

RELOCATABLE CLASSROOMS – PHASE 2

Dunsmore Elementary School

tBP Project No. 20967.02

DSA #3-

File #

Bid No:

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT

APPO3 11 8 9 3 7

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DATE *APR 03 2018*

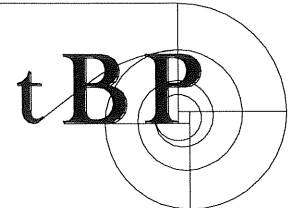
Glendale Unified School District
La Crescenta, California

PROJECT MANUAL

Volume 1 of 1
Divisions 00 - 33
March 2018

Architect:

tBP/Architecture
4611 Teller Ave. Newport Beach, CA 92660-2104
949. 673. 0300



Architecture
Planning
Interiors
Management

**SECTION 00 01 01
PROJECT TITLE PAGE**

FOR

RELOCATABLE CLASSROOMS - PHASE 2

PROJECT NUMBER: 20967.02

DISTRICT

GLENDALE UNIFIED SCHOOL DISTRICT

223 N. JACKSON STREET, 3RD FLOOR, GLENDALE, CALIFORNIA 91206

818.241.3111

WWW.GUSD.NET

PROJECT LOCATION

DUNSMORE ELEMENTARY SCHOOL

4717 DUNSMORE AVENUE

LA CRESCENTA , CALIFORNIA 91214

PREPARED BY:

ARCHITECT

TBP/ARCHITECTURE

4611 Teller Avenue, Newport Beach, CA 92660

949.673.0300

www.tbparchitecture.com

NOTICE: This Project Manual, is an unpublished instrument of service of the authors.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: Relocatable Classrooms - Phase 2, located at:
 - Project Number: 20967.02.
 - Dunsmore Elementary School.
 - 4717 Dunsmore Avenue.
 - La Crescenta, California 91214.
- B. The Owner, hereinafter referred to as District: Glendale Unified School District
 - Glendale Unified School District**
 - 223 N. Jackson Street, 3rd Floor, Glendale, California 91206
 - www.gusd.net
 - 818.241.3111
- C. District's Project Manager:

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: Relocatable buildings with related site improvements.
- 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, CA 92660
 - www.tbparchitecture.com
 - 949.673.0300

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, 5 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)

END OF SECTION

SECTION 00 01 07

SEALS PAGE

ARCHITECT

TBP/ARCHITECTURE, INC.
4611 Teller Avenue, Newport Beach, CA 92660



Hung L. Cheng C-34187



ELECTRICAL

FBA ENGINEERING
150 Paularino Avenue, Suite A120, Costa Mesa CA 92626



Steve Zajicek, PE E-10372



CIVIL

FPL ENGINEERING
30 Corporate Park, Suite 401, Irvine CA 92606



Alan Wing-Chi Lee C-34971



END OF SECTION

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Structure By Relocatable Building Vendor

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Openings By Relocatable Building Vendor

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By Relocatable Building Vendor

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By Relocatable Building Vendor

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By Relocatable Building Vendor

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**SECTION 00 40 25
REQUEST FOR INFORMATION**

RFI NUMBER: _____

DATE: _____

PROJECT NAME: RELOCATABLE CLASSROOMS - PHASE 2

PROJECT NO.: 20967.02

TO: TBP/ARCHITECTURE

4611 Teller Avenue, Newport Beach, CA 92660

Attention: _____

Contractor: _____

Address: _____

Request By: _____ Date: _____

BRIEF SUMMARY OF RFI: _____

Drawing No. _____ Detail No. _____

Specification Section _____ Title _____

Page _____ Paragraph _____

DETAILS OF THIS RFI: _____

Attachments: _____

RESPONSE WILL BE INCLUDED IN AN ADDENDUM

END OF RFI

SECTION 00 43 25
SUBSTITUTION REQUEST FORM - DURING PROCUREMENT

SUBSTITUTION REQUEST NO. _____

DATE: _____

PROJECT NAME: **RELOCATABLE CLASSROOMS - PHASE 2**

PROJECT NUMBER: **20967.02**

TO: **TBP/ARCHITECTURE**

4611 Teller Avenue, Newport Beach, CA 92660

From: _____

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

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

SPECIFIED PRODUCT: _____

Project Manual Section Title _____ Number ___ Page ____ Paragraph ____.

Drawing No. _____ Detail No. _____

Proposed Substitution: _____

Manufacturer: _____ Tel: _____

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

B. Reason request for substitution is being submitted: _____

DIFFERENCES BETWEEN PROPOSED SUBSTITUTION AND SPECIFIED PRODUCT

A. Does proposed substitution affect in any way the Structural Safety, Access Compliance, or Fire & Life Safety portions of the project? No__ Yes__

Explain _____

B. Does proposed substitution affect dimensions, gages, weights, etc. on Drawing? No__ Yes__

Explain _____

SECTION 00 63 25
SUBSTITUTION REQUEST FORM (POST-AWARD)

SUBSTITUTION REQUEST NO. _____

DATE: _____

PROJECT NAME: RELOCATABLE CLASSROOMS - PHASE 2

PROJECT NUMBER: 20967.02

TO: TBP/ARCHITECTURE

4611 Teller Avenue, Newport Beach, CA 92660

From: _____

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

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

Specified Product: _____

Project Manual Section Title _____ Number ___ Page ___ Paragraph ___.

Drawing No. _____ Detail No. _____

Proposed Substitution: _____

Manufacturer: _____ Tel: _____

A. Reason request for substitution is being submitted: _____

B. Does proposed substitution affect in any way the Structural Safety, Access Compliance, or Fire & Life Safety portions of the project? No__ Yes__

Explain _____

C. Does proposed substitution affect dimensions, gages, weights, etc. on Drawing? No__ Yes__

Explain _____

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

No__ Yes__ _____

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

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

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

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

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

No cost impact ___ Improve Schedule ___ Credit of \$ _____

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

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

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

Submitted by: _____
 (Type Name) Signature Date

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

Architect's Comments:

___ Accepted, ___ accepted as noted, ___ not accepted, ___ received too late.

Reviewed by:

 Architect Date

 Construction Manager Date

 District Date

END OF SECTION

SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Relocatable Classrooms - Phase 2.
- B. District's Name: Glendale Unified School District.
- C. Architect's Name: tBP/Architecture.
- D. The Project consists of the construction of relocatable buildings and related sitework located at Dunsmore Elementary School.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Owner-Contractor Agreement.
- B. The Work: The Work is construction and related services for a , CBC, Occupancy Type Educational Group E, Construction Type V-B, , totaling approximately 0 square feet.
 - 1. The Work includes remodeling of existing building utilities and related site improvements; with patch and repair as required, and other features to the extent indicated on the Drawings.

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 1 through 33 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

- A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 41 00.
1. The intent of these drawings and specifications are the work of the alteration, rehabilitation, or reconstruction of this facility shall be submitted and approved by DSA before proceeding with the repair work. CAC Section 4-317.
- B. Scope of alterations work is indicated on drawings.
- 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.
- F. Fire Suppression Sprinklers: Alter existing system and add new construction, keeping existing in operation.
- G. Fire Alarm: Alter existing system and add new construction, keeping existing in operation.
- H. Telephone: Alter existing system and add new construction, keeping existing in operation.
- I. Security System: Alter existing system and add new construction, keeping existing in operation.
- J. Communications: Alter existing system and add new construction, keeping existing in operation.

1.05 WORK BY OWNER

- A. Concurrent Work Under Separate Contracts:
1. 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.
2. Relocatable Buildings with the following to be provided by the Contractor to facilitate installation by the District's Vendor:
- a. See the appendix "Relocatable Responsibility Matrix" at the end of this Section.
 - b. Clear the site will be turf-free, cleared and graded to within 6 inches of level grade for each building.
 - c. Each site will have a minimum soil bearing capacity of 1,000 PSF with a moisture density ratio of 90% minimum.
 - d. The electrical service, communications, and plumbing points of connection to the building.
 - e. The Contractor will be provided unobstructed delivery access to the location of each building.
 - 1) Definition: "Unobstructed" means that grade level access and crane-lifting is not required to deliver or set the building(s).
 - 2) The District shall be responsible for all rigging/crane costs associated with a District-furnished foundation and access to the site for the installation of the building(s).
 - 3) Removal and protection of existing trees, shrubs, fencing, sprinklers, playground equipment and/or other obstacles necessary for the installation of the building(s) are the responsibility of the District.
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.
- C. District will supply and install the following:
- 1. Fire Extinguishers.
- D. District will supply the following for installation by Contractor:
- 1. Owner-Furnished Products: District may furnish, for installation by Contractor, products which are identified on the Drawings and in the Specifications as OFCI (Owner-Furnished/Contractor-Installed).
 - a. Epson Projectors.

- b. Soap Dispensers.
 - c. Paper Towel Dispensers.
2. Relocatable Buildings with the following to be provided by the Contractor to facilitate installation by the District's Vendor:
- a. Clear the site will be turf-free, cleared and graded to within 6 inches of level grade for each building.
 - b. Each site will have a minimum soil bearing capacity of 1,000 PSF with a moisture density ratio of 90% minimum.
 - c. The electrical service, communications, and plumbing points of connection to the building
 - d. The Contractor will be provided unobstructed delivery access to the location of each building.
 - 1) Definition: "Unobstructed" means that grade level access and crane-lifting is not required to deliver or set the building(s).
 - 2) The District shall be responsible for all rigging/crane costs associated with a District-furnished foundation and access to the site for the installation of the building(s).
 - 3) Removal and protection of existing trees, shrubs, fencing, sprinklers, playground equipment and/or other obstacles necessary for the installation of the building(s) are the responsibility of the District.

1.06 PERMITS, LICENSES AND FEES

- A. Permits:
 - 1. For Work included in the Contract, Contractor shall obtain all permits from authorities having jurisdiction and from serving utility companies and agencies.
 - 2. District will reimburse Contractor for amount charged for such permits, without mark-up.
 - 3. For Work performed under design/build basis, plancheck and permit fees shall be included in the Contract Sum.
- B. 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.
- C. Assessments:
 - 1. District will pay all assessments and utility service connection fees. Costs of assessments shall not be included in the Contract Sum.
- D. Test and Inspection Fees:
 - 1. Contractor shall pay all fees charged by authorities having jurisdiction and from serving utility companies and agencies, for tests and inspections conducted by those authorities, companies and agencies.
 - 2. District will reimburse Contractor for actual amount of such fees, without mark-up.

3. Refer to Section 01 40 00 - Quality Requirements for additional information on tests and inspections and responsibility for payment of fees.

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.

END OF SECTION

**APPENDIX A
PLACEMENT OF RELOCATABLES - SCOPE RESPONSIBILITY MATRIX**

Description	Contractor Furnished	Contractor Installed	Relocatable Building Mfr Furnished	Relocatable Building Mfr Installed	District Furnished	District Installed
1.0 Site Related Work						
1.0 Demolition	•	•				
1.1 Grading of Pad/Backfill after Foundations Complete	•	•				
1.2 Footings, rat slab, vapor barrier, flashing			•	•		
1.3 Forming of vents and vent grates			•	•		
1.4 Removal of Spoils	•	•				
1.5 Irrigation - new	•	•				
1.6 Landscaping - new	•	•				
1.7 New hardscape	•	•				
1.8 Site accessibility upgrades	•	•				
1.9 Utilities (SITE) • Power, low voltage, gas, domestic water, fire water, storm drainage • Narrative for POCs	•	•				
2.0 Building Related						
2.0 Furniture and Equipment					•	•
2.1 Floor Finish	•	•				
2.2 Wall backing for Whiteboards, Projectors, Tall Cabinets (OFOI)			•	•		
2.3 Signage	•	•				
2.4 Exterior and Interior Paint			•	•		
2.5 Sewer and water piping from 5' outside building line, connect to Plumbing fixtures inside the building	•	•				
2.6 Testing of plumbing lines			•	•		

Description	Contractor Furnished	Contractor Installed	Relocatable Building Mfr Furnished	Relocatable Building Mfr Installed	District Furnished	District Installed
3.0 Electrical						
3.0 Modular Grounding	•	•				
3.1 UG Feeders and Pullboxes to Building Electrical Rooms/Panels	•	•				
3.2 Transformers and pads	•	•				
3.3 Distribution Panel boards (Building)	•	•				
3.4 Building Panelboards (Interior Rooms)			•	•		
3.5 UG Feeders and Connections to Building Panel boards	•	•				
3.6 Building Power outlets, receptacles, connections and associated branch circuit conduit and wiring			•	•		
4.0 Lighting						
4.0 Building mounted lighting, interior and exterior and associated branch circuit conduit, wiring and controls			•	•		
4.1 Lighting control system including control panels, relays, occupancy sensors, daylighting, control stations, conduit and wiring			•	•		
4.2 Lighting control system startup and Cx			•	•		
4.3 Networked lighting controls (coordinate with District standards system)			•	•		
4.4 Emergency Lighting Central Battery Inverter(s) and connections			•	•		
5.0 Telephone						
5.0 Site UG Conduit and Pull Boxes to POC	•	•				
5.1 VOIP Telephones					•	•
5.2 Voice outlet boxes and conduit to ceiling			•	•		
5.3 Voice/Data Network Cabling	•	•				
5.4 Telephone system startup and Cx					•	•

Description	Contractor Furnished	Contractor Installed	Relocatable Building Mfr Furnished	Relocatable Building Mfr Installed	District Furnished	District Installed
6.0 Paging/Intercom/Master Clock						
6.0 Rack, Equipment, software in MDF's/IDF's	•	•				
6.1 Power connections and grounding at rack	•	•				
6.2 Systems startup and Cx	•	•				
6.3 Interface with telephone system	•	•				
6.4 Interior Clock/Speakers	•	•				
6.5 Interior Clock/Speaker Back boxes			•	•		
7.0 Electronic Network Systems Infrastructure						
<u>MDF</u>						
7.0 Fiber patch panels	•	•				
7.1 Copper patch panels	•	•				
<u>IDF</u>						
7.2 Equipment Racks and Cable Management	•	•				
7.3 Power outlets and connections			•	•		
7.4 Grounding	•	•				
7.5 Fiber patch panels	•	•				
7.6 Copper patch panels	•	•				
7.7 Plywood Backboards			•	•		
7.8 Network Servers, switches and router					•	•
<u>Site Data Distribution</u>						
7.9 UG conduit	•	•				
7.10 Fiber Optic cabling and Inner Duct	•	•				
<u>Building Distribution</u>						
7.11 Copper Computer Data Network cabling	•	•				
7.12 Conduit sleeves - furnished by Contractor, Installed by M.B.M.	•			•		
7.13 Termination device back boxes and conduit to above ceilings			•	•		
7.14 Termination devices	•	•				
7.15 Portable patch cords					•	•

Description	Contractor Furnished	Contractor Installed	Relocatable Building Mfr Furnished	Relocatable Building Mfr Installed	District Furnished	District Installed
7.16 Network cable testing and Cx	•	•				
7.17 J-Hooks	•	•				
7.18 Wireless Access Devices		•			•	
7.19 Wireless Access Device backboxes for Exterior WAPS			•	•		
7.20 Wireless Access Point cabling	•	•				
8.0 Intrusion Detection/Access Controls						
8.0 Control panels and power supplies	•	•				
8.1 Power connections to control panels and power supplies	•	•				
8.2 Remote monitoring service					•	
8.3 Data network connection to control panel	•	•				
8.4 Door Access (Card Reader Door Hardware)	•	•				
8.5 Door Access back boxes and conduit to above ceiling			•	•		
Narrative on door / conduit coordination by relo manuf?						
8.6 Conduit system above ceiling	•	•				
8.7 Cabling, complete system	•	•				
8.8 Motion sensors	•	•				
8.9 Motion sensor back boxes and conduit to above ceiling			•	•		
8.10 Door contact switches	•	•				
8.11 Door contact switches conduit to above ceiling			•	•		
8.12 Terminal cabinets			•	•		
8.13 Testing, startup and Cx	•	•				
8.14 Site UG conduits	•	•				
8.15 Cabling in Site UG conduits	•	•				

