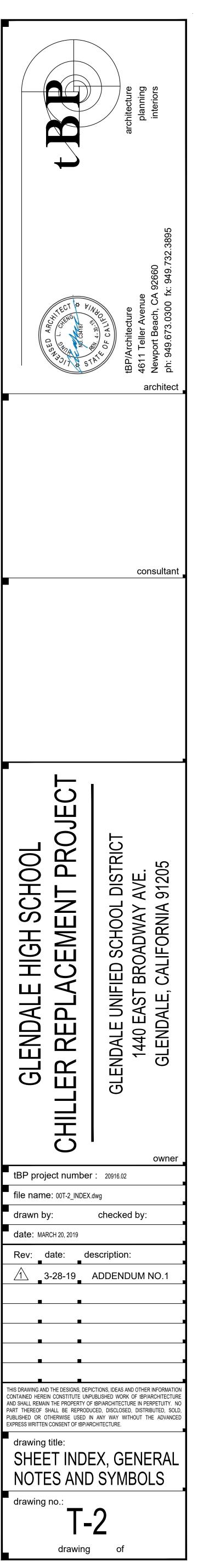
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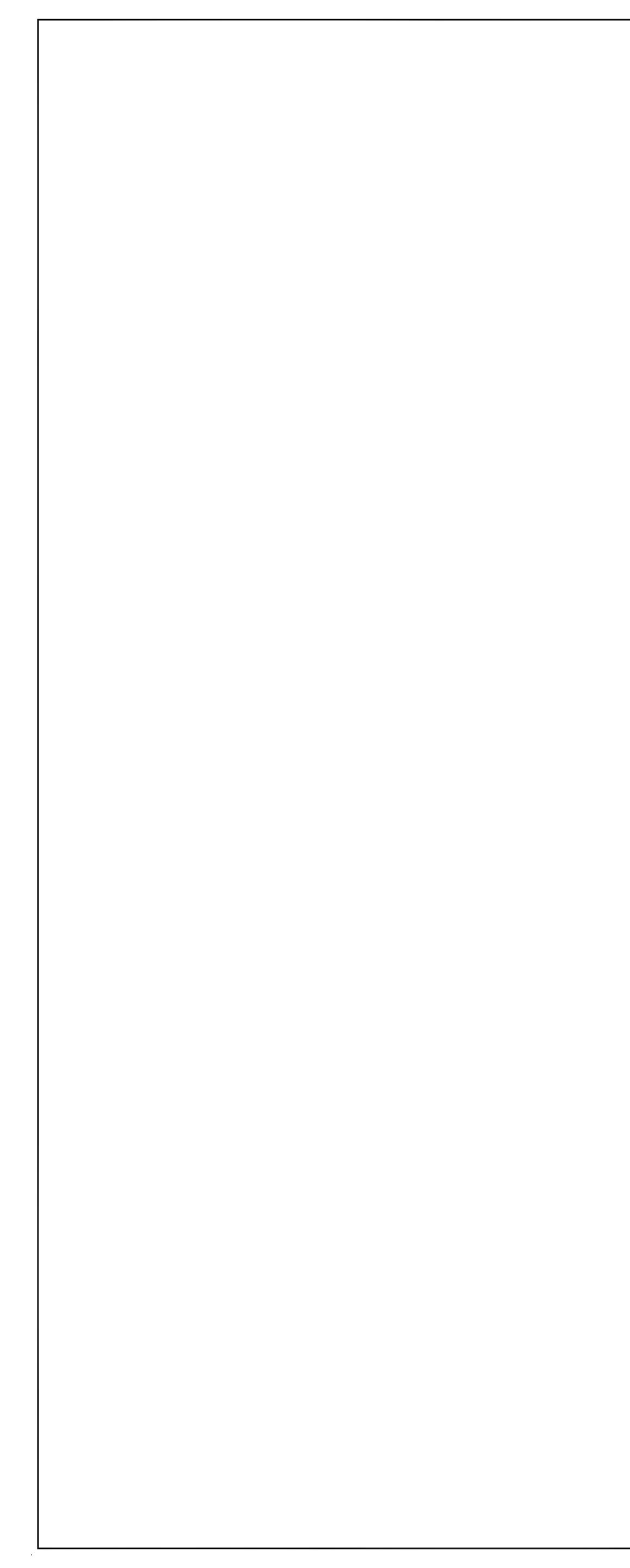
FULL BUILDING SECTION	INTERIOR ELEVATION IDENTIFICATION
A LETTER ABOVE - SECTION A-4 NUMBER BELOW - SHEET NUMBER A-4	101 2 NUMBER ABOVE - ROOM NUMBER
PARTIAL BUILDING SECTION / WALL SECTION	DOOR NUMBER IDENTIFICATION
B LETTER ABOVE - SECTION A-4 NUMBER BELOW - SHEET NUMBER	101 DOOR NUMBER - REFER TO DOOR SCHEDULE
EXTERIOR ELEVATION	WINDOW TYPE IDENTIFICATION
NUMBER ABOVE - ELEVATION NUMBER A-3 NUMBER BELOW - SHEET NUMBER	A WINDOW TYPE - REFER TO WINDOW DETAILS
DETAIL	CASEWORK IDENTIFICATION
NUMBER ABOVE - DETAIL NUMBER 3.01 NUMBER BELOW - SHEET NUMBER	CASE HEIGHT - 34 M 24 CASE DEPTH 202 W.I.C. MODEL NUMBER CASE LENGTH - 36 L COCKABLE - IF REQUIRED
ROOM IDENTIFICATION WITH INTERIOR ELEVATION REFERENCES	TOILET ACCESSORY IDENTIFICATION
NUMBER ABOVE - ROOM NUMBER 2 INTERIOR ELEVATION - (REFERENCE ONLY THOSE DRAWN) NUMBER BELOW - SHEET NUMBER	3 TOILET ROOM ACCESSORY NUMBER

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	CT-3 COLOR REFERENCE - REFER TO	LOR SCHEDULE	<u>4</u> 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4. 4	<u></u>	
WALI	_ TYPE REFERENCE	NEW	/ PARTITION WALL		

WALL TYPE - REFER TO SHEET A6-1 & A6-2 DEMOLISHED WALL _____ -----







DI	RECT-F	IRE) AB	SOF	RPTI	NC	CHIL	LER S	SCHI	EDU	LE											\sim	$\sim \sqrt{1}$	7						
SYM.	MFR. &	NOM.		-	CHIL	LED W	/ATER	-			-	HEA	TING W	ATER				C00	LING WA	TER	>		ELECT	RICAL		OPER.		REMARKS	WIRING	ANCHORAGE
0,111	MODEL	TONS	GPM	EWT °F	LWT °F	PD	FOULING	GAS INPUT	COP	GPM	EWT °F	LWT °F	PD	FOULING	GAS INPUT	COP	GPM	EWT °F	LWT °F	PD	FOULING	V	PH	Јнz	KW	WT.			DETAIL	DETAIL
CH 1	BROAD BZ100-H2	300	887	56	44	20 FT	0.0001	2648 MBH	1.36	476	131	146	23 FT	0.00025	4620 MBH	0.93	1117	85	97.6	23 FT	0.00025		3	60	6.8	18,000	1, 2		9 M5-3	10 M5-2
1. H2 HIC	GH TEMPERAT	TURE GEN	NERATO	R.																	١	\sim	$\overline{}$	/						

1. H2 HIGH TEMPERATURE GENERATOR. 2. OWNER FURNISHED, CONTRACTOR INSTALLED.

PUMP SCHEDULE														
SYM.	MFR. & MODEL	SERVICE	GPM	HEAD	TYPE	TYPE NPSHR(FT)			MOTOR			OPER.	REMARKS	
5 HVI.		GERVICE	0 M	FT. H ₂ O			HP	RPM	V	PH	HZ	WT		
P 1	BELL & GOSSETT HSC-S 4x6x14L	CHW/HHW PRIMARY	700	165	HORIZONTAL SPLIT CASE	10.9	50	1800	460	3	60	1,530	1, 2, 3, 4	
P 2	BELL & GOSSETT HSC-S 4x6x14L	CHW/HHW PRIMARY	700	165	HORIZONTAL SPLIT CASE	10.9	50	1800	460	3	60	1,530	1, 2, 3, 4	
$\left(\begin{array}{c} P \\ 2 \end{array} \right)$	BELL & GOSSETT HSC-S 4x6x14L	BLDG 5000 HHW	375	60	HORIZONTAL SPLIT CASE	4.64	10	1200	460	3	60	895	1, 2, 3, 4	

2. PREMIUM EFFICIENCY MOTOR. 3. (N)FLEX CONNECTION ON INLET AND OUTLET.

4. PROVIDE WITH VARIABLE FREQUENCY DRIVE. REFER TO VFD SCHEDULE THIS SHEET.

	VARIABLE FREQUENCY DRIVE SCHEDULE										
SYM	MFR. & MODEL #	SERVICE	MOTOR HP	ELECT		UNIT WT (LBS)	REMARKS				
	MODEL #		111	V	PH	(LDO)					
VFD 1	ABB ACH550	P 1	50	460	3	100	1, 2				
VFD 2	ABB ACH550	$\begin{pmatrix} P \\ 2 \end{pmatrix}$	50	460	3	100	1, 2				
VFD 3	ABB ACH550	$\left(\begin{array}{c} P \\ 3 \end{array} \right)$	10	460	3	100	1, 2				

1. MANUAL BYPASS. 2. NEMA 12 ENCLOSURE.

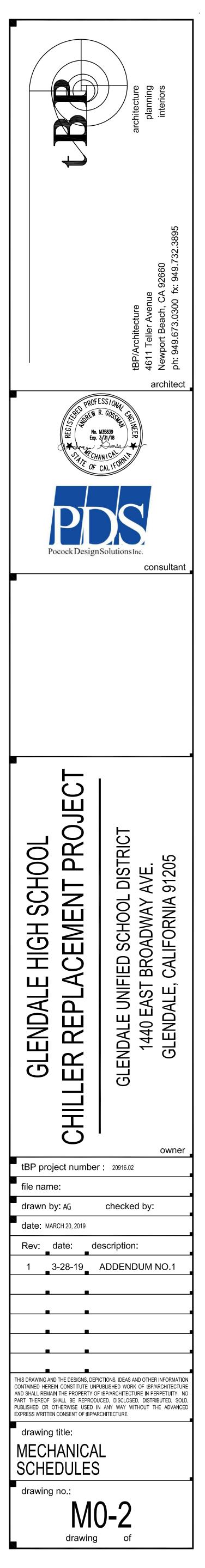
5	STEAM BOILER SCHEDULE (ADD ALTERNATE)										
SYM	MFR & MODEL #	CAPACITY (MBH) BLOWER DATA			SURFACE AREA	FLUE SIZE	FEED CONN.	STEAM CONN.	OPER. WT. (LBS)	REMARKS	
B 1											
1. LOW	1. LOW NOX SCAQMD RULE 1146.2 CERTIFIED.										

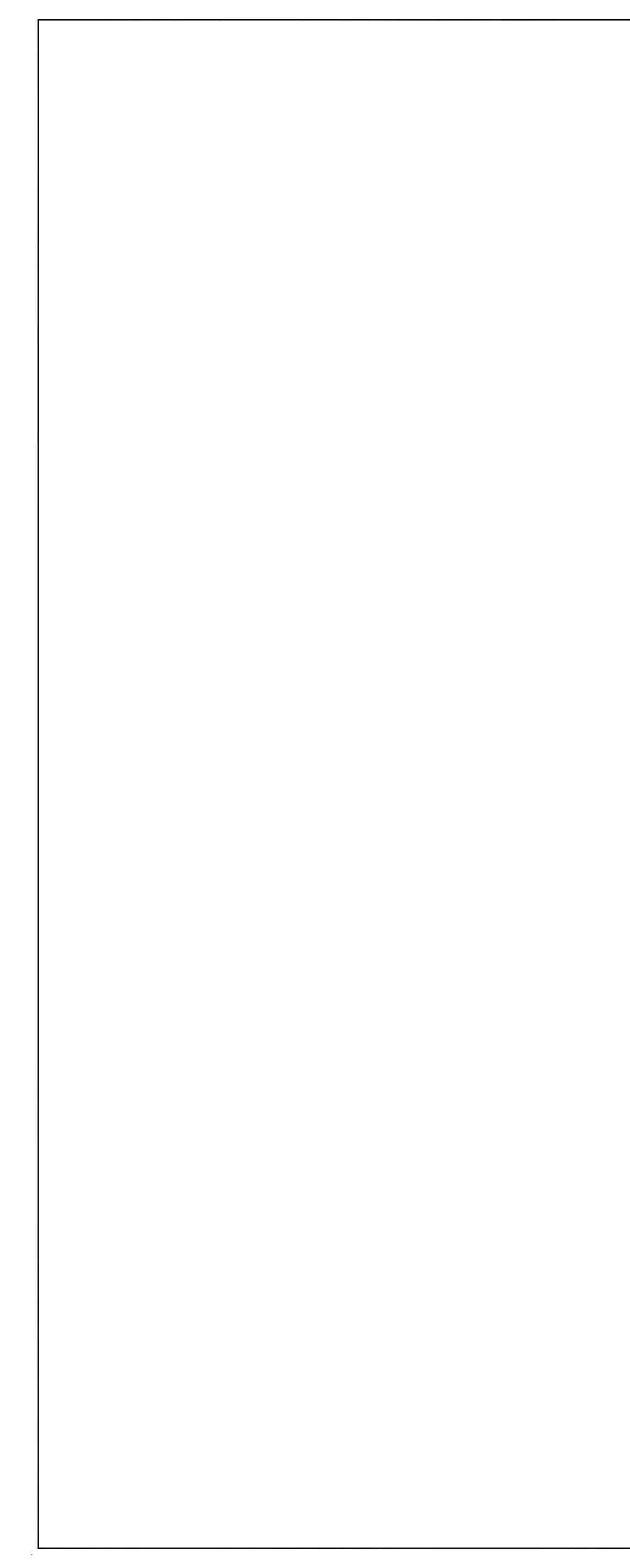
2. INDOOR RATED.

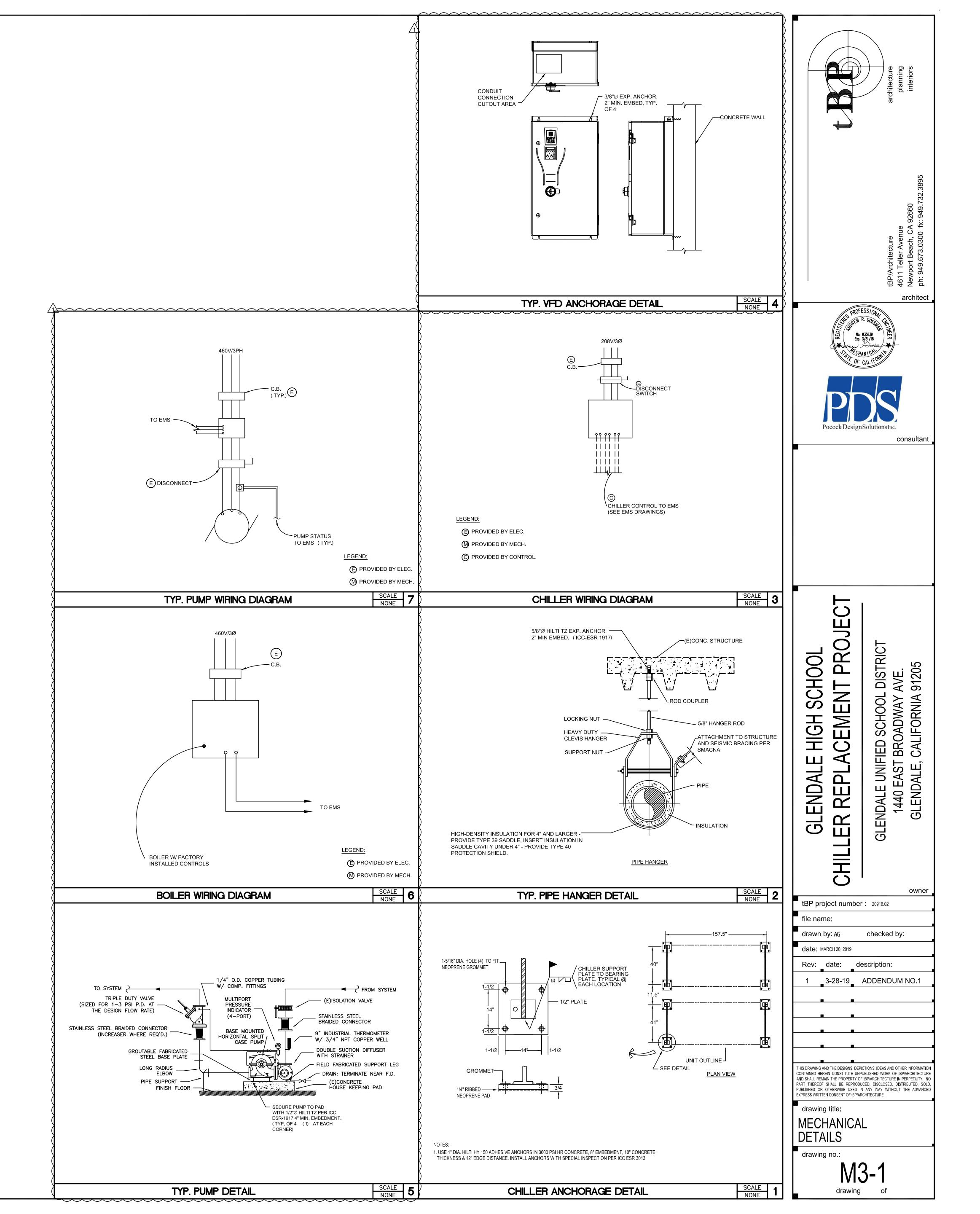
3. WEISHAUPT PLN BURNER W/BACNET INTEGRATION.

REPLACEMENT OF THE EXISTING STEAM BOILER TO BE PRICED AS AN ADD-ALTERNATE TO THE BASE PROJECT.

S	TEAM/HHW	CONVERTE	RS	CHED	ULE					
SYM	MFR. & MODEL	SERVICE	GPM	ENT. WATER	LVG. WATER	STEAM PSI	NO. PASSES	PD WATER	SURFACE AREA	OPER. WT
$\begin{pmatrix} C \\ 1 \end{pmatrix}$	BELL & GOSSETT SU-165-2	BLDG 500 HHW	375	150	188	5	2	4 FT	188	900







SEQUENCE OF OPERATIONS

MAIN LOOP PUMPS THE EQUIPMENT WILL RUN ACCORDING TO THE FOLLOWING USER SELECTABLE MODES: OFF THE EQUIPMENT WILL NOT RUN AND ALL OUTPUTS WILL REMAIN IN THEIR OFF MANUAL ON

POSITION. THE EQUIPMENT WILL RUN.

PUMP CONTROL

THE TWO CHILLED WATER PUMPS WILL OPERATE IN A LEAD/STANDBY FASHION THE LEAD PUMP WILL RUN FIRST. ON FAILURE OF THE LEAD PUMP, THE STANDBY PUMP WILL RUN AND THE LEAD PLIMP WILL TURN OFF. THE DESIGNATED LEAD PUMP WILL ROTATE WEEKLY.

ALARMS WILL BE PROVIDED AS FOLLOWS: CHILLED WATER PUMP 1 AND 2 FAILURE: COMMANDED ON, BUT THE STATUS IS OFF. RUNNING IN HAND: COMMANDED OFF, BUT THE STATUS IS ON. RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT.

CHILLED WATER DIFFERENTIAL PRESSURE CONTROL THE CONTROLLER WILL MODULATE CHILLED WATER PUMP SPEED T ΓΟ ΜΑΙΝΤΑΙΝ Α

THE VED SPEED OF BOTH PUMPS DROPS BELOW 30% (ADJ.) THE SECONDARY PUMP NORMALLY CLOSED POSITION (NO BYPASS) SHALL BE DISABLED.

ALARMS WILL BE PROVIDED AS FOLLOWS: ALARMS WILL BE PROVIDED AS FOLLOWS: HIGH CHILLED WATER DIFFERENTIAL PRESSURE: IF THE CHILLED WATER DIFFERENTIAL PRESSURE IS 25% (ADJ.) GREATER THAN SETPOINT. LOW CHILLED WATER DIFFERENTIAL PRESSURE: IF THE CHILLED WATER DIFFERENTIAL LOW CHILLED WATER DIFFERENTIAL PRESSURE: IF THE CHILLED WATER DIFFERENTIAL THE CONDENSER WATER SETPOINT THE COOLING TOWER FAN SHALL REMAIN OFF UNTIL THE CONDENSER WATER > CONDENSER WATER SUPPLY TEMPERATURE SETPOINT + 5 F.

CENTRAL PLANT THE PLANT SHALL BE OCCUPIED ANY TIME THE MAIN LOOP PUMPS ARE RUNNING. MORNING WARM-UP WHEN THE PLANT TRANSITIONS FROM AN UNOCCUPIED PERIOD TO AN OCCUPIED PERIOD THE FOLLOWING CONDITIONS MUST BE TRUE FOR MORNING WARM-UP TO START: OUTSIDE AIR TEMP < 71 $^{\circ}$ F (ADJ.)