Description	Contractor Furnished	Contractor Installed	Relocatable Building Mfr Furnished	Relocatable Building Mfr Installed	District Furnished	District Installed
9.0 Audio Visual Systems						
9.0 Extron Plenum Vault system and components	•	•				
9.1 Testing, startup and Cx	•	•				
9.2 Back boxes and conduit to the ceiling spaces for ceiling mount AV connection/control devices			•	•		
9.3 Data network connection at AV controller	•	•				
9.4 AV cabling and terminations	•	•				
9.5 White Boards (backing by Modular Manufac.)		•			•	
9.6 Projectors (backing by Modular Manufac.)		•			•	
10.0 Fire Alarm / Sprinkler						
10.0 Terminal Cabinets	•	•				
10.1 120v. power connections to power supplies and amps			•	•		
10.2 120v. power connection to FS Bell			•	•		
10.3 FS Bells			•	•		
10.4 FS Bell back box and conduit into ceiling space			•	•		
10.5 FS DDCV connections	•	•				
10.6 FS DDCV site UG conduit	•	•				
10.10 FS DDCV site UG cabling	•	•				
10.11 FS PIV connections	•	•				
10.12 FS PIV site UG conduit	•	•				
10.13 FS PIV site UG cabling	•	•				
10.14 Fire Riser			•	•		
10.15 Fire Riser Point of Connection from site utility line	•	•				
10.16 Test of Fire Sprinklers			•	•		
10.17 FS Flow and Tamper switches as FSR			•	•		
10.18 FS Flow and Tamper conduit to control panels			•	•		

Description	Contractor Furnished	Contractor Installed	Relocatable Building Mfr Furnished	Relocatable Building Mfr Installed	District Furnished	District Installed
10.19 FS Flow and Tamper FA cabling	•	•				
10.20 Site UG Fire alarm conduits	•	•				
10.21 Site UG Fire alarm cabling	•	•				
10.22 FA Annunciator	•	•				
10.23 FA Horns and Strobes	•	•				
10.24 FA Horns and Strobes back boxes and conduit to above ceiling			•	•		
10.25 FA Horns and Strobes cabling	•	•				
10.26 FA Heat Detectors (as required by code)	•	•				
10.27 FA Heat Detector back boxes			•	•		
10.28 FA Heat Detector conduit			•	•		
10.29 FA Heat Detector cabling	•	•				
10.30 FA conduit above ceilings	•	•				
10.31 FA system testing and Cx	•	•				
10.32 FA HVAC unit shutdown, control modules and cabling			•	•		
10.33 FA HVAC unit shutdown conduit only			•	•		

END OF APPENDIX

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 Bulletin and Change Order as indicated below and as provided for in the Contract for Construction and General Conditions.

1.06 MODIFICATION PROCEDURES

- A. Construction Bulletins, 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 the 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 Bulletin 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 Bulletin 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 be based on the fixed unit prices.
 4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.
- 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 Construction Manager 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

END OF SECTION

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

1.02 RELATED REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: General product requirements.
- B. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
- C. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.
- D. Technical Product Sections: Procedures for specific submittals specified in those Sections to be made at Contract closeout.

1.03 DEFINITIONS

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

- A. Conform to requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Architect:
 - 1. Requests for Interpretation (RFI).
 - 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. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 10. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 - 1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (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: The selected service is:
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. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.
1. Representatives of District are scheduled and included in this training.
- E. 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.
 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;
 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. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Meeting Time and Location: As mutually agreed by District, Architect, and Contractor, at on-site location.
- D. Special Meetings: As necessary, Construction Manager may convene special meetings to discuss specific construction issues in detail and to plan specific activities.
 1. See Section 01 70 00 - Execution and Closeout Requirements.
- E. Attendance Required:
 1. Contractor.
 2. District.
 3. Architect.
 4. Contractor's superintendent.
 5. Major subcontractors.
 6. Inspector of Record.
- F. 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.
- G. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, District, participants, and those affected by decisions made.

3.05 CONSTRUCTION PROGRESS SCHEDULE

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

3.06 DAILY CONSTRUCTION REPORTS

- A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.
- B. In addition to transmitting electronically a copy to District and Architect, submit two printed copies at weekly intervals.
 1. Submit in format acceptable to District.
 2. Submit using required form, a sample of which is appended to this section.
- C. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
 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 site and 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. Excavations in progress.
 3. Foundations in progress and upon completion.
 4. Final completion, minimum of ten (10) photos.
- F. Take photographs as evidence of existing project conditions as follows:
 1. 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 1600 by 1200 ("2 megapixel"), in JPG format; provide files unaltered by photo editing software.
1. Delivery Medium: Via email with project record photo CD.
 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. Photo CD(s): Provide 1 copy including all photos cumulative to date and PDF file(s), with files organized in separate folders by submittal date.
 6. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.08 REQUESTS FOR INTERPRETATION (RFI)

- A. Definition: A request seeking one of the following:
1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in the Contract Documents.
 2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
- C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of the 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.
 - a. Use the form provided in this project manual.
 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 the 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 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.
 - 1) RFIs submitted to request clarification of issues related to means, methods, techniques and sequences of construction or for establishing trade jurisdictions and scopes of subcontracts will be returned without interpretation.
 - (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 conformance to 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, the 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.
- I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to District.
 1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.

2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.09 SUBMITTAL SCHEDULE

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

3.10 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.

- B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the 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.

3.11 SUBMITTALS FOR INFORMATION

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

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

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

3.13 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format with renderable text; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Extra Copies at Project Closeout: See Section 01 78 00.

- C. 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.

3.14 SUBMITTAL PROCEDURES

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

- f. Field construction criteria have been verified, including confirmation that information submitted has been coordinated with the work being performed by others for District and actual site conditions.
 - g. All deviations from requirements of Drawings and Specifications have been identified and noted.
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 the 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.

3.15 SUBMITTAL REVIEW

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

- a. "Revise and Resubmit".
 - 1) Resubmit revised item, with review notations acknowledged and incorporated.
 - 2) Non-responsive resubmittals may be rejected.
 - 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: RELOCATABLE CLASSROOMS - PHASE 2

PROJECT NO.: 20967.02

TO: TBP/ARCHITECTURE

4611 Teller Avenue, Newport Beach, CA 92660

Attention: _____

Contractor: _____

Address: _____

BRIEF SUMMARY OF RFI: _____

Drawing No. _____ Detail No. _____

Specification Section _____ Title _____

Page _____ Paragraph _____

DETAILS OF THIS RFI: _____

SUGGESTED SOLUTION: _____

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

Organization: _____

RESPONSE: _____

Attachments: _____

Response By: _____ Date: _____

Organization: _____

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

END OF RFI

SECTION 01 35 50
REQUESTS FOR ELECTRONIC FILES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements to receive electronic construction document files from Architect.
- B. Hold Harmless Agreement form.

1.02 RELATED SECTIONS

- A. Section 01 30 00 - Administrative Requirements: Shop Drawings, Product Data and Samples.
- B. Section 01 70 00 - Execution and Closeout Requirements.
- C. Divisions 31 through 33 - Site Work.

1.03 REQUIREMENTS

- A. Electronic files have legal ramifications as information therein can be modified.
- B. In order to receive this electronic information, the following Hold Harmless Agreement form must be executed in its entirety, including signature by a company officer.
- C. Costs for processing and handling electronic files, however limited, will be \$250.00

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION.)

PART 3 - EXECUTION

3.01 ELECTRONIC FILE TRANSFER PROCEDURE

- A. Submit a check in the amount of \$250.00 along with a list of the requested sheet numbers and an acknowledged copy of this waiver to the office of the Architect, tBP/Architecture, 4611 Teller Avenue, Newport Beach, CA 92660.
- B. In order to expedite the transfer, upon receipt of a PDF copy of this acknowledgement, the requested CAD files will be sent in the form of a compact disc, DVD, or thumb drive to the recipient, as requested, by UPS, similar delivery service, or other method of electronic transfer after payment is received.
- C. It is expressly understood that any transfer is done as a courtesy and can be revoked at any time by the Architect.

Agreement is on next page

HOLD HARMLESS AGREEMENT

ARCHITECT'S PROJECT: RELOCATABLE CLASSROOMS - PHASE 2

ARCHITECT'S PROJECT NUMBER: 20967.02

We, _____, understand that we may be receiving electronic media containing design information, not necessarily intended for construction. We agree to hold tBP/Architecture harmless for any defects in this data. We agree that it shall be our responsibility to reconcile this electronic data with the paper plans, and that only the paper plans shall be regarded as legal documents for the referenced project.

Further, the Contractor acknowledges that the Architect's reports, drawings, specifications, field data, field notes, laboratory test data, calculations, estimates and other similar documents are instruments of professional service, not products. In accepting and utilizing any drawings or other data on any form of electronic media generated and provided by the Design Professionals, the Parties listed above covenant and agree that all such drawings and data are instruments of service of the Design Professionals, who shall be deemed the author of the drawings and data, and shall retain all common law, statutory law and other rights, including copyrights.

The Parties agree that in accepting and utilizing any drawings and other data, that the Design Professionals waive all responsibility for any subsequent use of these data, the accuracy of dimensions, and the interpretation of information contained herein.

The Parties further agree not to use these drawings and data, in whole or in part, for any purpose or project other than the project which is the subject of this Agreement. The Parties further agree to waive all claims against the Design Professionals resulting in any way from any unauthorized changes of the drawings and data or any other use other than for the project which is the subject of this Agreement.

The Contractor shall indemnify, defend and hold harmless the Design Professionals and its subconsultants and their officers, agents, employees from any claims, damages, losses, liabilities or expenses (including attorneys' fees) arising out of use of such documents without Consultant's prior written authorization.

Under no circumstances shall transfer of the drawings and other data be deemed a sale by the Design Professionals, and the Design Professionals make no warranties, either express or implied of the merchantability and fitness of the data for any particular purpose.

Acknowledged by:

Signature of Company Officer Print or Type Name Date

Company Name

Street Address City, State, Zip Code

E-mail Address

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, guard service, and miscellaneous restrictions.

1.02 RELATED REQUIREMENTS

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

1.03 SECURITY PROGRAM

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

1.04 ENTRY CONTROL

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

1.05 PERSONNEL IDENTIFICATION

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

1.06 GUARD SERVICE

- A. Employ uniformed guard service to provide watch persons at site during all non-working hours.

- B. The phone number for security is _____.
- C. All personnel must obey and act immediately upon any request by security.
- D. In an emergency, from inside the facility, dial _____. Outside the facility, dial 911.

1.07 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. Regulatory requirements for testing and inspection.
- B. Contractor Quality assurance submittals.
- C. Quality assurance.
- D. References and standards.
- E. Testing and inspection agencies and services.
- F. Control of installation.
- G. Tolerances.
- H. Manufacturers' field services.
- I. Defect Assessment.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- B. Section 01 41 00 - Regulatory Requirements: Compliance with applicable codes, ordinances and standards.
- C. Section 01 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.
- D. 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; 2010.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. 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.
- C. 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. Conformance 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 conformance with information given and the design concept expressed in the contract documents, or for District's information.
- D. 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 conforms to 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.
- E. 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.
- F. 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 conformance with information given and the design concept expressed in the contract documents.
- G. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for District.
1. Submit for information for the limited purpose of assessing conformance 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.

1.05 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.

1.06 REFERENCES AND STANDARDS

- A. For products and 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 current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.07 REGULATORY REQUIREMENTS FOR TESTING AND INSPECTION

- A. Inspections, testing and approvals as required by authorities having jurisdiction. Refer to Section 01 41 00 - Regulatory Requirements and Section 01 45 33 - Code Required Special Inspections and Procedures.
- B. Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Unless more stringent requirements are indicated or specified, comply with manufacturer's instructions and recommendations, reference standards and building code research report requirements in preparing, fabricating, erecting, installing, applying, connecting and finishing Work.
- C. Deviations from Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Document and explain all deviations from reference standards and building code research report requirements and manufacturer's product installation instructions and recommendations, including acknowledgement by the manufacturer that such deviations are acceptable and appropriate for the Project.

1.08 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. District will employ and pay for services of an independent testing agency approved by DSA to perform specified testing.

- 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-conformance 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/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-conformance to specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-conformance to 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 of 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: 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 summarized 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 9, Title 24 CCR - 2016 California Fire Code (CFC).
 - a. ICC (IFC) - International Fire Code; 2012.
 7. Part 10, Title 24 CCR - 2016 California Existing Buildings Code.
 - a. Based on ICC (IEBC) - ICC International Existing Buildings Code, 2015.
 8. Part 11, Title 24 CCR - 2016 California Green Building Standards Code (CALGreen).
 9. Part 12, Title 24 CCR - 2016 California Referenced Standards Code.
- F. Erosion and Sedimentation Control Regulations: .
1. California Codes and Regulations; Title 24, California Building Code, Parts 1 & 2.
 2. State of California State Water Resources Control Board Regulations.
 3. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; current edition.

1.02 SUMMARY OF REFERENCE STANDARDS

- A. Regulatory requirements applicable to this project are the following:
- B. National Fire Protection Association (NFPA): (Partial List of Applicable Standards)
 1. Reference CBC for applicable NFPA Standards - 2016 CBC (SFM) Chapter 35.
 2. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances; 2016 is current; use 2016, as amended in 2016 CBC Referenced Standards.
 3. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 4. NFPA 72 - National Fire Alarm and Signaling Code; 2016 is current; use 2016 as amended in 2016 CBC Referenced Standards.
 5. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.
- C. 28 CFR 35 - Nondiscrimination on the Basis of Disability in State and Local Government Services; Final Rule; Department of Justice; current edition.
- D. 28 CFR 36 - Nondiscrimination by Public Accommodations and in Commercial Facilities; Final Rule; Department of Justice; current edition.
- E. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- F. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- G. FED-STD-795 - Uniform Federal Accessibility Standards (UFAS); 1988.
- H. 29 CFR 1910 - Occupational Safety and Health Standards; current edition.
- I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

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 45 33
CODE-REQUIRED SPECIAL INSPECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittal procedures.
- B. Section 01 40 00 - Quality Requirements.
- C. Section 01 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. National Institute of Standards and Technology (NIST).
- D. 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; 2014a.
- 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 shall:
 - 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 shall:
 - 1. 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. Submit certification that Testing Agency is acceptable to AHJ.
 - 4. 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 shall submit documentation of manufacturing capability and quality control procedures. Include documentation of AHJ approval.
- E. Fabricator's Qualification Statement: Fabricator shall 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. Contractor 1
 - 4. District's Inspector 1
 - 5. Division of the State Architect 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 shall promptly submit 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. Conformance 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 shall promptly submit 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. Conformance with Contract Documents.
 - j. Conformance to referenced standard(s).
- K. Test Reports: After each test or inspection, promptly submit 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. Conformance 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 conforms to 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 conformance with information given and the design concept expressed in the 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 conformance with information given and the design concept expressed in the 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 shall 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).
- 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 shall 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 shall 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 ARCHITECTURAL INSPECTIONS

- A. Signs and/or identification devices:
 - 1. Prior to issuance of a final Certificate of Occupancy, Enforcing Agency shall verify installation of signs for information content, appearance, location and Braille per CBC 11B-703.1.1.2.
 - a. Inspection shall include, but not limited to:
 - 1) Braille dots and cells are properly spaced and the size proportion and type raised characters are in compliance with these regulations.
 - 2) Tactile exit signage per CBC 1013.4 and 11B-216.4.1 Exit doors.
 - 3) Sanitary facilities signage per CBC 11B-216.8 Toilet rooms and bathing rooms; and 11B-703.7.2.6 Toilet and bathing facilities geometric symbols.