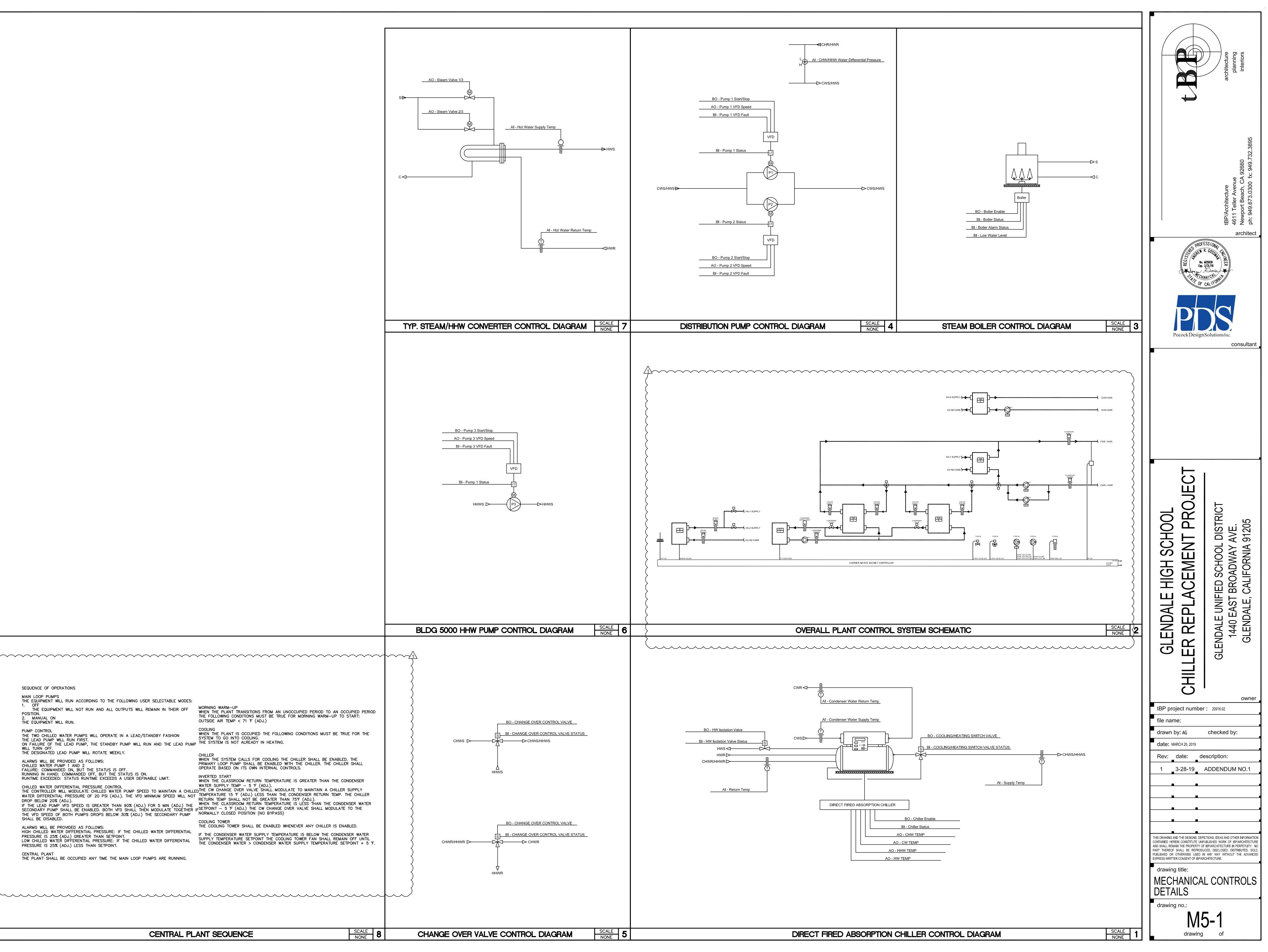
COOLING WHEN THE PLANT IS OCCUPIED THE FOLLOWING CONDITIONS MUST BE TRUE FOR THE

SYSTEM TO GO INTO COOLING. THE SYSTEM IS NOT ALREADY IN HEATING.

CHILLER WHEN THE SYSTEM CALLS FOR COOLING THE CHILLER SHALL BE ENABLED. THE PRIMARY LOOP PUMP SHALL BE ENABLED WITH THE CHILLER. THE CHILLER SHALL OPERATE BASED ON ITS OWN INTERNAL CONTROLS.

INVERTED START WHEN THE CLASSROOM RETURN TEMPERATURE IS GREATER THAN THE CONDENSER WATER SUPPLY TEMP - 5 °F (ADJ.). FDTHE CW CHANGE OVER VALVE SHALL MODULATE TO MAINTAIN A CHILLER SUPPLY WATER DIFFERENTIAL PRESSURE OF 20 PSI (ADJ.). THE VFD MINIMUM SPEED WILL NOT TEMPERATURE 15 * (ADJ.) LESS THAN THE CONDENSER RETURN TEMP. THE CHILLER THE VED SPEED OF BOTH PUMPS DROPS PELOW 20% (ADJ.). THE VED MINIMUM SPEED WILL NOT DROP BELOW 20% (ADJ.). THE VED MINIMUM SPEED WILL NOT DROP BELOW 20% (ADJ.). THE VED STATES THAN 10% (ADJ.) FOR 5 MIN (ADJ.) THE VED SPEED DATES OF ADJ.). THE VED SPEED OF BOTH PUMPS DROPS PELOW 20% (ADJ.) THE STOCK STATES OF ADJ.). THE VED SPEED OF BOTH PUMPS DROPS PELOW 20% (ADJ.) THE STOCK STATES OF ADJ.) THE VED SPEED OF BOTH PUMPS DROPS PELOW 20% (ADJ.) THE STOCK STATES OF ADJ.) THE VED SPEED OF BOTH PUMPS DROPS PELOW 20% (ADJ.) THE STOCK STATES OF ADJ.) THE VED SPEED OF BOTH PUMPS DROPS PELOW 20% (ADJ.) THE STOCK STATES OF ADJ.) THE VED SPEED OF BOTH PUMPS DROPS PELOW 20% (ADJ.) THE STOCK STATES OF ADJ.) THE VED SPEED OF BOTH PUMPS DROPS PELOW 20% (ADJ.) THE STOCK STATES OF ADJ.) (ADJ.) THE STOCK STATES OF ADJ.) THE STOCK STA

COOLING TOWER THE COOLING TOWER SHALL BE ENABLED WHENEVER ANY CHILLER IS ENABLED.





A	BBREVIATIONS		SYMBOL LIST
			(ALL SYMBOLS NOT NECESSARILY USED ON THE ALL SYMBOL DESCRIPTIONS ARE SUBJECT TO MODIFICATION A
			VERIFY EXACT LOCATIONS AND HEIGHTS OF OUTLETS WITH A ELEVATIONS PRIOR TO ROUGH-IN.
			ELEVATIONS PRIOR TO ROOGH-IN.
	AMPERES INTERRUPTING CAPACITY (SYMMETRICAL)		
	AMP FRAME, AMP TRIP AMP SWITCH, AMP FUSE		
-	CIRCUIT	<u>کم ج</u>	
	CIRCUIT BREAKER		HOME RUN TO MCA-11, INDICATES MOTOR CONTROL CENTER "MCA" CIRC WIRE AND CONDUIT.
	CONDUIT		PUSH BUTTON STATION WITH "STOP-START" PUSH BUTTONS AND RED IN
	CONDUIT ONLY		MOUNTED OUTLET BOX, +45".
	CONNECTED		CONDUIT, INSTALLED CONCEALED IN WALL OR IN CEILING SPACE.
	CURRENT LIMITING CIRCUIT BREAKER		CONDUIT, INSTALLED CONCEALED IN OR UNDER FLOOR OR BELOW GRAD
	DIAMETER		
	ENERGY MANAGEMENT CONTROL SYSTEM		CONDUIT, INSTALLED EXPOSED.
	ELECTRICAL METALLIC TUBING	<u>← ₽ + </u> □ ₽ 5 7 0	HOMERUN TO PANEL "B" FOR CIRCUITS 5, 7, 9 WITH COMMON NEUTRAL.
	ELECTRIC WATER COOLER	└─B-5,7,9	UNDERGROUND CONDUIT STUBOUT, STUB 5'-0" FROM BUILDING OR WALK
	END-OF-LINE CIRCUIT TERMINATOR	6	MOTOR CONNECTION. PROVIDE FUSED SAFETY SWITCH (DISCONNECT), I
	EXHAUST FAN	9	EQUIPMENT MOUNTED, +36". PROVIDE SWITCH AND FUSES SIZED PER EQ
	FEET	A	
	FIRE ALARM	EI	PANELBOARD, ADJACENT LINE INDICATES PANEL FRONT. ADJACENT BAL SEE DRAWING E-1 FOR PANEL SCHEDULE.
	FULL LOAD AMPS		
	GROUND FAULT INTERRUPTER	A	TERMINAL CABINET OR EQUIPMENT CABINET. ADJACENT LINE INDICATES
	GROUND		FLOOR STANDING SWITCHGEAR ADJACENT BALLOON INDICATES EQUIPM
	HAND-OFF-AUTO		E-1 FOR SINGLE LINE DIAGRAM AND/OR SCHEDULE.
	HEATING, VENTILATING AND AIR CONDITIONING		TERMINAL CABINET OR EQUIPMENT CABINET. ADJACENT LINE INDICATES
	HEIGHT, WIDTH, DEPTH, LENGTH		CIRCUIT BREAKER WITH ZERO SEQUENCE GROUND FAULT RELAY SYSTEM
	HIGH INTENSITY DISCHARGE	₩	TRANSFORMER; KVA, LINE AND LOAD VOLTAGE RATINGS AS INDICATED.
	HORSEPOWER		FUSED SAFETY SWITCH (DISCONNECT), HORSE POWER RATED. MOUNT C
	HIGH PRESSURE SODIUM		PROVIDE SWITCH AND FUSES SIZED PER EQUIPMENT MANUFACTURER RE
	INCHES		
	ISOLATED GROUND	S 2,P T a,b	SINGLE POLE TOGGLE SWITCH, ON FLUSH WALL MOUNTED OUTLET BOX, UNDER COMMON COVER PLATE. SUBSCRIPT OR SUPERSCRIPT AT SWITC
	JUNCTION BOX		
	KILOVOLT AMPERES		2 - DOUBLE POLE 3 - THREE WAY
	KILOWATT		4 - FOUR WAY P - PILOT LIGHT
	LONG CONTINUOUS LOAD		M - MANUAL MOTOR STARTERS
	LINEAR FEET		K - KEY OPERATED R - SPDT MOMENTARY CONTACT RELAY SWITCH
	LIGHTING		V - VAPOR PROOF
	MAIN CIRCUIT BREAKER		a,b,c,d, ETC MULTIPLE SWITCHES WITH IDENTIFICATION OF OUTLET CON
	MAIN LUGS ONLY	€	DUPLEX CONVENIENCE RECEPTACLE VERTICAL ON FLUSH WALL MOUNTE
	METAL HALIDE		WALL MOUNTED OUTLET BOX, TYPICAL.
	MOTOR CONTROL CENTER	Φ-	DUPLEX CONVENIENCE RECEPTACLE HORIZONTAL ON FLUSH WALL MOUI
	THOUSAND CIRCULAR MILS	П	SPLASH.
	MOTOR CIRCUIT PROTECTOR	●	DUPLEX CONVENIENCE RECEPTACLE SPLIT WIRED, ON FLUSH WALL MOU
	MOUNTED	\longrightarrow	DOUBLE DUPLEX (FOUR-PLEX) CONVENIENCE RECEPTACLE ON ONE FLUS
	MICROWAVE		+18".
	NATIONAL ELECTRIC CODE		DUPLEX CONVENIENCE RECEPTACLE WITH INTERNAL GROUND FAULT INT
	NORMALLY CLOSED		MOUNTED OUTLET BOX +18". U.N.O.
	NORMALLY OPEN		DOUBLE DUPLEX CONVENIENCE RECEPTACLE WITH INTERNAL GROUND F FLUSH WALL MOUNTED OUTLET BOX +18". U.N.O.
	NON-FUSED		
	NOT IN CONTRACT	₽ ₩	DUPLEX CONVENIENCE RECEPTACLE WITH INTERNAL GROUND FAULT INT MOUNTED OUTLET BOX, +6" ABOVE COUNTER SPLASH. U.N.O.
	NUMBER		
	OWNER FURNISHED, CONTRACTOR INSTALLED	WP ==	DUPLEX CONVENIENCE RECEPTACLE, WITH INTERNAL GROUND FAULT IN ENCLOSURE WITH HINGED DOOR, LOCK AND KEY, +18".
	OVER 600 VOLTS	WP 🗲	DUPLEX CONVENIENCE RECEPTACLE, WITH INTERNAL GROUND FAULT IN
	PHASE		OUTLET BOX WITH SPRING DOOR COVER, +18" U.N.O.
	FURNISH, INSTALL AND CONNECT	LC 🗲	DUPLEX CONVENIENCE RECEPTACLE, SPLIT WIRED, IN FLUSH IN WALL OL
	PUBLIC ADDRESS		RECEPTACLE SHALL BE CONTROLLED BY THE ROOM'S LIGHTING CONTRO
EPT	RECEPTACLE		TITLE 24 LIGHTING REQUIREMENTS.
	UNLESS NOTED OTHERWISE	J-	JUNCTION BOX, FLUSH WALL MOUNTED, +18" U.N.O.
			JUNCTION BOX CONCEALED ABOVE ACCESSIBLE CEILING OR ON EXPOSE
		<u></u>	INDICATES CONNECTION TO EQUIPMENT AS REQUIRED, TYPICAL. U.N.O.

A.F.F.

A.F.G.

AWG

A.I.C.

AMP, A

AF/AT

AS/AF

CB

C.O.

CONN

CLCB

EMCS

EMT

EWC

E-O-L

FT OR '

EF

FA

FLA

GFI

GRD

HOA

HID

HPS

IN. OR "

J-BOX

KVA

KW

LCL

L.F.

LTG, LTS

MCB

MLO

MCC

MCM

MCP

MTD

MW

NEC

NC

NO. OR #

PRIMARY

PH. OR 🛇

PROVIDE

REC, RECEPT

PA

U.N.O.

OFCI

MF

HP

IG

HVAC

H.,W.,D.,L

DIA

CIRC., CK

- (リント) INDICATES CONNECTION TO EQUIPMENT AS REQUIRED, TYPICAL. U.N.O.
- THERMOSTAT ON FLUSH WALL MOUNTED OUTLET BOX, REFER TO MECHANICAL DRAWINGS FOR HEIGHT AND LOCATION.

OL LIST ARILY USED ON THESE DRAWINGS) TO MODIFICATION AS NOTED ON THE DRAWINGS. MEP COMPONENT ANCHORAGE NOTE: S OF OUTLETS WITH ARCHITECTURAL INTERIOR RIOR TO ROUGH-IN.

CENTER "MCA" CIRCUIT NO. 11. SEE RESPECTIVE SCHEDULE FOR ITTONS AND RED INDICATING PILOT LIGHT ON FLUSH WALL

ILING SPACE. OR OR BELOW GRADE, 3/4" CONDUIT MINIMUM.

I BUILDING OR WALKWAY, CAP, MARK AND RECORD. TCH (DISCONNECT), HORSE POWER RATED, WALL MOUNTED, +45" OR USES SIZED PER EQUIPMENT MANUFACTURER REQUIREMENTS.

ONT. ADJACENT BALLOON INDICATES PANEL DESIGNATION "A", ENT LINE INDICATES CABINET FRONT.

INDICATES EQUIPMENT DESIGNATION "DBA", SEE DRAWING CENT LINE INDICATES CABINET FRONT.

FAULT RELAY SYSTEM.

NGS AS INDICATED.

ER RATED. MOUNT ON WALL +45", OR ON EQUIPMENT +36". MANUFACTURER REQUIREMENTS.

NTED OUTLET BOX, +45". INSTALL MULTIPLE SWITCHES RSCRIPT AT SWITCH SYMBOL INDICATES THE FOLLOWING:

ION OF OUTLET CONTROLLED

LUSH WALL MOUNTED OUTLET BOX, +18". STEM INDICATES

N FLUSH WALL MOUNTED OUTLET BOX, +6" ABOVE COUNTER

N FLUSH WALL MOUNTED OUTLET BOX, +18". TACLE ON ONE FLUSH WALL MOUNTED OUTLET BOX

GROUND FAULT INTERRUPTER, VERTICAL ON FLUSH WALL

NTERNAL GROUND FAULT INTERRUPTER, VERTICAL ON

GROUND FAULT INTERRUPTER, HORIZONTAL ON FLUSH WALL H. U.N.O. L GROUND FAULT INTERRUPTER, IN FLUSH WALL MOUNTED

L GROUND FAULT INTERRUPTER, ON FLUSH WALL MOUNTED

N FLUSH IN WALL OUTLET BOX, +18". HALF OF DUPLEX S LIGHTING CONTROL SYSTEM IN ACCORDANCE WITH CEC

ING OR ON EXPOSED CEILING. U.N.O.

ANCHORAGE NOTES

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 2016 C

BC,SECTIONS 1616A.1.18 THROUGH 1616A.1.26 AND ASCE7-10 CHAPTER 13,26 AND 30. 1. ALL PERMANENT EQUIPMENT AND COMPONENTS. 2. TEMPORARY OR MOVEABLE EQUIPMENT THAT IS PERMANENTLY ATTACHED (E.G. HARD WIRED) TO THE BUILDING UTILITY SERVICES SUCH AS ELECTRICITY, GAS OR WATER. 3. MOVEABLE EQUIPMENT WHICH IS STATIONED IN ONE PLACE FOR MORE THAN 8 HOURS AND HEAVIER THE 400 POUNDS ARE REQUIRED TO BE ANCHORED WITH TEMPORARY

ATTACHMENTS. THE FOLLOWING MECHANICAL AND ELECTRICAL COMPONENTS SHALL BE POSITIVELY ATTACHED TO THE STRUCTURE, BUT THE ATTACHMENT NEED NOT BE DETAILED ON THE PLAN. THESE COMPONENTS SHALL HAVE FLEXIBLE CONNECTIONS PROVIDED BETWEEN THE COMPONENT AND ASSOCIATED DUCTWORK, PIPING, AND CONDUIT. A. COMPONENTS WEIGHING LESS THAN 400 POUNDS AND HAVE A CENTER OF MASS LOCATED 4

FEET OR LESS ABOVE THE ADJACENT FLOOR OR ROOF LEVEL THAT DIRECTLY SUPPORT THE COMPONENT. B. COMPONENTS WEIGHING LESS THAN 20 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS LESS THAN 5 POUNDS PER FOOT, WHICH ARE SUSPENDED FROM ROOF OR FLOOR OR HUNG

FROM A WALL. FOR THOSE ELEMENTS THAT DO NOT REQUIRE DETAILS ON THE APPROVED DRAWINGS, THE INSTALLATION SHALL BE SUBJECT TO THE APPROVAL OF THE DESIGN PROFESSIONAL IN GENERAL RESPONSIBLE CHARGE OR STRUCTURAL ENGINEER DELEGATED RESPONSIBILITY AND THE DSA DISTRICT STRUCTURAL ENGINEER. THE PROJECT INSPECTOR WILL VERIFY THAT ALL COMPONENTS

AND EQUIPMENT AND EQUIPMENT HAVE BEEN ANCHORED IN ACCORDANCE WITH ABOVE

PIPING.DUCTWORK, AND ELECTRICAL DISTRIBUTIN SYSTEM NOTE,

PIPING, DUCTWORK, AND ELECTRICAL DISTRIBUTION SYSTEMS SHALL BE BRACED TO COMPLY WITH THE FORCES AND DISPLACEMENTS PRESCRIBED IN ASCE 7-10 SECTION 13.3 AS DEFINED IN ASCE 7-10 SECTION 13.6.5.3,13.6.7,13.6.8,AND 2016 CBC, SECTIONS 1616A. 1.24,1616A.1.25 AND 1616A.1.26.

THE METHOD OF SHOWING BRACING AND ATTACHMENTS TO THE STRUCTURE FOR THE IDENTIFIED FOR THE IDENTIFIED DISTRIBUTION SYSTEM ARE AS NOTED BELOW. WHEN BRACING AND ATTACHMENTS ARE BASED ON A PRE-APPROVED INSTALLATION GUIDE (E.G., SMACNA OR OSHPD OPM), 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 EX -OPTION 1: DETAILED ON THE APPROVED DRAWINGS WITH PROJECT SPECIFIC NOTES AND DETAILS.