3.03 OTHER SPECIAL INSPECTIONS

- A. Provide for special inspection of work that, in the opinion of the AHJ, is unusual in nature.
- B. For the purposes of this section, work unusual in nature includes, but is not limited to:

1. Construction materials and systems that are alternatives to materials and systems prescribed by the building code.
 2. Materials and systems required to be installed in accordance with the manufacturer's instructions when said instructions prescribe requirements not included in the building code or in standards referenced by the building code.
- C. Alternative Test Procedures: Where approved rules and standards do not exist, test materials and assemblies as required by AHJ or provide AHJ with documentation of quality and manner in which those materials and assemblies are used.

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 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-conformance to specified requirements shall be performed by the same agency on instructions by Architect.
- D. Re-testing required because of non-conformance to 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-conformance 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 facsimile (or email if agreed to in advance) to the Architect, Structural Engineer, and District's Inspector
- D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.
- E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.
- 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, not employed by the Laboratory of Record, related to the use of form DSA 152 are as follows:
1. Meet with the project inspector, Laboratory of Record, the design professionals, and the contractors as needed to mutually communicate and understand the testing and inspection program, and the methods of communication appropriate for the project.

2. Report all project related activities to the project inspector. The project inspector is responsible for monitoring the work of the Laboratory of Record and special inspectors to ensure the testing and special inspection program is satisfactorily completed.
3. Perform work under the direction of the design professional in general responsible charge, as defined in Section 4-335(f)1B of the California Administrative Code (Title 24, Part 1).
4. Perform inspections in conformance with the DSA approved construction documents, applicable codes and code reference standards.
5. Prepare detailed daily inspection reports outlining the work inspected and provide the project inspector a copy of the reports on the same day the inspections were performed.
6. Immediately submit reports of materials or work not conforming to the requirements of the DSA approved construction documents. These reports shall be submitted to DSA, the Architect, structural engineer, project inspector and the school district.
7. Submit daily special inspection reports in a timely manner such that construction is not delayed and not to exceed 14 days from the date the special inspections were performed. The reports are to be submitted to DSA, the Architect, structural engineer, project inspector and the school district.
8. Submit Special Inspection Verified Report forms DSA 292 to DSA, the project inspector, the school district and the Design Professional in General Responsible Charge.
 - a. The reports are required to be submitted upon any of the following events occurring:
 - 1) Within 14 days of the completion of the special inspection work.
 - 2) Work on the project is suspended for a period of more than one month.
 - 3) The services of the special inspector are terminated for any reason prior to completion of the project.
 - 4) DSA requests a verified report. (See interim verified reports below. This is a "DSA request.")
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:

1. Each Multi-Prime Contractor or Subcontractor shall comply with DSA Construction Oversight Procedure PR 13-01. California Code of Regulations (CCR), Title 24, Part 1, CCR, Chapter 4, Article 1 (Sections 4-211 through 4-220) and Group1, Articles 5 and 6 (Sections 4-331 through 4-344) which provide regulations governing the construction process for projects under the jurisdiction of the Division of the State Architect (DSA).
 - a. Assist the Project Inspector (IOR) and complete and fill out the following forms during the course of construction.
 - 1) Form-102-IC: Construction Start Notice/ Inspection Card Request: Verify Project Inspector has an active form issued by DSA.
 - 2) Form-151: Project Inspector Notifications: Contractor to notify IOR and assist.
 - 3) Form-152: Project Inspection Card: See below.
 - 4) Form-154: Notice of Deviations/ Resolution of Deviations: Contractor to verify all deviations are reviewed, corrected, and accepted by the design professional, and filed with DSA through the Project Inspector (IOR).
 - (a) When the Project Inspector identifies deviations from the DSA approved construction documents the inspector must verbally notify the contractor. If the deviations are not corrected within a reasonable time frame, the inspector is required to promptly issue a written notice of deviation to the contractor, with a copy sent to the design professional in general responsible charge and the DSA.
 - (b) When the noticed deviations are corrected, the inspector is required to promptly issue a written notice of resolution to the contractor, with a copy sent to the design professional in general responsible charge and the DSA.
 - (c) Deviations include both construction deviations and material deficiencies.
 - (d) The written notice of deviations shall be made using form DSA 154.
 - (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 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.
1. Each contractor responsible for the construction of a main wind- or seismic-force-resisting system, designated seismic system or a wind- or seismic-resisting component listed in the statement of special inspections shall submit a written statement of responsibility to the building official and the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:
 - a. Acknowledgment of awareness of the special requirements contained in the statement of special inspections;
 - b. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official;
 - c. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports; and
 - d. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
- D. Contractor Responsibilities, Seismic Force-Resisting Systems: Submit written statement of responsibility for each item listed to DSA 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 Systems: Submit written statement of responsibility for each item listed to DSA 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. Security requirements.
- D. Vehicular access and parking.
- E. Waste removal facilities and services.

1.02 RELATED REQUIREMENTS

- A. Section 01 35 53 - Security Procedures
- B. Section 01 58 13 - Temporary Project Signage.

1.03 TEMPORARY UTILITIES

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

1.04 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
 - 1. Provide temporary toilet facilities if maximum number of personnel on project is greater than 10.
 - 2. Submit proposed location of temporary toilet(s) to Construction Manager 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.

1.05 FENCING

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

1.06 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.

1.07 SMOKING AND TOBACCO

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

1.08 VEHICULAR ACCESS AND PARKING

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

1.09 WASTE REMOVAL

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

1.10 PROJECT SIGNS - SEE SECTION 01 58 13

1.11 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 01 50 00 - Temporary Facilities and Controls: Temporary wood barriers and enclosures.
- C. Section 05 50 00 - Metal Fabrications: Miscellaneous connectors.
- D. Section 06 10 00 - Rough Carpentry: General requirements for structural and non-structural rough carpentry Work.

1.03 REFERENCE STANDARDS

- A. FHWA (SHS) - Standard Highway Signs; Federal Highway Administration; 2004.

1.04 QUALITY ASSURANCE

- A. Design sign and structure to withstand 80 miles/hr wind velocity.

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.
- 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 and Section 06 10 00 - Rough Carpentry..
- 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. One painted sign, 48 sq ft area, bottom 6 feet above ground.
- B. Content:
 - 1. Project 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.
- E. Provide municipal traffic agency directional traffic signs to and within site.

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

1.02 RELATED REQUIREMENTS

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

1.03 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.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Drawings and Specifications:
 - 1. If a conflict exists between the Drawings and the Specifications (Project Manual), then the Contractor shall submit a Request for Interpretation from the Architect. 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.

2.02 SYSTEM COMPLETENESS

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

2.03 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the 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. DO NOT USE products having any of the following characteristics:

1. Made outside the United States, its territories, Canada, or Mexico.
 2. Containing lead, cadmium, asbestos.
- C. Where all 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.
 6. Have a published GreenScreen Chemical Hazard Analysis.
- D. 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.
- E. 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.

2.04 PRODUCT OPTIONS

- A. Unless the specifications state that no substitution is permitted, whenever the Contract Documents indicate any specific article, device, equipment, product, material, fixture, patented process, form, method, or type of construction or any specific name, make, trade

- name, or catalog number, with or without the words "or equal," such specification shall be deemed to be used for the purpose of facilitating description of the material, process, or article desired and shall be deemed to be followed by the words "or equal."
1. See Section 01 25 00 - Substitution Procedures.
- B. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
1. Reference Standards:
 - a. Where Specifications require compliance with a standard, provided product shall fully comply with the standard specified.
 - b. Refer to general requirements specified in Section 01 42 19 - Reference Standards regarding compliance with referenced standards, standard specifications, codes, practices and requirements for products.
 2. Product Description:
 - a. Where Specifications describe a product, listing characteristics required, with or without use of a brand name, provide a product that has the specified attributes and otherwise complies with specified requirements.
 3. Performance Requirements:
 - a. Where Specifications require compliance with performance requirements, provide product(s) that comply and are recommended by the manufacturer for the intended application.
 - b. Verification of manufacturer's recommendations may be by product literature or by certification of performance from manufacturer.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
- D. Products Specified by Identification of Manufacturer and Product Name or Number:
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.

2.05 MAINTENANCE MATERIALS

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

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

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

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. 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.
- B. Inspection Provisions: Arrange storage to provide access for inspection and measurement of quantity or counting of units.
- C. Structural Considerations: Store heavy materials away from the structure in a manner that will not endanger supporting construction.
- D. Store and protect products in accordance with manufacturers' instructions.
- E. Store with seals and labels intact and legible.
- F. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- G. 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.
- H. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

- I. 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.
- J. Comply with manufacturer's warranty conditions, if any.
- K. Do not store products directly on the ground.
- L. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- M. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- N. Prevent contact with material that may cause corrosion, discoloration, or staining.
- O. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- P. 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.

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. Other products when specifically stated in the specifications.
- B. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- C. 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 - South Coast Air Quality Management District Rule No.1113; current edition.
- F. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

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 jurisdiction, South Coast Air Quality Management District, and California Green Standards Code, Rules and Regulations in effect at the time of installation. Products specified in this project shall be used as a basis of design. Updated products that are compliant with the rules in force at the time of installation shall be submitted as substitutions when they become available.
 - 1. If a product is found to be non-compliant with the VOC rules at the scheduled time of installation, notify the Architect a minimum of 90 days prior to installation. Contractor shall submit a suggested compliant product that is equal to the performance and cost of the specified product using the substitution procedure 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: Relocatable Classrooms - Phase 2
2. Project No.: 20967.02
3. Architect: tBP/Architecture

B. Use of This Form:

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

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

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

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. Pre-installation meetings.
- C. Cutting and patching.
- D. Surveying for laying out the work.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- H. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures.
- C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 45 33 - Code Required Special Inspections & Procedures: Construction oversight procedures by DSA regarding the execution, approval, and closeout of this building project.
- E. Section 01 71 23 - Field Engineering: Additional requirements for field engineering and surveying work.
- F. Section 01 74 19 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- G. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- H. Section 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.
- I. Individual Product Specification Sections:
 - 1. Advance notification to other sections of openings required in work of those sections.
 - 2. Limitations on cutting structural members.

1.03 REFERENCE STANDARDS

- A. CFC Ch. 35 - California Fire Code - Chapter 35 - Welding and Other Hot Work; current edition.

1.04 SUBMITTALS

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

- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. 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.
- D. 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 surveying work, employ a land surveyor registered in California and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,
- C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in California. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.
- D. 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.
 - 1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
- E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- F. 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.
- G. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- I. 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. Notify affected utility companies and comply with their requirements.
- D. 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.

- E. 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.
- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean-up of work of separate sections.
- H. 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.
- 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 LAYING OUT THE WORK

- A. Notify the District at least 48 hours before staking is to be started.
- B. Verify locations of survey control points prior to starting work.
- C. Promptly notify Architect of any discrepancies discovered.
- D. Contractor shall locate and protect survey control and reference points.
- E. Control datum for survey is that established by District provided survey.
- F. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- G. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- H. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- I. Utilize recognized engineering survey practices.
- J. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- K. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- L. Periodically verify layouts by same means.
- M. Maintain a complete and accurate log of control and survey work as it progresses.

- N. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.05 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.

3.06 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. 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-conforming work.
- C. 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.
- D. After uncovering existing Work, inspect conditions affecting proper accomplishment of Work.
- E. Temporary Supports: Provide supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- F. Beginning of cutting or patching shall be interpreted to mean that existing conditions were found by Contractor to be acceptable.
- G. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- H. 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.
- I. Restore work with new products in accordance with requirements of Contract Documents.
- J. Fit work neat and tight allowing for expansion and contraction.
- K. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- L. 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.
- M. Finishing: Refinish surfaces to match adjacent and similar finishes as used for the Project.
 - 1. For continuous surfaces, refinish to nearest intersection or natural break.
 - 2. For an assembly, refinish entire unit.

3.07 PROGRESS CLEANING

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

3.08 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.

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

3.09 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 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.

3.12 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 Construction Manager 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 Construction Manager review and approval. Processes and degree of cleanliness shall be as directed by Architect, District and/or Construction Manager.
- E. Clean site; sweep paved areas, rake clean landscaped surfaces.
- F. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

- A. Clean-Up Retainage:
 - 1. Five (5) percent of each Contractor's bid will automatically be held in abeyance in their contract schedule of values for clean-up.
 - 2. If in the Construction Manager's opinion the Contractor is maintaining a clean project, a pro-rata share of this clean-up budget will be paid monthly to the Contractor in accordance with their approximate aggregate percentage of completion of the project.
 - 3. If a Contractor fails to heed written directives to clean-up during the course of the project, the work will be done at the Contractor's expense and a deductive change order will be written against their contract with the District.
 - 4. The establishment of this 5 percent budget in no way limits the cost for the Contractor to maintain a clean project.
- B. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and District.
- C. 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.
- D. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- E. 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.

- F. Clearing and Cleaning: Prior to the Substantial Completion review, Contractor shall conduct a thorough cleaning and clearing of the Project area, including removal of construction facilities and temporary controls.
- G. 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.
- H. District will occupy all of the building as specified in Section 01 10 00.
- I. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
 - 1. Correction (Punch) List: Contractor shall prepare and distribute at the preliminary Contract closeout review meeting, a typewritten, comprehensive list of items to be completed and corrected (punch list) to make the Work ready for acceptance by the District.
 - a. The punch list shall include all items to be completed or corrected prior to the Contractor's application for final payment.
 - b. The punch list shall identify items by location (room number or name) and consecutive number. For example, 307-5 would identify item 5 in Room 307, Roof-4 would identify item 4 on Roof.
 - c. Contractor shall prepare separate lists according to categories used for Drawings. For example, provide lists for Architectural, Structural, Plumbing, Mechanical, Electrical, Fire Protection, Civil, and Landscape.
 - 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 Construction Manager, 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 Construction Manager, 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 Construction Manager, 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 Construction Manager, 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.
- J. Correct items of work listed in Final Correction Punch List and comply with requirements for access to District-occupied areas.
 - K. 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.
 - L. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.14 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.

3.15 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.
- B. Land surveying 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. Having a skilled instrument person(s) available on short notice when necessary for laying out the work.
- E. 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.
- F. 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.
- G. 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.

- H. Preparation and maintenance of professional-quality, accurate, well organized, legible notes of all measurements and calculations made while surveying and laying out the work.
- I. Prior to backfilling operations, surveying - locating, and recording on a copy of the Contract Documents - an accurate representation of buried work and Underground Facilities encountered.
- J. Setting up and executing time-lapse photography of construction activities.

1.03 REFERENCE STANDARDS

- A. FGDC-STD-007.1 - Geospatial Positioning Accuracy Standards - Part 1: Reporting Methodology; 1998.
- B. FGDC-STD-007.2 - Geospatial Positioning Accuracy Standards - Part 2: Standards for Geodetic Networks; 1998.
- C. FGDC-STD-007.4 - Geospatial Positioning Accuracy Standards - Part 4: Architecture, Engineering, Construction, and Facilities Measurement; 2002.
- D. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; Sheet Metal and Air Conditioning Contractors' National Association; 2008.
- E. 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.
 - 2. Final property survey.