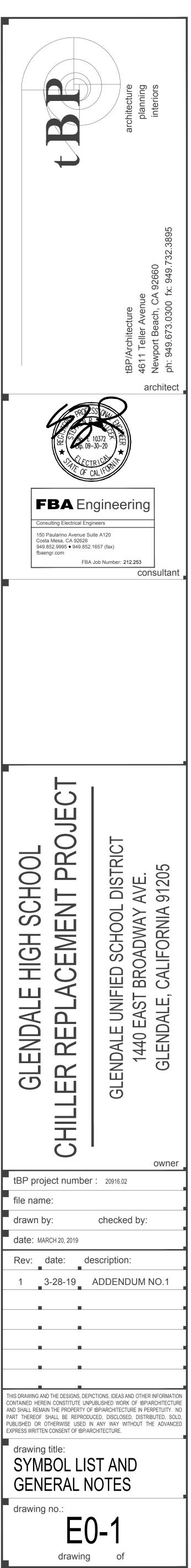
PRE-APPROVAL (OPM#) #_____

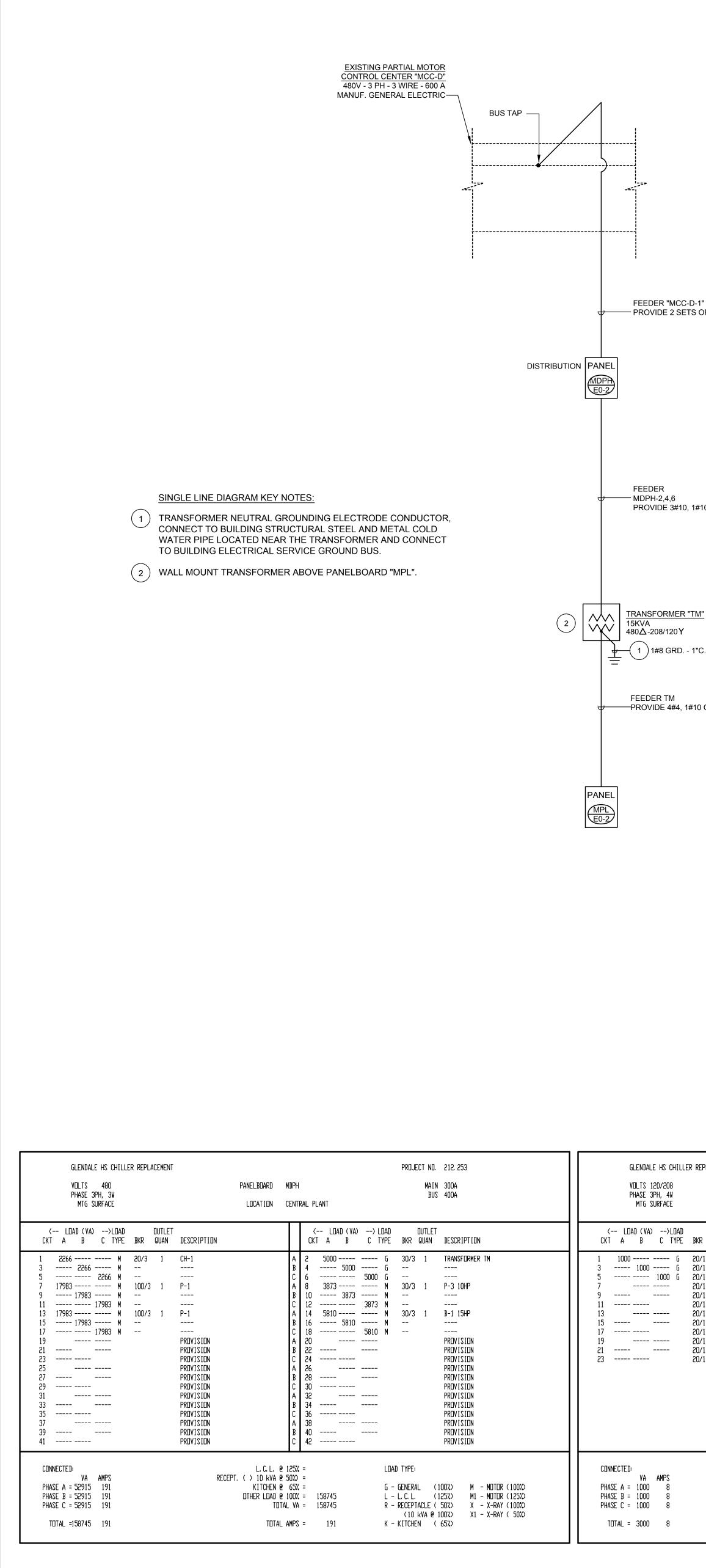
REQUIREMENTS.

MP_MD_PP_ -OPTION 3: SHALL COMPLY WITH THE SMACNA SEISMIC RESTRAINT MANUAL, OSHPD EDITION (2009) , INCLUDING ANY ADDENDA. FASTENERS AND OTHER ATTACHMENTS NOT SPECIFICALLY IDENTIFIED IN THE SMACNA SEISMIC RESTRAINT MANUAL, OSHPD EDITION, ARE DETAILED ON THE APPROVED DRAWINGS WITH PROJECT SPECIFIC NOTES AND DETAILS. THE DETAILS SHALL ACCOUNT FOR THE APPLICABLE SEISMIC HAZARD LEVEL _____ AND CONNECTION LEVEL _____ FOR THE PROJECT AND CONDITIONS.

SHEET INDEX

	•
E0-1	SYMBOL LIST AND GENERAL NOTES
E0-2	SINGLE LINE DIAGRAM AND DETAILS
E1-1	OVERALL SITE ELECTRICAL PLAN
ED2-0	ELECTRICAL DEMOLITION PLAN
E2-0	ELECTRICAL PLAN





SINGLE LINE DIAGRAM

PROVIDE 3#10, 1#10 GRD - 1"C.

)1#8 GRD. - 1"C

GLENDALE HS CHILLER REPLACEMENT PROJECT NO. 212-253 PANELBOARD MPL MAIN 60A BUS 100A LOCATION CENTRAL PLANT <-- LOAD (VA) -->LOAD OUTLET <-- LOAD (VA) --> LOAD OUTLET CKT A B C TYPE BKR QUAN DESCRIPTION CKT A B C TYPE BKR QUAN DESCRIPTION 1000 ----- G 20/1 1 B-1 -----20/1 SPARE ----- 1000 ----- G 20/1 1 CH-1 CONTROLS -----20/1 SPARE ----- 1000 G 20/1 1 DDC CONTROLS 20/1 SPARE -----20/1 -----20/1 SPAR SPARE SPARE SPARE 20/1 10 -----20/1 20/1 SPARE SPARE 12 -----20/1 SPARE SPARE 20/1 -----20/1 20/1 SPARE 16 -----20/1 SPARE SPARE 18 -----SPARE 20/1 20/1 SPARE 20/1 20 ----- 20/1 SPARE 20/1 SPARE 22 ----- 20/1 SPARE SPARE SPARE 20/1 24 -----20/1 L.C.L. @ 125% = load type: RECEPT. (> 10 kVA @ 50%) = KITCHEN @ 65/ = G - GENERAL (100%) M - MOTOR (100%) DTHER LOAD @ 100% = 3000 L – L. C. L. (125%) M1 – MOTOR (125%) R – RECEPTACLE (50%) X – X-RAY (100%) TDTAL VA = 3000 (10 kVA @ 100%) X1 - X-RAY (50%) TOTAL AMPS = 8 K – KITCHEN (65%)

EXISTING FEEDERS/CONDUCTORS TO BE REMOVED. SOLID (——) LINEWORK INDICATES PROVIDE NEW ELECTRICAL EQUIPMENT, FEEDERS, ETC. IN THIS SCOPE OF WORK.

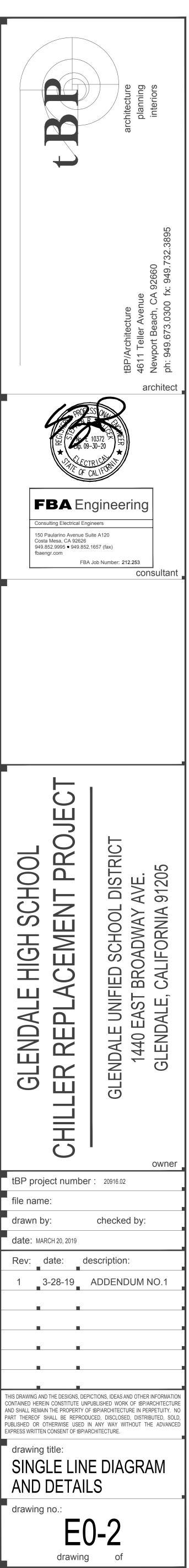
DASHED (---RE---) LINEWORK INDICATES

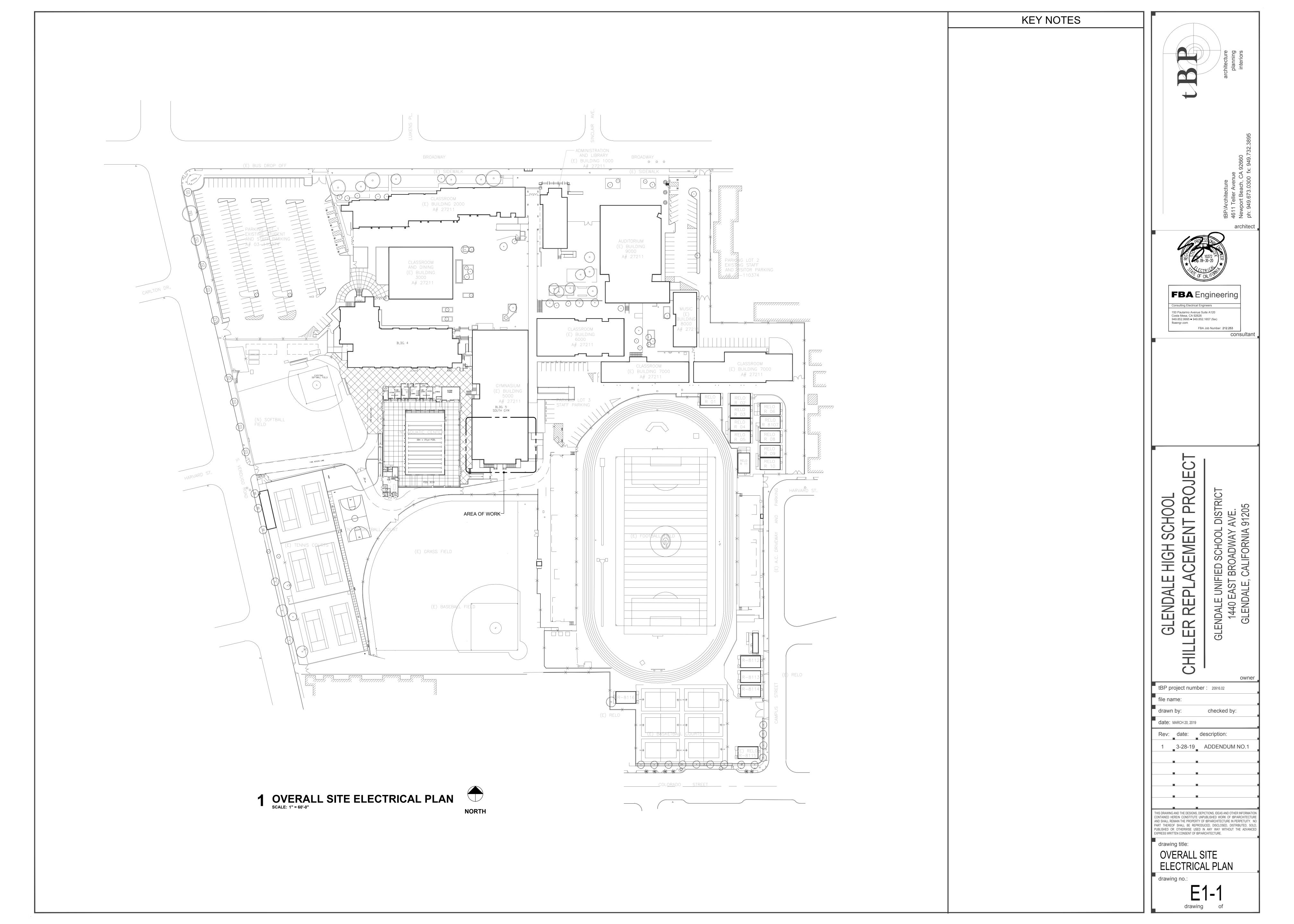
DASHED (-----) LINEWORK INDICATES EXISTING FEEDERS, DEVICES, ETC TO REMAIN U.N.O.

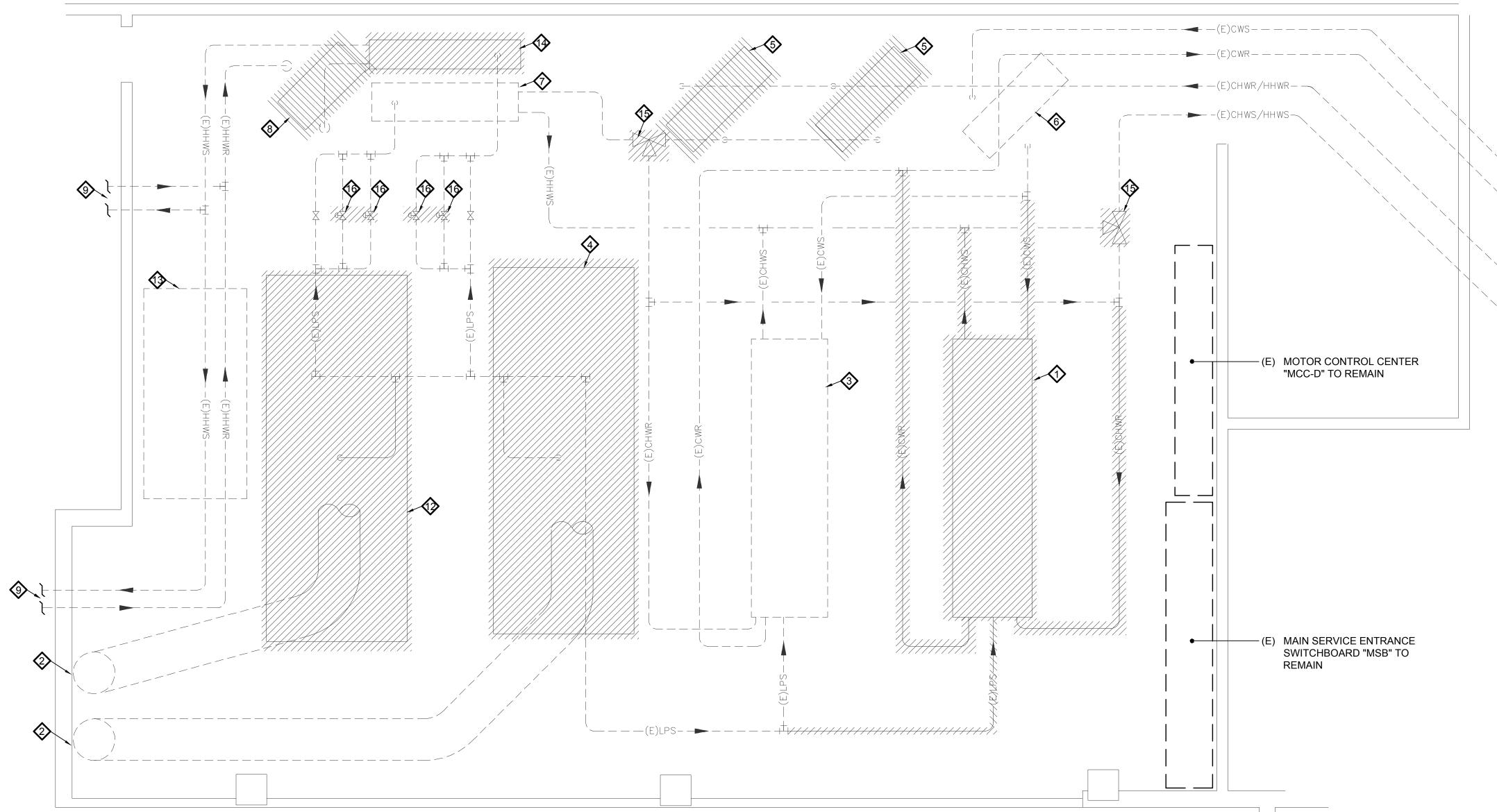
NOTE:

- 1. THESE DRAWINGS AND SPECIFICATIONS ARE INTENDED TO COVER A COMPLETE INSTALLATION OF SYSTEMS. THE OMISSION OR EXPRESSED REFERENCE TO ANY ITEM OF LABOR OR MATERIALS REQUIRED FOR THE PROPER EXECUTION OF THE WORK IN ACCORDANCE WITH PRESENT PRACTICE OF THE TRADE SHALL NOT RELIEVE THE CONTRACTOR FROM PROVIDING SUCH ADDITIONAL LABOR AND MATERIALS.
- 2. THESE PLANS, SPECIFICATIONS, AND ALL MATERIALS SHALL BE IN FULL ACCORDANCE WITH ALL LEGAL AND INDUSTRY REQUIREMENTS, AND STANDARDS INCLUDING WITHOUT LIMITATION TO THE FOLLOWING:
- a. CALIFORNIA CODE OF REGULATIONS TITLE 24, PARTS 1 AND 2 (CALIFORNIA BUILDING CODE), 2016 EDITION.
- b. CALIFORNIA CODE OF REGULATIONS TITLE 24, PART 3 (CALIFORNIA ELECTRICAL CODE), 2016 EDITION.
- c. CALIFORNIA CODE OF REGULATIONS TITLE 24, PART 6 (CALIFORNIA ENERGY CODE), 2016 EDITION.
- d. CALIFORNIA CODE OF REGULATIONS TITLE 24, PART 9 (CALIFORNIA FIRE CODE), 2016 EDITION.
- e. 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.
- f. THE ELECTRICAL SYSTEMS FUNCTIONALITY STANDARDS SET FORTH IN TITLE 7 OF THE CALIFORNIA CIVIL CODE (THE "RIGHT TO REPAIR ACT").
- g. THE MANUFACTURER'S REQUIREMENTS OR RECOMMEND-ATIONS FOR ANY INCORPORATED PRODUCTS. h. THE MOST CURRENT APPROVED ISSUES OF ANY NOTED
- SPECIFICATIONS, CODES AND STANDARDS, INCLUDING SUPPLEMENTS, UNLESS NOTED OTHERWISE
- 3. THE PLANS REPRESENT ONLY THE FINISHED ELECTRICAL, FIRE ALARM, AND LOW VOLTAGE SYSTEMS, AND THEY ARE NOT INTENDED TO INDICATE OR REQUIRE ANY CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES.
- 4. 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 ELECTRICAL 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.
- 5. IN INTERPRETATING THE PLANS, THE FOLLOWING GENERAL RULES APPLY:
- a. WRITTEN DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALED DRAWINGS.
- b. SCALED DIMENSIONS AND GRAPHICALLY SHOWN LOCATIONS ARE TO BE CONSIDERED ONLY APPROXIMATE. FIELD VERIFY DIMENSIONS PRIOR TO BID.
- 6. IN IMPLEMENTING THE PLANS, THE FOLLOWING GENERAL RULES APPLY:
- a. 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 CONT-RACTOR 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 AN ASSUMES THE RISK OF THE CONSEQUENCES OF FAILING TO DO SO BEFORE BIDDING OR OTHERWISE PROCEEDING.
- b. THE CONTRACTOR SHALL REVIEW AND VERIFY ALL DIMENSIONS PRIOR TO STARTING CONSTRUCTION, AND NOTIFY THE ARCHITECT IMMEDIATELY OF ANY DISCRE-PANCIES OR INCONSISTENCIES...
- 7. SUBMITTALS WILL BE REVIEWED BY THE ELECTRICAL ENGINEER, IF AT ALL, ONLY PURSUANT TO THE INDUSTRY-STANDARD PROTOCOL SET FORTH IN A1A DOCUMENT A201 AND IN NO EVENT WILL THE SUBMITTAL REVIEW PROCESS RELIEVE OR LESSEN THE SUBMITTING CONTRACTOR'S RESPONSIBILITY FOR AN INAPPROPRIATE SUBMITTAL.
- 8. IN NO EVENT WILL ANY SITE VISITS BY THE ELECTRICAL ENGINEER CONCERN CONSTRUCTION MEANS AND METHODS OR CONSTRUCTION SAFETY, AND ALL SUCH MATTERS SHALL REMAIN THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
- 9. 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 ELECTRICAL 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. ELECTRICAL ENGINEER PROVIDES DOCUMENTS IN AN ELECTRONIC FORM ONLY IN ITS STANDARD FORMATS AND CONVENTIONS AND WITH NO GUARANTEE OF COMPATIBILITY WITH ANY RECEIPIENT'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.
- 10. REFER TO THE DRAWINGS AND SHOP DRAWINGS OF OTHER TRADES FOR ADDITIONAL DETAILS WHICH AFFECT THE PROPER INSTALLATION OF THIS WORK.
- 11. BEFORE SUBMITTING A BID, THE CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH ALL FEATURES OF THE BUILDING, AND ALL BUILDING DRAWINGS WHICH MAY AFFECT THE EXECUTION OF THE WORK NO EXTRA PAYMENT WILL BE ALLOWED FOR FAILURE TO OBTAIN THIS INFORMATION.