1.06 QUALITY ASSURANCE

- A. Field Engineer's Qualifications: As established in Section 01 70 00 - Execution and Closeout Requirements.
- B. Land Surveyor's Qualifications: As established in Section 01 70 00 - Execution and Closeout Requirements.
- C. Use adequate number of skilled and thoroughly-trained workers to perform the work of this section in a timely and comprehensive manner.
- D. 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 the 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. In general, match existing adjacent grades and maintain existing flow lines.
- H. 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.
- I. Check all formwork, reinforcing, inserts, structural steel, bolts, sleeves, piping, other materials and equipment for conformance to shop drawings and Contract Documents requirements.
- J. Check all bracing and shoring for structural integrity and conformance to designs prepared by the Contractor.

3.03 LAND SURVEYING

- A. General: Follow standards for geospatial positioning accuracy.
 1. FGDC-STD-007.1 as amended by Authority Having Jurisdiction.

2. FGDC-STD-007.2 as amended by Authority Having Jurisdiction.
 3. FGDC-STD-007.4 as amended by Authority Having Jurisdiction.
- B. Coordinate survey data with the State Plane Coordinate System of California.
- C. Contractor is responsible for the restoration of all property corners and control monuments damaged or destroyed by construction-related activities. Any disturbed monuments must be replaced at Contractor's expense by a surveyor licensed in California, and approved by the Architect.
1. Temporarily suspend work at such points and for such reasonable times as the District may require for resetting monuments. The Contractor will not be entitled to any additional compensation or extension of time.

3.04 CONSTRUCTION SURVEYING

- A. General: Perform surveying as applicable to specific items necessary for proper execution of work.
1. Alignment Staking: Provide alignment stakes at 50 foot intervals on tangent, and at 25 foot intervals on curves.
 2. Slope Staking: Provide slope staking at 50 foot intervals on tangent, and at 25 foot intervals on curves. Re-stake at every ten-foot difference in elevation.
 3. Structure: Stake out structures, including elevations, and check prior to and during construction.
 4. Pipelines: Stake out pipelines including elevations, and check prior to and during construction.
 5. Site Utilities: Stake out utility lines including elevations, and check prior to and during construction.
 6. Road: Stake out roadway elevations at 50 foot intervals on tangent, and at 25 foot intervals on curves.
 7. Cross-sections: Provide original, intermediate, and final staking as required, for site work and other locations as necessary for quantity surveys.
 8. Easement Staking: Provide easement staking at 50 foot intervals on tangent, and at 25 foot intervals on curves. If required by project conditions, provide wooden laths with flagging at 100 foot intervals.
 9. Record Staking: Provide permanent stake at each blind flange and each utility cap is provided for future connections. Use stakes for record staking of material(s) acceptable to Architect.
 10. Structural Frame: Upon completion, certify location and plumbness.
- B. Surveying to Determine Quantities for Payment.
1. For each application for progress payment, perform such surveys and computations necessary to determine quantities of work performed or placed. Perform surveys necessary for Architect to determine final quantities of work in place.
 2. Notify Architect at least 24 hours before performing survey services for determining quantities. Unless waived in writing by Architect, perform quantity surveys in presence of Architect.

- C. Record Log: Maintain a log of layout control work. Record any deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used.
- D. Use by the Architect: The Architect may at any time use line and grade points and markers established by the Contractor. The Contractor's surveys are a part of the work and may be checked by the Architect at any time.
- E. Accuracy:
 - 1. Establish Contractor's temporary survey references points for Contractor's use to at least second-order accuracy (e.g., 1:10000). Set construction staking used as a guide for the work to at least third-order accuracy (e.g., 1:5000). Provide the absolute margin for error specified below on the basis established by such orders.
 - a. Horizontal accuracy of easement staking: Plus or minus 0.1 feet.
 - b. Accuracy of other staking shall be plus or minus 0.04 feet horizontally and plus or minus 0.02 feet vertically.
 - c. Include an error analysis sufficient to demonstrate required accuracy in survey calculations.
 - 2. District reserves the right to check the Contractor's survey, measurements, and calculations. The requirement for accuracy will not be waived, whether this right is exercised or not.

3.05 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).

3.06 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.

3.07 RECORDS

- A. Maintain at the Site a complete and accurate log of control and survey work as it progresses.
 - 1. Organize and record survey data in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in California. Record Contractor's surveyor's original field notes, computations, and other surveying data in Contractor-furnished hard-bound field books. Contractor is solely responsible for

completeness and accuracy of survey work, and completeness and accuracy of survey records, including field books. Survey records,(including field books) may be rejected by District due to failure to organize and maintain survey records in a manner that allows reasonable and independent verification of calculations, and/or allows identification of elevations, dimensions, and grades of the work.

2. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by Architect.
- B. Submit three copies of final property survey to District. Include on the survey a certification, signed by the surveyor, that principal metes, bounds, lines, and levels of the Project are accurately positioned as shown on the survey. Include the following information:
1. Structure locations from property lines, and distances to adjacent buildings.
 2. Dimensions and locations of drives, walks, walls, underground utilities, appurtenances, and major site features.
 3. Location of easements.
 4. Final grading topographic survey.

3.08 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

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.
 - 1. 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. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 10 00 - Site Clearing for use options.
 - a. Comply with California Green Code (CGC) 5.408.3; Excavated soil and land clearing debris: 100 percent of trees, stumps, rocks and associated vegetation and soils resulting primarily from land clearing shall be reused or recycled.
 - 1) Exception: Reuse, either on-or off-site, of vegetation or soil contaminated by disease or pest infestation.
 - 6. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
 - 7. Bricks: May be used on project if whole, or crushed and used as landscape cover, sub-base material, or fill.
 - 8. Concrete masonry units: May be used on project if whole, or crushed and used as sub-base material or fill.
 - 9. Asphalt paving: May be recycled into paving for project.
 - 10. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - 11. Glass.
 - 12. Gypsum drywall and plaster.

13. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (<http://flooring.dupont.com>) and Interface (www.interfaceinc.com) conduct reclamation programs.
 14. Roofing.
 15. Paint.
 16. Plastic sheeting.
 17. Rigid foam insulation.
 18. Windows, doors, and door hardware.
 19. Plumbing fixtures.
 20. Mechanical and electrical equipment.
 21. Fluorescent lamps (light bulbs).
 22. Acoustical ceiling tile and panels.
 23. Materials which could be hazardous and subject to special disposal regulations include but are not limited to the following: CalGreen Section 5.408.2
 - a. Lead-Based Paint
 - b. Asbestos: Found in older pipe insulation, asphalt floor tiles, linoleum, insulation, etc.
 - c. Polychlorinated Biphenyls (PCBs):
 - 1) Found in electrical oil filled equipment manufactured prior to 1978 such as transformers, switches and fluorescent lamp ballasts.
 - 2) Also found in adhesive, sealant, caulk, glazing putty, roofing material, pesticide vehicle, ink, paper, fabric dye, gaskets, and hydraulic fluid.
 - d. HVAC Refrigerants: Containing Fluorinated and Chlorinated compounds.
 - e. Drinking Fountain Refrigerants: Containing Fluorinated and Chlorinated compounds.
 - f. Fluorescent Light Tubes: Contain mercury.
 - g. EXIT signs and Smoke Detectors: May contain unregulated, radioactive tritium. · Required to be returned to manufacturer.
 - h. Contaminated Soils.
 - i. Pressure Treated Lumber.
- F. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
1. Contractor's quantitative reports for construction waste materials as a condition of approval of progress payments.
- G. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements. CalGreen Section 5.408.1.1.
- H. The following sources may be useful in developing the Waste Management Plan:
1. California Recycling Department, at www.bsc.ca.gov/Home/CALGreen.aspx.
 2. General information contacts regarding construction and demolition waste:
 - a. EPA Construction and demolition (C&D) debris website: www.epa.gov/epawaste/conserves/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.
- E. Section 31 10 00 - Site Clearing: Handling and disposal of land clearing debris.

1.03 DEFINITIONS

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

- a. Inert materials shall achieve a construction waste diversion rate of at least 95 percent.
 - 1) These materials include, but are not limited to, concrete, asphalt and rock.
 - 2) Earthwork is not included.
 - 3) Excavated soil shall not be included in any of the calculations used to ensure compliance with this specification section.
 - b. The overall diversion rate must be based on weight.
 - c. The diversion rate of individual materials can be measured in either weight or volume, but the rate shall be converted into the units selected for calculating the overall diversion rate.
 - 1) All individual material diversions must be converted to a consistent set of units when calculating the overall diversion rate for the all reports and submittals required for the Work.
 - d. Conversion rate numbers shall be based on standard conversion rate data for construction projects provided by the California Integrated Waste Management Board (CIWMB). This data is available at the following internet location, <http://www.calrecycle.ca.gov/LGCentral/Library/dsg/ICandD.htm>.
2. Submit Report on a form acceptable to District.
 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 4. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
 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. Pre-bid meeting.
 - 2. Pre-construction 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:				State:		Zip:
Phone: ()				Fax: ()		
E-Mail Address:						
Prepared by: (Print Name)						
Date Submitted:						
Project Period:		From:		TO:		
Reuse, Recycling or Disposal Processes To Be Used						
Describe the types of recycling processes or disposal activities that will be used for material generated in the project. Indicate the type of process or activity by number, types of materials, and estimated quantities that will be recycled or disposed in the sections below:						
01 - Reuse of building materials or salvage items on site (i.e. crushed base or red clay brick)						
02 - Salvaging building materials or salvage items at an offsite salvage or re-use center (i.e. lighting, fixtures)						
03 - Recycling source separated materials on site (i.e. crushing asphalt/concrete for reuse or grinding for mulch)						
04 - Recycling source separated materials at an offsite recycling center (i.e. scrap metal or green materials)						
05 - Recycling commingled loads of C&D materials at an offsite mixed debris recycling center or transfer station						
06 - Recycling material as Alternative Daily Cover at landfills						
07 - Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).						
08 - Disposal at a landfill or transfer station.						
09 - Other (please describe) _____						
Types of Material To Be Generated						
Use these codes to indicate the types of material that will be generated on the project						
A = Asphalt		C = Concrete		M = Metals		I = Mixed Inert G = Green Materials
D = Drywall		P/C=Paper/Cardboard		W/C = Wire/Cable		S= Soils (Non Hazardous)
M/C = Miscellaneous Construction Debris		R = Reuse/Salvage		W = Wood		O = Other (describe)
Facilities Used: Provide Name of Facility and Location (City)						
Total Truck Loads: Provide Number of Trucks Hauled from Site During Reporting Period						
Total Quantities: If scales are available at sites, report in tons. If not, quantify by cubic yards. For salvage/reuse items, quantify by estimated weight (or units).						
SECTION I - RE-USED/RECYCLED MATERIALS						
Include all recycling activities for source separated or mixed material recycling centers where recycling will occur.						
Type of Material	Type of Activity	Facility to be Used/Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) M	04	ABC Metals, Los Angeles	24	355		
a. Total Diversion						

CONTRACTOR'S CONSTRUCTION WASTE AND RECYCLING PLAN

Continued

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

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

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

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

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

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

CONTRACTOR'S REUSE, RECYCLING, AND DISPOSAL REPORT

(Submit With Each Progress Payment)

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

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Record Documents.
- B. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Section 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. 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 Construction Manager.
 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 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.

3.03 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:

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

END OF SECTION

**SECTION 02 41 00
DEMOLITION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of built site elements.
 - 1. Demolition and removal of existing site improvements within Project area, as indicated on Drawings and as necessary to accomplish the Work, including:
 - a. Asphaltic concrete and portland cement concrete paving.
 - b. Abandoned underground utility lines outside of utility easement.
 - c. Pavement cutting and removal.
 - d. Debris removal.
 - 2. Handling and disposal of removed materials.
 - 3. Dewatering of excavations as necessary to control surface and sub-surface water.

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 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- F. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- G. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal.
- H. Section 31 23 23 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

1.03 REFERENCE STANDARDS

- A. ABMA STD 9 - Guide to Durable Concrete; 2008.
- 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 Construction Manager, supervisory and quality control personnel of Contractor and all subcontractors performing this and directly-related Work.

- D. Submit minutes of meeting to District, Project Inspector and Architect, for Project record purposes.
- E. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.
 - 1. Refer to sequence requirements specified in Section 01 10 00 - Summary; and construction progress schedule requirements specified in Section 01 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 Construction Manager 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 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. 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.
 - 5. Contractor's Reuse, Recycling, and Disposal Report: See Section 01 74 19 - Construction Waste Management and Disposal.
- D. 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. Selective Demolition of Site and Building Elements:
 - 1. Use techniques acceptable to authorities having jurisdiction and which will achieve intended results and provide protection of surrounding features to remain.
 - 2. Some items may have been demolished prior to Work of this Contract. Verify existing conditions prior to start of demolition. If items are or have been demolished contact the Architect.
 - 3. Some items may require postponement of demolition until late in Contract Time period.
 - 4. Phase demolition as necessary to provide adequate interfacing of related Work.
 - 5. Demolish in an orderly and careful manner. Protect existing foundations, retaining walls, utility structures, other structures and finish materials to remain.
- C. Field Measurements and Conditions:
 - 1. Survey existing conditions and correlate with requirements indicated to determine extent of demolition and recycling required.
 - 2. In addition to provisions of the Conditions of the Contract, verify dimensions and field conditions prior to construction. Verify condition of substrate and adjoining Work before proceeding with demolition Work. If conflict is found notify Construction Manager, Project Inspector and Architect.

- D. Comply with other requirements specified in Section 01 70 00.
- E. 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.
- F. 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.

- G. 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.
 - 1) 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 Construction Manager.
 - 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.
- H. Do not begin removal until receipt of notification to proceed from District.
- I. Do not begin removal until built elements to be salvaged or relocated have been removed.

- J. 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.
- K. 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.
- L. Hazardous Materials: Comply with ABMA STD 9 and state and local regulations.
- M. 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.
- N. 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.
- O. 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.

3.03 DEWATERING

- A. Dewatering: Dewater site in localized areas as Work progresses.
 - 1. Provide an adequate system to lower and control groundwater in order to permit excavation, construction of structures, and placement of fill materials under dry conditions.

2. Install sufficient dewatering equipment to pre-drain waterbearing strata above and below bottom of structure foundations, drains, sewers, and other excavations.
 3. Maintain excavations free of standing water.
 4. Provide dewatering 24 hours per day in advance of placement of concrete.
 5. Allow no concrete to be placed in standing water.
 6. Ensure that trenching and excavations do not cave in due to water.
- B. Surface Run-off Water Control:
1. Minimize flow of ground water from adjacent areas into Work areas.
 2. Do not restrict flow from adjacent properties such that natural flow is hindered.
- C. Water Disposal:
1. Dispose of run-off by legal means and as acceptable to authorities having jurisdiction.
 2. Dispose of water removed from excavations in a manner to avoid endangering public health, property, and portions of Work under construction or completed.
 3. Dispose of water in a manner to avoid inconvenience to others engaged in work about site.
 4. Provide sumps, sedimentation tanks, and other flow control devices as required by authorities having jurisdiction.

3.04 PORTLAND CEMENT CONCRETE AND ASPHALTIC CONCRETE PAVING DEMOLITION

- A. Cutting: Make a saw cut at edges of existing paving to be removed, where portions of existing paving are indicated to remain.
- B. Cutting Method: Cut with abrasive type, water-cooled saw to a minimum depth of 1-1/2 inches. Cut lines straight and square to face of paving.
- C. Aggregate Base: Existing aggregate base may be retained except where landscaping and overexcavation are indicated.
- D. Concrete Removal: Break concrete and remove debris. Preserve straight cut.
- E. Disposal: Remove debris from the site except where allowed or directed for fill for subsequent earthwork or for landscape walls.

3.05 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Remove from site all materials not to be reused on site; comply with requirements of Section 01 74 19 - Waste Management.
- C. 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 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel items.
- B. Steel bollards.