- 12. PROTECT ALL WORK, MATERIALS AND EQIPMENT FROM DAMAGE FROM ANY CAUSE WHATEVER AND PROVIDE ADEQUATE AND PROPER STORAGE FACILITIES DURING THE PROGRESS OF THE WORK. PROVIDE FOR THE SAFETY AND GOOD CONDITION OF ALL THE WORK UNTIL FINAL ACCEPTANCE OF THE WORK BY THE OWNER AND REPLACE ALL DAMAGED OR DEFECTIVE WORK, MATERIALS AND EQUIPMENT BEFORE REQUESTING FINAL ACCEPTANCE.
- 13. THE DRAWINGS INDICATE IN A DIAGRAMMATIC MANNER. THE DESIRED LOCATIONS OF ARRANGEMENT OF THE COMPONENTS OF ELECTRICAL WORK. DETERMINE EXACT CONDUIT ROUTING, CONDUIT BENDS, AUXILIARY JUNCTION BOXES, SUPPORTS, AND UNDEFINED CONSTRUCTION DETAILS AS A JOB CONDITION TO BE INSTALLED IN ACCORDANCE WITH THE APPLICABLE CODE REQUIREMENTS. PROPER JUDGEMENT MUST BE EXERCISED IN EXECUTING THE WORK SO AS TO SECURE THE BEST POSSIBLE INSTALLATION IN THE AVAILABLE SPACE, AND TO OVERCOME LOCAL DIFFICULTIES DUE TO SPACE LIMITATIONS OR INTERFERENCE OF CONDITIONS ENCOUNTERED.
- 14. IN THE EVENT CHANGES IN THE INDICATED LOCATIONS OR ARRANGEMENTS ARE NECESSARY, DUE TO DEVELOPED CONDITIONS IN THE BUILDING CONSTRUCTION OR REARRANGEMENT OF EQUIPMENT, SUCH CHANGES SHALL BE MADE WITHOUT COST PROVIDING THE CHANGE IS ORDERED BEFORE THE CONDUIT RUNS, ETC., AND WORK DIRECTLY CONNECTED TO SAME IS INSTALLED AND NO EXTRA MATERIALS ARE REQUIRED.
- 15. THE DRAWINGS INDICATE APPROXIMATE LOCATIONS OF EXISTING CONDUITS. THE EXACT ROUTING SHALL BE VERIFIED IN FIELD AND LENGTH OF CONDUCTORS SHALL BE ADJUSTED TO THE LENGTH REQUIRED.
- 16. THE DRAWINGS INDICATE APPROXIMATE LOCATIONS OF EXISTING CONDUITS. THE EXACT ROUTING SHALL BE VERIFIED IN FIELD AND LENGTH OF CONDUCTORS SHALL BE ADJUSTED TO THE LENGTH REQUIRED.
- 17. PERFORM CUTTING AND PATCHING ON THE CONSTRUCTION WORK WHICH MAY BE REQUIRED FOR THE PROPER INSTALLATION OF THE ELECTRICAL WORK. PATCHING SHALL BE OF THE SAME MATERIAL, WORKMANSHIP AND FINISH AS SPECIFIED AND ACCURATELY MATCH SURROUNDING WORK TO SATISFACTION OF THE ARCHITECT.
- 18. PROVIDE ALL EQUIPMENT WITH ENCLOSURES LISTED OR LABELED FOR USE AND LOCATION WHERE SUCH EQUIPMENT IS INSTALLED.
- 19. PROVIDE UL LISTED FIRE STOP FOR ALL PENETRATIONS THROUGH FIRE RATED FLOORS, WALLS AND CEILINGS TO MAINTAIN ALL FIRE RATINGS. THE FIRE STOP MATERIALS SHALL BE RE-ENTERABLE AND REUSABLE.
- 20. PROVIDE COORDINATED SHOP DRAWINGS. INDICATING DIMENSIONED LOCATIONS AND SIZES OF ALL CORE DRILLS FOR REVIEW AND APPROVAL. ALL CORE DRILL LOCATIONS SHALL BE VERIFIED AND APPROVED WITH OWNERS REPRESENTATIVE, STRUCTURAL AND ARCHITECT PRIOR TO CORE DRILL. UTILIZE X-RAY EQUIPMENT TO LOCATE AND VERIFY EXISTING STRUCTUREAL ELEMENTS WITHIN SLAB.
- 21. GROUNDING SHALL BE EXECUTED IN ACCORDANCE WITH ALL APPLICABLE CODES AND REGULATIONS, BOTH OF THE STATE OF CALIFORNIA AND LOCAL AUTHORITIES HAVING JURISDICTION.
- 22. PROVIDE GROUND WIRE IN EACH CONDUIT CONTAINING CIRCUITS FEEDING RECEPTACLES. THE CONDUIT SHALL NOT BE PERMITTED TO SERVE AS THE ONLY ELECTRICAL GROUND RETURN PATH.
- 23. WHERE CIRCUIT CHANGES OR ADDITIONS OCCUR IN PANELBOARDS UPDATE PANEL DIRECTORY CARDS WITH NEW TYPEWRITTEN CARDS INDICATING DESCRIPTION OF ALL CIRCUITS.
- 24. PROVIDE HANDLE TIES AT CIRCUIT BREAKERS TO SIMULTAINEOUSLY DISCONNECT ALL UNGROUNDED CONDUCTORS OF MULTI-WIRE BRANCH CIRCUITS WITH A SHARED NEUTRAL.
- 25. UNLESS NOTED OTHERWISE ALL 120 VOLT HOMERUNS OVER 100 FEET SHALL BE #10 AWG MINIMUM. ADJUST CONDUIT SIZE ACCORDINGLY.
- 26. UNLESS NOTED OTHERWISE ALL 277 VOLT HOMERUNS OVER 200 FEET SHALL BE #10 AWG MINIMUM, OVER 300 FEET SHALL BE #8 AWG MINIMUM. ADJUST CONDUIT SIZE ACCORDINGLY.
- 27. CONDUIT FOR TELEPHONE/DATA CABLING SHALL COMPLY WITH THE FOLLOWING ADDITIONAL REQUIREMENTS:
- a. INSIDE BEND RADIUS SHALL BE AT LEAST 10 TIMES ITS INTERNAL DIAMETER.
- b. PROVIDE PULL BOXES WHENEVER CONDUIT LENGTH EXCEEDS 150 FEET AND WHEN COMBINED BENDS ARE GREATER THAN 180 DEGREES.
- c. ALL CONDUIT SHALL BE PROVIDED WITH INSULATED BUSHINGS.
- d. MAINTAIN A MINIMUM CLEARANCE OF 4 FEET FROM MOTORS AND TRANSFORMERS.
- e. MAINTAIN A MINIMUM CLEARANCE OF 12 INCHES FROM POWER CIRCUITS.
- 28. COORDINATE MOUNTING HEIGHTS OF RECEPTACLES, SWITCHES, A/V DEVICES, SECURITY DEVICES, ETC. MOUNTED ON COMMON WALLS SO THAT ALL OUTLETS ARE MOUNTED TO ALIGN HORIZONTALLY.
- 29. NOTIFY THE ARCHITECT IN WRITING WHEN INSTALLATION IS COMPLETE AND THAT A FINAL INSPECTION OF THIS WORK CAN BE PERFORMED. IN THE EVENT DEFECTS OR DEFICIENCIES ARE FOUND DURING THIS FINAL INSPECTION, THEY SHALL BE CORRECTED TO THE SATISFACTION OF THE ARCHITECT BEFORE FINAL ACCEPTANCE CAN BE ISSUED.
- 30. 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.
- 31. CONDUITS RUN ABOVE GRADE: PROVIDE OZ COMPANY TYPE "DX" EXPANSION/DEFLEXION FITTINGS WITH BONDING JUMPER ON ALL CONDUITS AT ALL BUILDING EXPANSION OR SEISMIC JOINT CROSSINGS.
- 32. ALL FIXED EQUIPMENT CONNECTIONS SHALL BE PROVIDED WITH FLEX JOINTS.