1.02 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
 - 1. Use 2008 as indicated in 2016 CBC Referenced Standards.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015, with Editorial Revision (2016).
 - 1. Use 2011 as indicated in 2016 CBC Referenced Standards.
- E. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009 (Reapproved 2015).
- F. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).
- G. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015 (with March 2016 Errata).
 - 1. Use 2010 w/Errata as indicated in 2016 CBC Referenced Standards.
- I. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc; 2017.
- J. SSPC-PA 1 - Shop, Field, and Maintenance Painting of Steel; 2004.
- K. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
- L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).
- M. SSPC-SP 10 - Near-White Blast Cleaning; 2007.
- N. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).
- O. SSPC-SP 3 - Power Tool Cleaning; 1982 (Ed. 2004).
- P. SSPC-SP 5 - White Metal Blast Cleaning; 2007.
- Q. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.03 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.

1.04 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 Construction Manager 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.

1.05 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.

1.06 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. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.
- C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Preparation Before Fabrication: Remove loose mill scale and rust and remove twists and bends in manners not injurious to materials and finishes.
- B. 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.
- C. 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.
- D. 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.
- E. 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.
- F. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- G. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- H. Welding: Conform to AWS D1.1/D1.1M recommendations.
1. Do not field weld galvanized components to remain unfinished.
 2. Provide continuous welds at welded corners and seams.
 3. Grind exposed welds smooth and flush with base material.
 4. Re-weld to fill holes. Putties and fillers are not acceptable.
- I. Joints on Finished Surfaces: Provide welds ground smooth and filled.
- J. Joints Exposed to Weather or Water: Fabricate to keep water out, or provide adequate drainage of water that penetrates.
- K. Steel Tubing and Piping Fabrication: Unless otherwise indicated, close ends with plate stock so no exposed ends of tubing and piping. Grind all edges.
- L. Coordination: Make provisions to connect metal fabrications with or to receive work specified in other Sections.

2.03 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. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; galvanized finish.
 - 1. Material: Standard weight, galvanized steel pipe, size as indicated on Drawings.
 - 2. Cap: Formed steel, where indicated on Drawings.
 - 3. Grout: Where indicated, portland cement and sand mixture, dome shaped at top as indicated on Drawings.
- 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 Construction Manager and Architect.

2.04 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.
- 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 13 - Exterior Painting .
 - a. Coordinate primer with finish paint and coating, as applicable, to provide sound foundation for field-applied topcoats despite prolonged exposure during construction.
 - 1) Shop primer for ferrous metal at exposed exterior locations: Tnemec 90E-92, ethyl silicate zinc primer, or equal.

- 2) Themec 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 Exterior Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.
- G. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.05 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.
- 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.
 - 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 20 (exterior) compliant material used for shop painting, minimum 3 mils dry film thickness.

END OF SECTION

SECTION 10 14 00

SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Room and door signs.
- B. Building identification signs.

1.02 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- C. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2011).
- D. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - 2. When content of signs is indicated to be determined later, request such information from District through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - 3. Submit for approval by District through Architect prior to fabrication.
- D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
- E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
- F. Verification Samples: Submit samples showing colors specified.
- G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- H. Maintenance Materials: Furnish the following for District's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.04 QUALITY ASSURANCE

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

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Flat Signs:
 - 1. Basis of Design Product: EmBoss™ ADA-Ready™ Sign System with requirements indicated for materials, thickness, finish colors, designs, shapes, sizes and details as manufactured by ASI Sign Systems, Inc., or approved equal.
 - 2. ASI Sign Systems, Inc.: www.asisignage.com.
 - 3. Best Sign Systems, Inc: www.bestsigns.com.
 - 4. Cosco Industries (ADA signs): www.coscoarchitecturalsigns.com.
 - 5. Cosco Industries (non-ADA signs): www.coscoarchitecturalsigns.com.
 - 6. FASTSIGNS: www.fastsigns.com/#sle.
 - 7. Inpro: www.inprocorp.com/#sle.
 - 8. Mohawk Sign Systems, Inc: www.mohawksign.com.
 - 9. Quiel Signs: www.quielsigns.com
 - 10. Seton Identification Products: www.seton.com/aec.
 - 11. Vomar Products, Inc.: vomarproduct.com.
 - 12. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Dimensional Letter Signs:
 - 1. Basis of Design Product: Series LPS Cut Metal Dimensional Letters as manufactured by ASI Sign Systems, Inc., or approved equal.
 - 2. ASI Sign Systems, Inc.: www.asisignage.com.
 - 3. Cosco Industries; Cast Aluminum: www.coscoarchitecturalsigns.com.
 - 4. FASTSIGNS: www.fastsigns.com/#sle.
 - 5. Inpro: www.inprocorp.com/#sle.

6. Metallic Arts: www.metallicarts.com
7. A.R.K. Ramos Signage Systems: www.arkramos.com
8. Seton Identification Products: www.seton.com/aec.
9. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
 1. Requirements for Persons with Disabilities: Provide identifying devices meeting the requirements for the physically disabled of the following codes:
 - a. California Building Code (CBC) Title 24, Part 2; Chapter 11B, Accessibility.
 - b. Code of Federal Regulations 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.
 2. Raised characters shall comply with CBC 11B-703.2.
 - a. Depth: It shall be 1/32 inch minimum above their background and shall be sans serif uppercase and be duplicated in Braille.
 - b. Height: It shall be 5/8 inch minimum and 2 inches maximum based on the height of the uppercase letter "I". CBC Section 11B-703.2.5
 - c. Finish and contrast: Characters and their background shall have a non-glare finish. Character shall contrast with their background with either light characters on a dark background or dark characters on a light background. CBC Section 11B-703.5.1
 - d. Proportions: It shall be selected from fonts where the width of the uppercase letter "O" is 60 % minimum and 110 % maximum of the height of the uppercase letter "I". Stroke thickness of the uppercase letter "I" shall be 15% maximum of the height of the character. CBC Sections 11B-703.4 and 11B-703.6
 - e. Character Spacing: Spacing between individual tactile characters shall comply with CBC Section 11B-703.2.7 and 11B-703.2.8
 - f. Braille: It shall be contracted (Grade 2) and shall comply with CBC Sections 11B-703.3 and 11B-703.4. Braille dots shall have a domed and rounded shape and shall comply with CBC Table and Figure 11B-703.3.1.
 - g. Mounting height: A tactile sign shall be located 48 inch minimum to the baseline of the lowest Braille cells and 60 inches maximum to the baseline of the highest line of raised characters above the finish floor or ground surface.
 - h. Mounting location: A tactile sign shall be located on the approach side, as one enters or exits rooms or space, and be reached within the required clear floor space per CBC Section and Figure 11B-703.4.2 as follows:
 - 1) a clear floor space of 18 x 18 inch minimum, centered on the tactile characters, shall be provided beyond the arc of any door swings between the closed position and 45 degree open position.
 - 2) on the wall at the latch side of a single door.
 - 3) on the inactive leaf of a double door with one active leaf.
 - 4) on the wall at the right side of a double door with two active leaves.

- 5) on the nearest adjacent wall where there is no wall space at the latch side of a single door or no space at the right side of a double door with two active leaves.
- i. Visual characters shall comply with CBC Section 11B-703.5 and shall be 40 inches minimum above finish floor or ground.
- j. Pictograms shall comply with CBC Section 11B-703.6.
- k. Symbol of accessibility shall comply with CBC Section 11B-703. 7.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.

- 1. Sign Type: Flat signs with injection molded or etched panel media as specified.
- 2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
- 3. Character Height: 1 inch.
- 4. Sign Height: 3 inches, unless otherwise indicated.
- 5. Exits: Provide raised character and Braille exit signs per CBC Section 1011.4 at the following locations:

<u>Location</u>	<u>Text</u>
Grade level exit door	EXIT
Exit door to exit stair	EXIT STAIR DOWN, EXIT STAIR UP
Exit door to exit ramp	EXIT RAMP DOWN, EXIT RAMP UP

C. Building Identification Signs:

- 1. Use individual metal letters.
 - a. Building Address Numbers.
- 2. Mount on outside wall in location indicated on drawings.

D. Other Dimensional Letter Signs: Wall-mounted.

- 1. Exterior: Allow for total of 50 letters, 12 inches high, metal.
- 2. Exterior quantities, wording, and custom logo shapes, as indicated on Drawings.

2.03 SIGN TYPES

A. Flat Signs: Signage media without frame.

- 1. Edges: Square.
- 2. Corners: Square.
- 3. Clear Cover: For customer produced sign media, provide clear cover of polycarbonate plastic, glossy on back, non-glare on front.
- 4. Wall Mounting of One-Sided Signs: Tape adhesive.
 - a. Provide visually matching back plate when mounted on a glass surface.

B. Color and Font: Unless otherwise indicated:

- 1. Character Font: Helvetica, Arial, or other sans serif font.
- 2. Character Case: Upper case only.
- 3. Background Color: Clear.
- 4. Character Color: Contrasting color.

2.04 TACTILE SIGNAGE MEDIA

- A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
 - 1. Total Thickness: 1/8 inch.
- B. Injection Molded Panels: One-piece acrylic plastic, with raised letters and braille.
 - 1. Total Thickness: 1/8 inch.

2.05 DIMENSIONAL LETTERS

- A. Fabricated Letters:
 - 1. Height: As indicated on Drawings.
 - 2. Depth: As indicated on Drawings.
 - 3. Letter style: As indicated on Drawings.
- B. Metal Letters:
 - 1. Metal: Aluminum, welded fabrication.
 - a. Finish: Brushed, satin.
 - b. Color: To be selected by Architect from full range.
 - 2. Overcoat: Manufacturer's standard baked-on clear coating.
 - 3. Mounting: Projecting Stud Mount.

2.06 ACCESSORIES

- A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
- B. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material.
- C. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material.
- D. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.
- E. Exposed Screws: Stainless steel.
 - 1. Exposed fasteners are permitted only where specifically indicated, and shall be tamper proof stainless steel, countersunk, and may be painted or finished to match adjacent surfaces.
- F. Tape Adhesive: Double sided tape, permanent adhesive.
- G. Adhesives:
 - 1. Type recommended by the manufacturer of the material specified to be laminated or adhered.
 - 2. No adhesives that fade, discolor or delaminate as a result of proximity to sunlight or heat therefrom shall be used.

3. Adhesives shall not change the color or otherwise deteriorate the materials to which they are to be applied.
 4. The adhesives shall be of non-staining, non-yellowing quality.
- H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Do not start work until deficiencies have been corrected. Start of work of this section constitutes acceptance of the surfaces.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Mounting Method:
 1. Mount signs to surfaces with a minimum of four countersunk tamperproof stainless steel fasteners.
 2. Provide anchorage where necessary for fastening signs securely in place.
 - a. Anchorage not otherwise specified or indicated shall include expansion shields and power-driven fasteners;
 - 1) when approved:
 - (a) for concrete and masonry;
 - (b) toggle or molly bolts to plaster surfaces;
 - (c) full threaded wood screws to wood doors;
 - (d) machine or metal screws to metal doors.
 - b. Provide backing plates for mounting to expanded metal substrates.
 3. Adhere signs to glass with adhesive.
 - C. Install neatly, with horizontal edges level.
 - D. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
 1. Room and Door Signs: Locate on wall at latch side of door a minimum of 48 inches to the baseline of the lowest braille cells; with top of highest line of raised character text at 60 inches above finished floor.
 - a. Comply with CBC 11B-703.4.1
 - E. Protect from damage until Substantial Completion; repair or replace damaged items.

3.03 ADJUST AND CLEAN

- A. Repair damage to signs incurred during installation. Replace signs which cannot be repaired to new condition. Clean glass, frames, and other sign surfaces, adjust hardware for proper operation.

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 three 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
 - l. 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

1. 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 16050 Paragraph 2.11, etc.*).
 - b. 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 - 16050 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 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 duration 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.

3. 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 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.

1.14 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.

1.15 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.

1.16 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.

2. 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 Study.
 - 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.

1.17 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.

1.18 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.

1.19 EQUIPMENT SEISMIC AND WIND LOAD REQUIREMENTS (ADDITIONAL REQUIREMENTS)

- A. Seismic Performance and Seismic Restraint Requirements
 - 1. 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
 - 1. 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. Aero-dynamic 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 re-enforcing 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.

1.20 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 (±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
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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, 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 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 quantity 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 water-tight 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 boxes of proper Code size for the number of wires or conduits passing through or terminating therein. In no case shall 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 or Conduit "homerun" connects to outlet box.
4. Signal, Communication and Low Voltage:
 - a. Individual audio/visual, telephone, computer or data outlets: 4.69-inches square by 2.125-inch deep minimum with two gang extension ring on flush boxes.
 - b. Combination signal/telephone/data or computer outlets: 4.69-inches square by 2.125-inch deep minimum with two-gang wide extension ring on flush boxes.
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 by 4.69-inches by 2.5-inches deep, but not less than size indicated on the Drawings or required by code.
6. Provide extension rings on flush outlets to finish face of extension ring flush with finished building surfaces. Extension ring shall match outlet box construction and contain "attachment mounting-tabs" for wiring devices. Extension rings shall be "screw-attached" to respective outlet 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.
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.
 - 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, 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 finishes.
 13. Outdoor flush in wall device outlet boxes:
 - a. Flush in wall, gasketed water tight, with hinged, key locking cast metal, self-closing cover. Tamper resistant and vandal resistant. UL-listed and labeled for installation in masonry, cast-in-place concrete and hollow-framed walls.
 - b. Flush cast-iron or cast-bronze device back-box, 4.68-inch square by 2.25-inch deep.
 - c. Internal metal adapter plate and wiring device types, in the box as indicated on the Drawings.
 - d. As manufactured by Legrand/Pass and Seymour #4600 Series; or C.W. Cole #310 Series.
 14. Refer to Architectural and Structural Contract Documents and details for Additional Box and Install Requirements.
- B. Surface Outlet Boxes
1. 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.

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 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 weather-tight cover of same material. Manufacturer's standard baked exterior enamel finish.
- C. Concrete Pull Boxes and Hand-holes
1. H-20 traffic 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 blocks.
 2. Boxes shall be "Intercept" type with multiple sections and 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-Spring" assist, hinged open-close.
 4. Box covers shall comply with Federal ADA, UL, State and Local AHJ for slip resistance. Provide bead weld on cover to 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-inch thick and extend 6-inches beyond box base on all sides. Provide a ¾-inch by 10-foot copper clad ground rod through the box bottom with 9-inch projection into box, for grounding all metal parts with #10awg copper bond wire.
 6. After cables have been pulled, connected, tested and inspected, seal all box joints and seal box between cover and frame with a mastic compound similar to Parmagum or Dukseal.
 7. As manufactured by Jensen Precast; or Oldcastle Precast.

2.03 SWITCHES

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 District's Representative. Switches 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 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>	<u>Lock Type</u>
Hubbell	#HBL1221	#HBL1221-L
Legrand/P&S	#20AC1	#20AC1-L
Leviton	#1221	#1221-L
Cooper-Arrow/Hart	#AH1221	#AH1221-L

2. Double Pole Switch – 20 amp at 277V

<u>Manufacturer</u>	<u>Toggle Type</u>	<u>Lock Type</u>
Hubbell	#HBL1222	#HBL1222-L
Legrand/P&S	#20AC2	#20AC2-L
Leviton	#1222	#1222-L
Cooper-Arrow/Hart	#AH1222	#AH1222-L

3. Three-Way Switches – 20 amp at 277V

<u>Manufacturer</u>	<u>Toggle Type</u>	<u>Lock Type</u>
Hubbell	#HBL1223	#HBL1223
Legrand/P&S	#20AC3	#20AC3-L
Leviton	#1223	#1223-L
Cooper-Arrow/Hart	#AH1223	#AH1223-L

4. Four-Way Switches – 20 amp at 277V

<u>Manufacturer</u>	<u>Toggle Type</u>	<u>Lock Type</u>
Hubbell	#HBL1224	#HBL1224-L
Legrand/P&S	#20AC4	#20AC4-L
Leviton	#1224	#1224-L
Cooper-Arrow/Hart	#AH1224	#AH1224-L

5. Momentary Contact Switches – 20 amp at 277V

<u>Manufacturer</u>	<u>Regular</u>	<u>Lock</u>
	3-Position	3-Position
Hubbell	#HBL1557	#HBL1557-L
Legrand/P&S	#1251	#1251-L
Leviton	#1251	#1251-L
Cooper-Arrow/Hart	#AH (extra)	#AH (extra)

6. Maintained Contact Switches (Double Throw, Center Off) – 20 amp at 277V

<u>Manufacturer</u>	<u>Toggle Type</u>		<u>Lock Type</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. 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.

D. 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 RECEPTACLES

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-to-metal 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 same Manufacturer.
3. Receptacle color as selected by District’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, guestrooms, condominiums, housing/residences, apartments, dwellings, hotels/motels, secondary schools K through 12th grade, child-care/day-care/kindergarten, hospital pediatric-care units and other locations required by AHJ.
 - b. The electrical receptacles shall be rated “Tamper-Resistant-Receptacle” (TR), UL-TR (TRTR). 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:
 - 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.
 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.).
- 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. 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>	<u>NEMA 5-20R-GFCI</u>
a. Legrand/P&S	#5262	#5362	#2095HG
b. Leviton	#5262	#5362	#W7899
c. Hubbell	#CR5252	#5362	#GFR8300
d. Cooper-Arrow/Hart	#AH5262	#AH5362	#WRVGF20
- C. 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.
 3. 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" conduit water tight cast metal body, with weather-proof spring door type covers, gasket water tight. Door shall be key locking-type or padlock-type.
- D. 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

Provide cover plates for every switch, receptacle, telephone, computer, television and other device outlets. All plates shall be 0.040-inch stainless steel, Type 302 alloy composed of 18% chromium and 8% nickel. Plates shall be manufactured by P&S, Hubbell, Leviton or General Electric.

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 District 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-of-doors 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 RELAYS, CONTACTORS AND TIME SWITCHES

A. Individual Control Relays (HVAC Plumbing of the Control Functions)

1. 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, 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

1. All time-switches shall have synchronous motor drive for operation on 120 or 277 volts, 60Hz, AC and shall be furnished with a ten-hour, spring-driven, reserve-power motor. Contacts shall be rated 40A per pole.
 - a. Exterior lighting time-switches 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 time-switches for control of individual circuits or electrically operated relays shall be Tork 7000 Series or approved equal by Paragon or Intermatic.
 - c. Time-switches 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 time-switches 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/Time-Switch Cabinet

1. Contactors, relays, and/or time-switches 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 time-switch 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 time-switches they shall have a clear acrylic shield installed over each relay or contactor to guard line exposed parts from accidental contact by non-authorized personnel.

2.09 DISCONNECTS (SAFETY SWITCHES)

A. General

1. Disconnect switches shall all be rated:
 - a. 600 volt 60Hz AC for all safety switches.
 - b. NEMA Type HD, quick-make, quick-break, H.P.-rated.
 - c. Fused Class "R", in NEMA Type I enclosure, lockable.
 - d. Number of poles 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. Where enclosure is indicated W.P. (Weather-Proof) switches shall be raintight NEMA Type HD and NEMA 3R enclosure, lockable.
4. 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.
5. Switch and fuses ampere rating shall also comply with Manufacturer recommendation for the connected load.

2.10 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 ¾-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 screen.

- 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.

2.11 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 gages.
 - 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 "split-box" 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 fire-rated 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 centerline, completely enclosing the outlet box.
 - c. The backing shall consist of the following:
 - 1) $\frac{5}{8}$ -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 after installation and circuit connection is complete.
 - b. Test all devices for correct polarity and proper electrical energization.
 7. Install and adjust all coverplates to be flush and level, with correct device 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.
 2. 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.

3.05 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
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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 ampere RMS.
 - 2) 2.0 inch and larger conduit/fitting size - 20,000 ampere RMS.
 - b. FMC and LTFMC Conduit Fittings
 - 1) 0.5 inch through 1.25-inch conduit/fitting size-1,000 ampere RMS (without external bonding jumper).
 - 2) 1.5 inch through 4.0-inch fitting size-10,000 ampere 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:
 - a. 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.
 - 1) 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 2 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.

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. 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 watertight.
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.

- 3) 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
- H. 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
- 1. 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>	<u>480/277 Volt</u>
Ground Green	Ground Green
Phase A Black	Phase A Brown
Phase B Red	Phase B Orange
Phase C Blue	Phase C Yellow
 - 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	
<u>480/277 Volt</u>	
Provide a continuous stripe on each conductor insulation blue or black, 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.
 - b. 277/480 volt; Phase A - White with Brown stripe; Phase B - White with Orange stripe; Phase C - White with Yellow 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, compact-stranded, 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.

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 above-identified 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/ raceway, with the respective phase conductors:

<u>Feeder, Subfeeders & Branch Circuit Protection</u>	<u>Min. Equipment Ground 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:
- Ground buses with listed and approved ground lugs.
 - 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. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

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. 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 24-inches 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:
 - 1) 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 Seismic Zone 4 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 12-inches.
 - 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 5-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 cures 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
 - 1) 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.
 - 2) 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 12-inches 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 or 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.
 - l. 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>	<u>Fitting Length Spacing</u>
1)	RMC and EMT	Exposed exterior locations	200-feet
2)	RMC and EMT	Interior weather protected locations	400-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 non-hardening mastic, a minimum of 0.25-inch thickness. Mastic shall be inorganic, non-hardening, and complying with ASTM-D1227. Mastic shall be applied with continuous uniform coverage, minimum 0.25-inch 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: Complete the required work prior to installing any conductors or cables in respective existing conduits.
 - a. “Rod” out existing raceways to be used under this contract, with approved test and flexible mandrels to remove all obstructions to clear debris from inside conduits.
 - b. 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-inches on center. Tag all spare conductors.

3.05 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 1/4-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.

END OF SECTION 26 05 30
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SECTION 27 20 00
ELECTRONIC NETWORK SYSTEMS INFRASTRUCTURE

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 Specifications Sections and Drawings for related work required to be included as work under Division 26.
 - 2. General Provisions and Requirements for electrical work.
- B. Provide Electronic Network Systems Infrastructure for the following systems:
 - 1. Computer Data Networks
 - 2. Telephone and Intercom Voice Communications
 - 3. Other special systems described in the Contract Documents.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. Drawings Submittals
 - 1. Drawings shall be submitted on reproducible sepias and AutoCAD® Version 2.2 (or later revision) data files on CD/DVD-ROM disk, WINDOWS®-XP or Version-7 or Version-8 format.
 - 2. Submit redrawn Building Floor Plan for each building area, same scale as the Contract Drawing.
 - 3. Plans shall show walls, doors, windows, furniture, infrastructure, outlets and network systems equipment locations. Show point-to-point interconnecting cables, pathways, conduit, conduit sizes, circuit types, along with circuit identification names, numbers and quantities between all components.
 - 4. Provide Scaled Elevation Drawings of each equipment rack, terminal blocks, terminal backboard and terminal room/closet showing location and arrangement of each equipment component, outlet and cable training provisions, with estimated weight of each complete assembly.
 - 5. Submit block wiring diagrams showing major system components, outlets, equipment racks, terminal blocks, signal loss with interconnecting circuit conductors, splices, portable patch cords and connectors. Riser type diagram shall be provided if the building has more than one floor level, with information shown on riser diagram corresponding for each respective floor.
- B. Submit Manufacturer's standard catalog data for each component. The submittal shall be arranged in the order of the Specification and shall list the Specification paragraph number, the name, the proposed model and Manufacturer for each item as well as a reference indicating the specific piece of data which can be easily located in the brochure. The Manufacturer's data sheets shall be marked to indicate the specific item being proposed in

cases where the sheet covers several types or sizes of items. The data sheet shall completely describe the proposed item. Where modification to the equipment is necessary to meet the Operational Requirements of the Contract Documents, the brochure shall include complete Mechanical and Electrical Shop Drawings, detailing the modification. The brochure shall include a listing of the Outlet Rough-In Requirements for every device and equipment item. The applicable symbol which illustrates that rough-in item on the Job Plans shall be drawn on the proposal, opposite the description of the rough-in to facilitate locating the data by Field Personnel. Submit elevation and dimensional information.

- C. Performance Calculation:
1. Provide engineered calculations showing the Passive Cable System Signal Attenuation losses of the proposed installed system. The intent is not to require calculations for every system segment, port and outlet. The intent is to require engineered calculations for proposed typical worst case port to port; head end to farthest distance outlet and patch port to outlet signal attenuations.
 2. Provide calculations for a minimum of 50 complete channel/circuit paths. The calculations shall include attenuation insertion losses for each system component including individually itemized cable-fiber/wire; outlet, termination, connector, electronic component (if any), coupler and patch cord along the entire path from the head end equipment to the end use outlet.
 3. The calculations shall serve as the basis for verifying the system performance with the system testing specified in the Contract Documents.
- D. Provide proposed nameplate and outlet identification/color coding system. Indicate proposed identification naming sequence and methods, itemized for review.
- E. Submit Manufacturer Certified Test Reports showing test documentation for the proposed material that the material meets or exceeds the Performance Standards defined in the Contract Documents. The testing and results shall reflect worst case performance based on a minimum of ten samples. Tests shall be certified by a Nationally Recognized Independent Test Lab (i.e., ETL, UL, etc.). The Manufacturer shall certify in writing the material has been manufactured and tested to comply with the Requirements defined in the Contract Documents.
- F. Submit three samples of each of the following, fully assembled with 24-inches of cable type connected:
1. Copper wire outlet and connector, with each type of specified inserts.
 2. Copper cables and patch cords, each type.
 3. Fiber optic cables and patch cord each type.
 4. Mechanical splice - fiber optic.
 5. Fusion splice - fiber optic.
 6. Fiber optic outlet and connector each type.
 7. Fiber optic cable connector each type of termination, with interconnection coupler.
 8. Patch panel each type.
 9. Coverplate each type.

1.03 APPLICABLE STANDARDS

- A. Individual Component Production/Manufacturer Testing and Labeling.
 - 1. The equipment shall be UL listed, labeled, and approved for the application shown in the Contract Documents.
 - 2. ETL (USA) each network systems infrastructure component. Third party testing, documentation and certification for performance compliance of each component with the UL, ANSI, TIA and EIA Applicable Standards specified in the Contract Documents.
- B. The complete system material, equipment, testing, installation, workmanship and installed performance shall comply with the Mandatory Requirements and the Guideline/Recommendation Requirements of the following latest published version, supplements, latest revision including Addendums and TSB. Both the mandatory and advisory criteria shall be included as Requirements of the Contract Documents:
 - 1. TIA-526 Optical Power and loss measurements – multimode and single mode fiber.
 - 2. ANSI/TIA/EIA-568C Commercial Building Telecommunications Standards.
 - 3. ANSI/TIA/EIA-569B – Commercial Building Standards for Telecommunications Pathways.
 - 4. ANSI/TIA/EIA-570A Residential Telecommunications Standard.
 - 5. ANSI/TIA/EIA-598B Optical Fiber Cabling Color-Coding.
 - 6. ANSI/TIA/EIA-606A Administrative Standard for Commercial Telecommunications Infrastructure.
 - 7. ANSI/TIA/EIA-607 Commercial Buildings Grounding and Bonding Requirements for Telecommunications.
 - 8. FCC – FYU/FT6.
 - 9. ISO/IEC 11801
 - 10. National Electrical Code (NEC) and California Electrical Code (CEC) including Articles 770 and 800 with ETL verified testing and Local Code Jurisdictions.
 - 11. NECA/NEIS, National Electrical Contractors Association, National Electrical Installation Standards:
 - a. 301 – Standard for Installation and Testing for Fiber Optic.
 - b. 568 – Standard for Installing Building Telecommunications Bonding and Grounding.
 - c. 607 – Telecommunications
 - 12. Manufacturer's recommendations for the respective equipment.
- C. Network Performance
 - 1. The entire completed Electronic Network Systems Infrastructure shall be tested and provide electronic data/network and telephone/voice multi-channel communications latest Revisions, Standards and Addendums for the following protocols:
 - a. IEEE 802.3/ETHERNET latest revisions.
 - 2. Twisted pairs copper wire (100 meter path length unless indicated otherwise)
 - a. 10Mbps 10Base-T, 100Mbps 100Base-Tx;
 - b. 1000Mbps (1Gbps) 1000 Base-Tx;
 - c. 10,000 Mbps (10Gbps) 10Gb Base-Tx.

- d. IEEE-802.3 for Power Over Ethernet (POE) and Power Over Ethernet-Plus (POE Plus).
- 3. Fiber optic, 550 meter communications pathway distance, OM4 Standard multimode and OS2 single-mode.
 - a. 10Mbps 10Base-F1, 100Mbps 100Base-FX,
 - b. 1000Mbps 1000Base-Lx-Sx
 - c. 10,000 Mbps (10Gbps) for fiber optics
 - d. Single Mode path length performance increase Requirement to 3000 meters.
- 4. IEEE 802.5/TOKEN RING.
- 5. APPLETALK (Phone-net).
- 6. FDDI – Distributed data interface on fiber or copper wire, 100Mbps.
- 7. 100VG – Any LAN
- 8. TIA/EIA serial and Bi-directional RS-232 and RS-485, including Star-Hub repeaters.
- 9. ANSI – TPPMD 55Mbps, 155Mbps and 622Mbps Asynchronous Transfer Mode - ATM.
- D. The Complete Telephone/Voice Infrastructure System shall be suitable for the telephone/ voice analog and digital communications and VoIP protocols. The system shall be compatible with the telephone/voice equipment installed as part of the Contract.
- F. Installation of All Infrastructure Equipment, Devices, Splices, Terminations, Cables, Outlets, etc. shall comply with Manufacturer's recommendations.

1.04 EQUIPMENT QUALIFICATIONS

- A. Equipment
 - 1. The Supplier of the equipment shall be the Factory Authorized Distributor and service facility for the brands of equipment and material provided.
 - 2. Network systems infrastructure equipment and materials shall all be the product of one of the individual same Manufacturers as follows. Typical unless specifically described otherwise:
 Belden – 10GX Series; or CommScope-Systimax X10D Series;
 or AMP/Tyco – NetConnect Series;
 or Ortronics/Legrand – NetClear Series;
 or Siemon – Converge IT Series.
 or to match existing currently used on campus.
- B. Installation Certification
 - 1. Work and material for cables, cable terminations, outlets and related components for infrastructure systems shall be performed by Certified Installers. The Installer shall be certified by the respective Product Manufacturers.
 - 2. The Manufacturers of the indicated work and material shall provide an Installer education/training and certification program for the supplied products.
 - 3. The Installers performing the Contract Work for the indicated products shall have attended and successfully completed each of the respective Manufacturer's installation training education programs for the specified products.