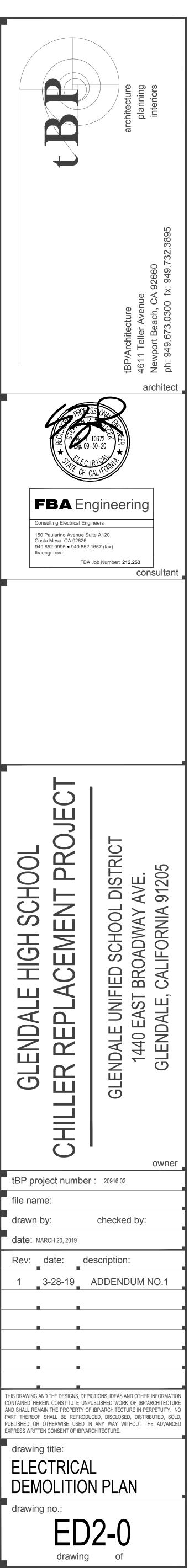


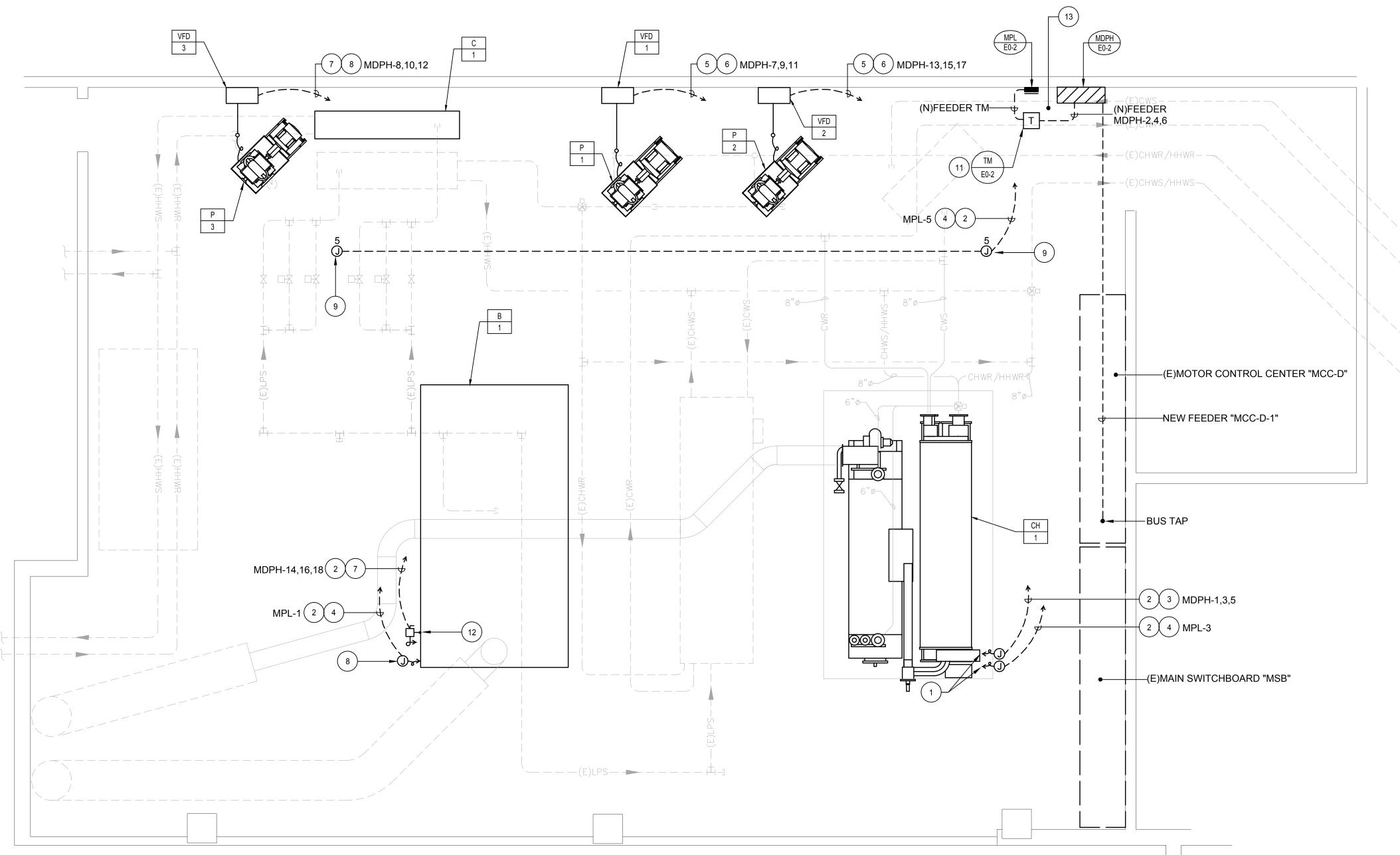
- 1. ELECTRICAL CONTRACTOR SHALL DISCONNECT POWER AND REMOVE EXISTING FEEDERS IN THEIR ENTIRETY FROM MECHANICAL EQUIPMENT TO BE REMOVED, RELOCATED AND/OR REPLACED AS REQUIRED.
- 2. OWNER SHALL HAVE FIRST RIGHT OF REFUSAL ON ALL ITEMS TO BE REMOVED. CONTRACTOR SHALL VERIFY ALL SUCH ITEMS WITH OWNER PRIOR TO REMOVAL. ALL ITEMS NOT REFUSED BY OWNER SHALL BE REMOVED INTACT AND FULLY FUNCTIONAL BY CONTRACTOR AND RETURNED TO OWNER. ALL ITEMS REFUSED BY OWNER SHALL BE PROPERLY DISPOSED BY CONTRACTOR.
- 3. CONTRACTOR SHALL RE-USE EXISTING OPENINGS IN WALLS AND ROOF WHEREVER POSSIBLE. COORDINATE WITH OTHER TRADES AS NECESSARY. GENERAL CONTRACTOR SHALL MODIFY OPENING AS REQUIRED TO ACCOMMODATE NEW MECHANICAL DEVICE.
- 4. CONTRACTOR SHALL PATCH ALL OPENINGS IN WALLS, ROOF, ETC. THAT WILL NOT BE REUSED FOR FUTURE WORK. COORDINATE AS NECESSARY WITH OTHER TRADES.
- 5. PRIOR TO ANY WORK BEING DONE CONTRACTOR SHALL MAKE A CAREFUL EVALUATION OF THE EXISTING CONDITIONS AND VERIFY ALL METHODS OF REMOVAL AND INSTALLATION OF MECHANICAL EQUIPMENT/ELECTRICAL.
- 6. CONTRACTOR SHALL COORDINATE ALL DEMOLITION WORK WITH THE WORK OF ALL OTHER TRADES.
- 7. EXISTING ABANDONED OR DEFUNCT CONDUIT AND CABLING SHALL BE REMOVED. PATCH AND REPAIR WALLS/ROOF AS NECESSARY.
- 8. CONTRACTOR SHALL SEQUENCE ALL DEMOLITION AND REMODEL WORK SUCH THAT THERE IS NO SYSTEM DOWN TIME DURING OCCUPIED BUILDING HOURS UNLESS PREVIOUSLY COORDINATED WITH THE DISTRICT. ANY AND ALL SYSTEM SHUTDOWNS SHALL BE COORDINATED WITH THE DISTRICT IN WRITING A MINIMUM OF 30 DAYS IN ADVANCE.
- DEMOLITION KEY NOTES:

- DISCONNECT AND REMOVE FEEDER TO THE EXISTING STEAM DRIVEN ABSORPTION CHILLER.
- EXISTING STEAM BOILER FLUE UP THROUGH ROOF TO REMAIN.
- (3) EXISTING STEAM DRIVEN ABSORPTION CHILLER TO REMAIN.
- EXISTING STEAM BOILER TO BE DEMOLISHED, REMOVED, AND REPLACED WITH NEW.
- EXISTING CHW/HHW DISTRIBUTION PUMP TO BE DEMOLISHED, REMOVED, AND REPLACED WITH NEW.
- EXISTING CONDENSER WATER PUMP TO REMAIN. PROVIDE INTEGRATION TO NEW DDC CONTROLS SYSTEM. SEE SHEET M5-1.
- **(7)** EXISTING STEAM/HHW CONVERTER TO REMAIN. EXISTING HHW DISTRIBUTION PUMP TO BE DEMOLISHED, REMOVED, AND REPLACED WITH NEW.
- (9) EXISTING HHW SUPPLY AND RETURN PIPING TO BUILDING 5000.
- EXISTING CHW/HHW SUPPLY AND RETURN PIPING TO CAMPUS.
- EXISTING CONDENSER WATER SUPPLY AND RETURN PIPING UP TO COOLING TOWER ON ROOF.
- EXISTING STEAM BOILER TO BE DEMOLISHED AND REMOVED.
- EXISTING STEAM BOILER DE-AERATOR TANK AND ALL ASSOCIATED COMPONENTS AND CONNECTIONS TO REMAIN.
- EXISTING STEAM/HHW CONVERTER TO BE DEMOLISHED, REMOVED, AND REPLACED WITH NEW.
- EXISTING 3-WAY CHANGEOVER VALVE TO BE REPLACED WITH NEW. PROVIDE INTEGRATION TO THE NEW DDC CONTROLS SYSTEM. SEE SHEET
- M5-1
- EXISTING PNEUMATIC STEAM VALVE TO REPLACED WITH NEW. PROVIDE INTEGRATION TO THE NEW DDC CONTROLS SYSTEM. SEE SHEET M5-1.



1/4"=1'-0"





CONSTRUCTION NOTES:

- 1. FIELD VERIFY ALL EXISTING DIMENSIONS PRIOR TO FABRICATION. PROVIDE ALL TRANSITIONS AS REQUIRED TO CONNECT NEW TO EXISTING.
- 2. COORDINATE ENTIRE INSTALLATION OF THE ELECTRICAL WITH THE WORK OF ALL OTHER TRADES PRIOR TO ANY FABRICATION OR INSTALLATION. PROVIDE ALL FITTINGS, OFFSETS, AND TRANSITIONS AS REQUIRED FOR A COMPLETE WORKABLE INSTALLATION.
- 3. BEFORE COMMENCEMENT OF WORK, THE ELECTRICAL CONTRACTOR SHALL VERIFY THE EXACT LOCATIONS AND DIMENSIONS OF ALL EXISTING EQUIPMENT AND ELECTRICAL SERVICES IN THE AREA OF NEW CONSTRUCTION AND NOTIFY THE DISTRICT OF ANY DISCREPANCIES.
- 4. CONTRACTOR SHALL SEQUENCE ALL DEMOLITION AND REMODEL WORK SUCH THAT THERE IS NO SYSTEM DOWN TIME DURING OCCUPIED BUILDING HOURS UNLESS PREVIOUSLY COORDINATED WITH THE DISTRICT. ANY AND ALL SYSTEM SHUTDOWNS SHALL BE COORDINATED WITH THE DISTRICT IN WRITING A MINIMUM OF 30 DAYS IN ADVANCE.
- 5. PRICING FOR THE REPLACEMENT OF THE EXISTING STEAM BOILER SHALL BE PROVIDED AS AN ADD ALTERNATE TO THE BASE PROJECT.

RENOVATION NOTES:

- (1) WIRE AND CONNECT TO CH-1 CONTROL PANEL IN ACCORDANCE WITH THE CHILLER MANUFACTURERS REQUIREMENTS.
- (2) ROUTE CONDUIT(S), SURFACE MOUNTED, EXPOSED, HIGH IN CENTRAL PLANT TO PANELS INDICATED. ROUTE CONDUITS TO AVOID EXISTING OBSTRUCTION.
- (3) PROVIDE 3#12, 1#12 GRD. 3/4"C.
- (4) PROVIDE 2#12, 1#12 GRD. 3/4"C.
- (5) ROUTE CONDUIT(S), SURFACE MOUNTED, EXPOSED, HIGH ON WALL TO PANELS INDICATED. ROUTE CONDUIT(S) TO AVOID EXISTING OBSTRUCTIONS.
- (6) PROVIDE 3#2, 1#6 GRD. 1 1/2"C.
- 7) PROVIDE 3#10, 1#10 GRD. 1"C.
- 8 CONNECT TO BOILER CONTROLS IN ACCORDANCE WITH THE EQUIPMENT MANUFACTURERS REQUIREMENTS.
- 9 FOR CONNECTION TO DDC CONTROLS. COORDINATE WITH HVAC CONTROLS INSTALLER.
- (10) PROVIDE SEAL-TITE FLEX AND WIRING AND CONNECT TO PUMP.
- (11) INSTALL TRANSFORMER HIGH ON WALL ABOVE PANEL.
- (12) CONNECT TO 15HP, 480V, 3Ø BOILER BLOWER MOTOR AND VFD.
- 13 LOCATIONS OF PANELBOARD TRANSFORMER ARE DIAGRAMMATIC. CONTRACTOR SHALL LOCATE AVAILABLE OPEN WALL SPACE FOR PANELS AND TRANSFORMER AND INSTALL ACCORDINGLY TO MAINTAIN CODE REQUIRED CLEARANCE. INCLUDE ALL COSTS IN BID TO COMPLY WITH THIS PROVISION.

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