4. Submit six copies of the Manufacturer's Certifications for each Installer performing the work. The submittal shall be approved by the Owner's Representative prior to initiating any related Contract Work.
 5. Contract material installed and work performed by Installers not complying with these Requirements shall be removed. Removal of work and material not in compliance with these Requirements shall be done at the Contractor's expense, without any additional cost to the Contract and without any additional Contract completion due date extensions. New material and work required to replace the non-complying removed work and material shall be provided at the Contractor's expense, without any additional cost to the Contract and without any Additional Contract completion due date extensions.
- C. Extended Material and Performance Warranties
1. In addition to the Warranty Requirements described elsewhere in the Contract Documents, provide the following extended material and performance warranties. The warranty period shall be for not less than 15-years from the Contract Notice of Completion.
 2. Warranty scope includes materials and performance for network cables and terminations, network workstation plug-in outlets, and patch panel plug-in outlets, cable splices and connectors.
 3. Repair or replace the defective material with new material at the Project premise, to comply with the Performance Standards outlined in the Contract Documents during the warranty period.
 4. Submit seven copies of proposed warranty statements, with Shop Drawing submittals.

1.05 ABBREVIATIONS

<u>Abbreviation</u>	<u>Terminology</u>
ACR.....	Attenuation to Cross Talk.
AHJ	Authority Having Jurisdiction.
Backbone.....	Circuit interconnections between MDF and IDF patch panel locations.
dB	Decibel.
dBm.....	Decibel referenced to a milliwatt.
Demarc.....	Demarcation location where operational control change occurs or ownership change occurs.
ft.....	Feet.
GHz.....	Gigahertz.
Gbps	Gigabits per second.
Horizontal Connection, and/or Horizontal wiring	Circuit interconnections between individual workstation outlet location to respective IDF or MDF equipment rack patch panel.
IDF	Intermediate Distribution Frame (horizontal or vertical cross connect) for an individual building area/floor.
km	Kilometer-lkm.
kPSI.....	1000 pounds per square inch.
m	Meter = 39.37 inches.

Mbps	Megabits per second.
MDF.....	Main Distribution Frame (central/main cross connect) for multi-building site or for a single individual building.
MHz.....	Megahertz.
MIC.....	Micrometer
mm.....	Millimeter = 10 ⁻³ meter.
NEXT.....	Near end cross talk.
nm.....	Nanometer = 10 ⁻⁹ meter.
pF.....	Picofarad = 10 ⁻¹² farad.
Provide	Furnish, install and connect.
RTDE.....	Equipment rack mount fiber optic termination distribution enclosure, with fiber optic patch panel.
RMSE.....	Equipment rack mount fiber optic enclosure, splice only (without patch panel).
STP.....	Shielded individual twisted pairs copper wire.
ScTP.....	Shield Screened Twisted Pairs copper wire.
Trunking-Cable.....	Individually insulated twisted pair copper wire cable, consisting of 24-pair or more of conductors inside a common cable jacket. Terminate and connect to common terminal-block location at each end of the trunking-cable.
um.....	Micrometer = 10 ⁻⁶ meter.
USE.....	Universal Splice Enclosure.
UTP.....	Unshielded twisted pairs copper wire.
VoIP.....	Voice communications Over Internet Protocol.
WGNA	Wide Band Gigabit Networking Alliance.
Workstation or	Spaces remote from the MDF/IDF terminal room/ closet, where user equipment interacts and connects with the electronic systems infrastructure equipment connection outlet device.
Workstation location	
WMIC	Wall Mount fiber optic cable Interface Cabinet.

1.06 MATERIALS AND METHODS

- A. Material and Labor not complying with the Contract Documents shall be removed by the Contractor from the Project Site. Material and labor complying with the Contract Documents shall be provided.
- B. All the cost to remove deficient work and material, provide work and material complying with the Contract Documents and 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.
- C. System Performance Requirements
 - 1. The work, performance and type of materials provided as part of the Contract shall comply with the following ANSI/TIA/EIA-568C and related Standards for all Electronics Network Systems Infrastructure work and materials described in the Specifications and shown the Drawings:
 - a. Computer/Data Network systems: Category-6

- b. Telephone/Intercom Voice systems: Category-6
2. The Electronic Network Systems Infrastructure system shall be based on “star-topology”; for MDF to IDF backbone connections and workstation outlet to MDF/IDF horizontal connections.

PART 2 PRODUCTS

2.01 FIBER OPTICS CABLES

A. General

1. Operating temperature range - 20 degrees centigrade through +60 degrees centigrade. Cables shall be flame retarding.
2. Electronic network systems infrastructure cables that are not installed inside conduit raceways. Electronic network systems infrastructure cables that are installed in concealed spaces including plenums and non-plenums; access floors, ceiling spaces, walls, floor, etc., and/or installed without continuous raceways. The cable insulation and jacket shall be listed and labeled “Limited Combustible Cable” (LC or LCC) and shall comply with the latest published revision of all of the following Additional Requirements.
 - a. Limited combustible “FHC-25/50” per UL-2424.
 - b. NEC/CEC;CMP, additional listing/labeling where the install location is an environmental air plenum, fiber optic “FHC-25/50-CMP and/or OFNP/OFCP”.
 - c. NFPA-90A; ceiling cavity plenums, wall cavity spaces and raised floor cavity plenums, limited-combustible.
 - d. NFPA-5000; defines combustible material including wire and cable.
 - e. NFPA-75 computer rooms and electronic equipment room.
 - f. NFPA-13; spaces containing “limited combustible loading”.
3. Cables shall qualify as 100% recyclable materials disposal, RoHS Regulation complaint.
4. All fibers in a multi-fiber cable shall be fully operational within the performance characteristics specified prior to and after the cable is installed. The use of spare fibers in the cable to compensate for defective fibers is not permitted. Defective cables shall be removed and replaced with fully functional cables at no additional cost to the Contract.
5. Cables shall be UL listed, complying with National Electrical Code, ETL Tested and certified to comply with specified Requirements. ANSI/TIA/EIA-568C including related Standards, Amendments and TSB.
6. Each fiber shall be individually identified with factory color-coding or factory imprinted label. The outer cable jacket shall be imprinted with date, Manufacturer's model and catalog number, along with Agency listing identification.
7. Fiber optic cable shall be a product of the same Manufacturer, including portable patch cables.
8. Cables installed in raceways or conduits below grade, through in-grade manholes or pullboxes shall be rated for installation in water/wet locations.
9. Provide overall outer jacket enclosing all fibers inside jacket. Cables containing less than seven fiber strands shall be provided with a color coded outer jacket (red or orange).

10. Multimode (62.5/125)
 - a. Fiber optic cables optical fibers, (62.5/125) graded index multimode optical glass fibers, 62.5 micron fiber core and 125 micron fiber cladding, 0.275 numerical aperture. Optical fibers shall be 100 kpsi proof tested, with maximum 0.7 micron flaw size for dual operation at 850nm and 1300nm wave lengths.
 - b. Minimum bandwidth:

@ 850nm - wave length	160MHz per km length
@ 1300nm - wave length	500MHz per km length
 - c. Maximum attenuation:

@ 850nm-wave length	3.4 dB @ 1km length
@ 1300nm-wave length	1.0 dB @ 1km length
 - d. Laser-optimized "OM2" optical multi-mode standards.
 11. Multimode (50/125)
 - a. 50/125 fiber optic cables optical fibers, graded index multimode optical glass fibers, 50.0-micron fiber core and 125-micron fiber cladding, 0.2 numerical aperture. Optical fibers shall be 100 kPSI proof tested, with maximum 0.7 micron flaw size for dual operation at 850nm and 1300nm wave lengths.
 - b. Minimum bandwidth:

@ 850nm-wave length	3500Mhz per km length
@ 1300nm-wave length	500Mhz per km length
 - c. Maximum attenuation:

@ 850nm-wave length	3.0db @ 1km length
@ 1300nm-wave length	1.0db @ 1km length
 - d. Laser-optimized "OM4" optical multi-mode standards.
 12. Single mode:
 - a. Fiber optic cables optical fibers, (8.3/125) single mode optical glass fibers, 8.3-micron core fiber and 125-micron fiber cladding, 0.11 numerical aperture. Optical fibers shall be 100-kPSI proof tested, with maximum 0.7-micron flaw size. For operation at 1310nm and 1550nm wave lengths.
 - b. Maximum attenuation:

@ 1310nm- wave length	0.5 dB @ 1km length
@ 1550nm- wave length	0.4 dB @ 1km length
 - c. Maximum dispersion

@ 1310nm- wave length	2.8 ps/nm km length
@ 1550nm- wave length	18.0 ps/nm km length
 - d. Laser-optimized "OS1"/"OS2" optical single mode standards.
- B. Loose Tube Gel-filled Cables
1. Multiple, loose tube buffer tubes, gel-filled. Each buffer tube shall contain the same quantity of optical fibers, but not more than twelve optical fibers in each buffer tube.
 2. Buffer tubes shall be cabled around a central dielectric strength member. The central strength member shall be centered along the length of the cable.
 3. Aramid yarn, non-optical, strength fibers shall extend continuously along the length of the cable.

4. The cable interstitial spaces shall be flooded to inhibit water migration, with non-flammable water blocking gel.
 5. Each optical fiber shall be individually UV cured acrylate coated, 250-micron diameter coating over fiber cladding.
 6. A seamless black polyethylene outer layer jacket shall envelope the entire cable.
 7. The cable shall be fungus resistant, UV resistant, and moisture resistant for installation indoors with or without an enclosed raceway and outdoors in underground enclosed raceway/conduit and manholes/pullboxes continuously flooded with water.
- C. Indoor/Outdoor Cables
1. The cable shall be fungus resistant, UV resistant, and moisture resistant for installation indoors with or without an enclosed raceway and outdoors in underground enclosed raceway/conduit and manholes/pullboxes continuously flooded with water, and in conduits exposed to the sun.
 2. Each optical fiber shall be primary coated with 500 micron uniform acrylate tight buffered and with elastomeric uniform 900-micron diameter tight buffered, secondary coating. Aramid yarn strength member elements shall be tensioned and symmetrically and uniformly distributed around the fibers, along the length of the cable.
 3. An overall cable jacket uniformly extruded directly around and mechanically interlocked with the optical fibers/strength members. The extruded jacket shall form internal helical cusped ridges that interlock with the optical fibers and strength members. The interlocking jacket shall not allow cable fibers to move axially within the cable jacket.
 4. Cables containing more than 24-optical fibers shall be constructed with sub-cable fiber bundles. Each sub-cable bundle shall contain equal quantities of optical fibers, with a separate PVC jacket around each sub-cable. Sub-cable and sub-cable jacket construction shall match the Overall Cable Requirements and Jacket Requirements.
 5. The cable shall be UL listed and comply with NEC and NFPA Requirements for each installation location shown in the Contract Documents. ETL tested and certified to comply with or exceed specified Requirements.
 - a. NEC – OFNR (Vertical Riser Type Locations) OFNP (UL FHC-25/50 LC Plenum Type Locations and locations where not continuously enclosed inside conduits for entire cable length).
 - b. NEC – OFNG (where continuously enclosed inside conduits for entire cable length).
- D. Tight Buffered Cables
1. Each optical fiber shall be coated, 900-micron diameter uniform coating, with uniform tight buffering over the coating, uniform dielectric strength member surrounding the buffering coating and an overall jacket around each optical fiber assembly.
 2. Individual multiple optical fiber assemblies shall be symmetrically arranged around a central dielectric strength member. The central strength member shall be centered along the length of the cable.
 3. A dielectric strength member shall surround the fiber assemblies.
 4. An outer dielectric jacket shall envelope the entire cable.

5. The cable shall be UL listed and comply with NEC and NFPA Requirements for each installation location shown in the Contract Documents. ETL tested and certified to comply with or exceed specified Requirements.
 - a. NEC - OFNP (UL FHC-25/50 LC Plenum type locations and locations where not continuously enclosed inside conduits for entire cable length).

2.02 COPPER WIRE CABLES (TWISTED PAIRS)

A. General

1. Conductors shall be copper wire, individually insulated and color coded, with multiple conductors arranged in twisted pairs.
2. An overall non-conductive jacket shall encase the copper wires and any shielding (where shielding is specified) shall also be encased by the jacket.
3. Cables shall be UL listed, complying with NEC National Electrical Code, National Fire Protection Agency and NFPA Requirements for each installation location shown. ETL tested and certified to comply with or exceed specified Requirements.
 - a. NEC – MPP/CMP, FHC-25/50 (Plenum type locations and locations where not continuously enclosed inside conduit).
 - b. NEC – MPR/CMR (Vertical riser type locations).
 - c. ANSI/TIA/EIA-568C; including related standards, amendments and TSB.
4. Electronic network systems infrastructure cables that are not installed inside conduit raceways. Electronic network systems infrastructure cables that are installed in concealed spaces including plenums and non-plenums; access floors, ceiling spaces, walls, floor, etc., and/or installed without continuous raceways. The cable insulation and jacket shall be listed and labeled “limited combustible cable” (LC or LCC) and shall comply with the latest published revision of all of the following Additional Requirements.
 - a. Limited combustible “FHC-25/50” per UL-2424.
 - b. NEC/CEC;CMP, additional listing/labeling where the install location is an environmental air plenum, copper wire “FHC-25/50-CMP”.
 - c. NFPA-90A; ceiling cavity plenums, wall cavity spaces and raised floor cavity plenums, limited-combustible.
 - d. NFPA-5000; defines combustible material including wire and cable.
 - e. NFPA-75 computer rooms and electronic equipment room.
 - f. NFPA-13; spaces containing “limited combustible loading”.
5. Cables shall qualify as 100% recyclable materials disposal, RoHS regulations complaint.
6. Cables installed in air plenums, air-handling spaces and cables installed without raceway or conduit shall also be UL listed and labeled for installation in air plenums.
7. Cables installed in raceways or in conduits below grade, or through in-grade manholes and pullboxes, shall be rated for installation in water/wet locations.
8. The outer cable jacket shall be imprinted with date, Manufacturer’s model and catalog number and Agency (AHJ) listing identification.
9. Copper wire Electronic Network Systems Infrastructure cable shall be a product of the same Manufacturer, including portable patch cables.

10. The outer jacket of cables with less than nine pair of conductors shall be color-coded. The jacket color shall be different for each system type; multimedia; telephone/voice; computer/data network; and fiber cable jackets.
11. 300-volt RMS insulation material for each data conductor shall be the same material; shall be the same electrical characteristics and shall be the same dielectric constant, for all data conductors contained within the respective common cable jacket, along the entire installed length of the cable. Data cables employing differing insulation materials for individual data conductors contained within a common cable jacket are not acceptable and shall not be provided.
12. Propagation and "Skew" Rate
 - a. Skew rate (nominal velocity of propagation delay) between any twisted pair in a combination of four twisted pair conductors grouped in the same cable, shall not exceed 35-nano seconds between any wire pair contained in the conductor group, and as required by the Cable Category rating, over a cable length of 328-feet (100 meters), for all frequencies up to the cable maximum frequency rating.
 - b. Nominal velocity of propagation, exceeding 70% of the speed of light.
13. Large capacity feeder cables and trunking-cables
 - a. Copper wire cables with more than 24-twisted pairs of conductors shall be constructed with 25-pair binder groups of conductors. The cable binder groups shall be enclosed in colored binders and assembled to form a single cable. The twisted pair/binder groups shall be enclosed with multi-layer dielectric protective sheaths underneath a cable jacket enclosing the entire cable assembly. A corrugated metal 100% shield shall be provided under the cable jacket enclosing all conductors.
 - b. Cables shall be wet location rated and listed for installation in conduit, where the conduit is in a wet environment and/or high-temperature environment, including:
 - Underground conduit.
 - Inside manholes and pull boxes.
 - Outdoor conduit exposed to weather and/or sunlight.
 - c. ANSI/TIA/EIA Category rating of cable assembly shall be Category-5E, trunking-cable.

B. Category-6 Computer/Data Enhanced Cables

1. Category-6 cables shall be tested and shall pass the ANSI/TIA/EIA test recommendations for Category-6A.
2. Operation Characteristics:

a. Wire size	23AWG solid copper (23AWG stranded copper for portable patch cables)
b. Quantity of twisted pairs	As indicated but in no case less than 4-twisted pairs
c. Impedance	100 OHM \pm 15%, 1-500Mhz
d. Maximum Signal Attenuation	2.1dB @ 1Mhz
Per 328-feet	3.8dB @ 4Mhz
(100 meters)	5.9dB @ 10Mhz
	7.5dB @ 16Mhz
	8.4dB @ 20Mhz
	10.5dB @ 31.25Mhz
	15.0dB @ 62.5Mhz

- 19.1dB @ 100Mhz
- 27.6dB @ 200Mhz
- 31.1dB @ 250Mhz
- 34.3dB @ 300Mhz
- 40.1dB @ 400Mhz
- 45.3dB @ 500Mhz
- e. Mutual Maximum Capacitance of any Pair 4.4nF/100m
- f. Worst Pair "NEXT" Loss Per/328-feet (100 meters)
 - 67.0dB @ 1Mhz
 - 67.0dB @ 4Mhz
 - 67.0dB @ 10Mhz
 - 67.0dB @ 16Mhz
 - 67.0dB @ 20Mhz
 - 67.0dB @ 31.25Mhz
 - 65.6dB @ 62.5Mhz
 - 42.3dB @ 100Mhz
 - 58.0dB @ 200Mhz
 - 56.5dB @ 250Mhz
 - 55.3dB @ 300Mhz
 - 53.5dB @ 400Mhz
 - 52.0dB @ 500Mhz
- 3. ScTP, all the wires in the cable shall be enclosed in a common, 100% metallic foil shield with copper "drain" wire, shield and drain wire located under the cable jacket.

2.03 FIBER OPTIC FIBER SPLICES

A. General

1. Fiber optic cable splices shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified Requirements, ANSI/TIA/EIA-568C including related Standards, Amendments and TSB.
2. Fiber optic splices shall be the product of the same Manufacturer.

B. Mechanical Splice

1. Mechanically splice each fiber with a splice suitable for use with the type of fiber optic fibers. Re-enterable and reusable splice. Splice shall be recommended as compatible with the optical fibers by the Manufacturer. Splice shall not require the use of adhesives. Splice shall provide integral strain relief.
2. Performance Requirements after installation:
 - a. Operating temperature range minus 20-degrees centigrade through plus 60-degrees centigrade.
 - b. Loss variation over temperature range, 0.05dB or less at specified wave lengths.
 - c. Insertion loss, 0.3dB or less at specified cable wave lengths.
 - d. Reflection (return loss), -40dB at specified cable wavelengths.

C. Fusion Splicing

1. Fusion splicing shall be performed with equipment providing the following features:
 - a. Cleaving and cleaning optical fiber.

- b. Integral splice optimization verification system with local injection and detection.
 - c. Projection screen optics and fiber core alignment system.
 - d. Fiber cleaning/stripping.
 - e. Cleaning fiber ends and fusing of fiber together with an electric arc.
2. Fusion splice insertion loss as measured at the completion of the splice shall be less than 0.1dB at specified cable wave lengths.

2.04 FIBER OPTIC FIBER CONNECTORS AND INTERCONNECTION COUPLERS

A. General

1. The connectors and interconnection couplers shall be compatible, maintain the same Performance Category rating and be compatible with the corresponding fiber optic cable type attached to the connectors.
2. Fiber optic cable connectors and interconnection couplers shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified Requirements. Connectors and couplers shall comply with ANSI/TIA/EIA-568C, related Standards, Amendments, TSB, and TIA/EIA-Fiber Optic Connector Intermateability Standard (FOCIS) documentation.
3. Fiber optic connectors and couplers shall be the product of the same Manufacturer.
4. Shall be UL listed and comply with UL94V-0.
5. Color code connectors for fiber optic cables to match the respective fiber optic strand/jacket color.

B. Fiber Optic Fiber Connectors

1. LC – Small Form Factor (SFF) termination connector
 - a. Ceramic oxide 1.25mm ferrule. Mechanical durability not less than 500-mating cycles. Insertion loss of mated connector shall be less than 0.3dB at specified wavelengths.
 - b. Strain relief boot, long boot type unless indicated otherwise, short or angled boot type to match the connector installation application. Provide duct cover cap for each connector.
 - c. Locking type to automatically align mating fibers in the fiber cable and prevent accidental rotation and pullout.
2. ST type bayonet termination connector
 - a. Ceramic aluminum oxide 2.5mm ferrule, multi-cure ultra violet or heat cured epoxy bonded, for multimode or single mode to match cable fiber. Insertion loss of each mated connector shall be less than 0.3dB at specified wavelengths.
 - b. Strain relief boot, long boot type unless indicated otherwise, short or angled boot type to match the connector installation application. Provide dust cover cap for each connector.
 - c. Locking type, to automatically align fiber cable and prevent accidental pullout.
3. SC – Square/Subscriber termination connector
 - a. Ceramic oxide 2.5mm ferrule.
Insertion loss of mated connectors shall be less than 0.3dB at specified wavelength.

- b. Strain relief boot, long boot type unless indicated otherwise, short or angled boot type to match connector installation application. Provide dust cover cap for each connector.
 - c. Push-pull snap and lock type to automatically align mating fibers in the fiber cable and prevent accidental rotation and pullout.
 - 4. "FSD" fixed shroud duplex type termination connector
- C. Fiber Optic Fiber Interconnection Couplers
 - 1. Interconnection couplers shall be "like-to-like" compatible, and shall provide "plug-in" coupling of two fiber optic cable connectors terminated with fiber optic fibers front-to-rear "in-line" together. The coupler shall provide interlocking, automatic optical self-alignment of two mating fiber optic connectors.
 - 2. The centerline to centerline spacing of the interconnection couplers shall allow removal and insertion of portable patch cords, fiber cable connectors for both "single" and "duplex" type fiber adapter connectors without interfering with adjacent connectors.
 - 3. Patch panel mounted interconnections couplers shall be factory pre-mounted to a modular nominal 0.09-inch thick metal panel, couplers aligned and anchored on the plate.
 - a. The metal panel shall be predrilled for standard EIA mounting in high-density 19-inch wide metal patch panel frames.
 - 4. Interconnection couplers in workstation outlets shall be installed in outlet boxes with cover plates.
 - 5. Provide removable dust caps for the front side of each coupler.

2.05 COPPER WIRE OUTLET CONNECTORS

- A. General
 - 1. Connectors shall comply with FCC part-68 Subpart F for gold plating.
 - 2. Connectors shall be UL listed and shall comply with UL94V-0.
 - 3. Provide a removable blank dust cover for each plug-in outlet insert. The dust cover shall protect the insert from contamination until a workstation or patch cord is "plugged" into the outlet.
 - 4. Copper wire outlet connectors shall be color coded to distinguish telephone/voice separately from computer/data. The outlet cover plate shall be engraved to identify telephone/voice, computer/data and other infrastructure outlets separately.
 - 5. Copper wire outlet connectors shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified Requirements, ANSI/TIA/EIA-568C including related Standards, Amendments and TSB.
 - 6. Copper wire outlet connectors shall be the product of the same Manufacturer.
- B. Universal Outlet Connector (for twisted pair Copper Wire Premise/Workstation Wiring and copper wire patch panels).
 - 1. General
 - a. Connections for twisted pairs copper conductors shall provide a universal outlet connector between the building premise copper wire, and plug-in workstation

locations. Patch panel/equipment plug-in connectors. The connector components shall assemble with "snap-in" spring loaded retainers to prevent dislocation during insertion or removal of external plug-in devices.

- b. The contacts shall be gold plated with a 250 insertion/withdrawal cycle rating.
 - c. Unless specifically noted otherwise the universal outlet connector shall comply with ANSI/TIA/EIA-568C; related Standards, Amendments and TSB.
 - d. Operational characteristics shall match or exceed and shall be compatible with the respective twisted pair's cable.
 - e. A metal ground shield with EMI/RFI metal ground clip shall be provided where shielded cable is connected to the universal outlet connector for each universal outlet connector assembly.
 - f. Each universal outlet connector shall consist of three major components.
 - 1) Universal edge connector assembly.
 - 2) Plug-in adapter inserts.
 - 3) Connector housing.
 - g. Provide snap-in blank removable insert covers for connector installed without plug-in adapter inserts.
2. Universal edge connector:
- a. Insulated assembly shall connect to the premise copper wire. The connectors shall be multiple plug type connector contacts, one contact (total of eight contacts) for each individual premise wire connection interconnected to the individual wire terminations.
 - b. Connector shall provide insertion of individual insulated copper wire, gas tight, 110-style punch down/displacement termination, for 22-26 AWG insulated premise wire.
 - c. The edge connector assembly shall provide termination of eight separate wire conductors, twisted or untwisted pairs, solid or stranded, shielded or unshielded, with color codes and numbered identification of each contact. Integral cable/conductor strain relief to prevent pullout of terminated premise wire conductors.
3. Plug-in adapter inserts:
- a. Plug-in adapter inserts shall be internally factory connected to the universal edge connector assembly to adapt the universal connector to the specific outlet type configuration (i.e. "RJ" style computer/data, telephone/voice, (multimedia) modular jacks, etc.).
 - b. Inserts shall be certified for shielded or unshielded wire, to match premise wire type connected to the universal edge connector.
 - c. Inserts shall provide correct pin-to-pin connections, electrical and mechanical matching characteristics for the specific equipment connected to the respective outlet.
 - d. Inserts for different infrastructures shall be color coded with different colors from each other, for system identifications.
 - e. Plug-in adapter insert type:
 - 1) Computer/data network systems:
 - a) ANSI/TIA/EIA-568C, female modular jack 8-position/contact "RJ-45" style.
 - 2) Telephone/intercom voice systems:
 - a) ANSI/TIA/EIA-568C female modular jack 8-position/contact RJ-45 style.

4. Connector housing:
 - a. Connector housing shall contain the universal edge connector assembly and the plug-in adapter inserts in a rigid assembly. Connector housing shall provide integral cable strain relief for the premise wiring connection.
 - b. The connector housing shall mount to a metal panel, metal device cover plate or plastic device cover plate with spring loaded snap-in retainers. Nominal depth of connector housing behind the mounting panel and/or device cover plate shall not exceed 1.625-inch including Premise Wiring Termination Depth Requirements.

2.06 FIBER OPTIC FIBER DISTRIBUTION ENCLOSURES

A. General

1. Fiber optic fiber distribution enclosures shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified Requirements, ANSI/TIA/EIA-568C including related Standards, Amendments and TSB.
2. Fiber optic fiber distribution enclosures shall be the product of the same Manufacturer.

B. Equipment Rack Mount Fiber Optic Termination Distribution Enclosure - RTDE

1. The RTDE enclosure shall mount in an EIA Standard 19-inch wide enclosed or open frame equipment rack assembly. The RTDE enclosure shall be metal, painted finish, Manufacturers standard color.
2. The RTDE shall provide the following self-contained functions internal to the RTDE assembly.
 - a. Fiber cable termination.
 - b. Fiber cable "pig-tail" splicing.
 - c. Fiber cable patch panel.
 - d. Fiber cable management, training and strain relief.
 - e. Individual fiber and patching port identification numbers, color-coding of incoming trunk and out-going distribution fiber ports.
 - f. Plug-in fiber optic interconnection couplers for port to port patching with portable fiber optic patch cords.
3. Fiber splice drawers:
 - a. Horizontal sliding metal drawers adjustable to approximately 30-degree angle when fully open, and removable for easy access. Each drawer shall contain two fiber optic splice trays with tray holders.
 - b. Drawers shall stack vertically one above the other in the RTDE and allow sufficient slack in all fiber cables for removal of the drawer and splice trays.
 - c. Provide one sliding drawer and two splice tray assemblies for each group (twenty-four individual fibers or fewer fibers per group) of fiber optic fibers terminated in the equipment rack, but in no case provide not fewer than two sliding drawers with splice tray assemblies in each RTDE.
4. Fiber cable patch panel
 - a. Metal panel shall provide a patch port for each fiber consisting of metal panel mounted fiber optic interconnection couplers for each fiber optic fiber indicated to be terminated at the RTDE.

- b. The fiber optic fiber interconnection coupler shall be provided to match and be compatible with the fiber cable connectors. Quantity shall match quantity of terminated fibers, unless indicated otherwise on the equipment rack schedules.
- c. Nominal panel thickness 0.09 inches.
- d. Provide a minimum of sixteen unused spaces for additional couplers in the patch panel.

5. Nominal height of the RTDE shall not be exceeded, as follows:

<u>Quantity of Patch Ports</u>	<u>Quantity of Splice Drawers</u>	<u>Nominal Height</u>
24	2	11-inches
48	2	11-inches
72	3	14-inches
144	6	28-inches

C. Equipment Rack Mount Fiber Optic, Splice only (for use only where fiber patch panel is not required) enclosure - RMSE

- 1. The RMSE enclosure shall mount in an EIA standard 19 inch wide enclosed or open frame rack assembly. The enclosure shall be metal, painted finish, Manufacturer's standard color.
- 2. The RMSE shall provide the following self-contained functions internal to the RMSE assembly:
 - a. Fiber cable splicing for "thru splicing" of fiber optic cables where the cables do not terminate in the equipment rack.
 - b. Fiber cable management, training and strain relief.
- 3. Fiber splice drawers
 - a. Horizontal sliding metal drawers adjustable to approximately 30-degree angle when fully open and removable for easy access. Each drawer shall contain two fiber optic splice trays with splice tray holders.
 - b. Drawers shall stack vertically one above the other in the RMSE and allow sufficient slack in all fiber cables for removal of the drawers and splice trays.
 - c. Provide one sliding drawer and two fiber optic splice tray assemblies for each group (twenty-four individual fibers or fewer fibers per group) for fibers optic fiber routed through but not terminated in the equipment rack, but in any condition provide not fewer than two sliding drawers with splice tray assemblies in each RMSE.
- 4. Nominal height of the RMSE shall not be exceeded, as follows:

<u>Quantity of Thru Splices</u>	<u>Quantity of Splice Drawers</u>	<u>Nominal Height</u>
24	2	4-inches
48	2	4-inches
72	4	8-inches
96	4	8-inches

2.07 COPPER WIRE PATCH PANELS

A. General

1. Copper wire patch panels shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified Requirements, ANSI/TIA/ EIA-568C including related Standards, Amendments and TSB.
2. Copper wire patch panels shall be the product of the same Manufacturer.

B. Equipment Rack Mounted Patch Panel

1. Standard EIA 19-inch wide metal panel, Manufacturers standard color. Prepunched for copper wire outlet connectors. Panel shall mount on an EIA standard 19 inch wide enclosed or open frame equipment rack assembly. Nominal twenty-four copper wire outlet connectors in a horizontal row, quantity of rows as required for total quantity of connectors. Provide not less than two spare empty rows for future copper wire outlet connectors.
2. The patch panel shall provide the following self-contained functions.
 - a. Copper wire cable termination including conductor/shield termination and strain relief.
 - b. Plug-in copper wire outlet connectors for port to port patching with copper wire portable patch cords.
3. Patch panel height shall be based on the quantity of copper wire outlet connectors described plus the specified space for future outlets and shall not exceed the following dimension height:

<u>Outlet Quantity</u>	<u>Nominal Patch Panel Height</u>
1-24	3.5 inches
25-48	7 inches
49-72	10.5 inches
73-96	14 inches

4. Horizontally mounted, cable support metal bracket shall be provided for each twenty-four outlet/connector groupings. The brackets shall be bolted to the equipment rack located at the backside of the patch panel; the brackets shall support and provide strain relief for each incoming copper wire cable connecting to the patch panel.
5. The copper wire connector installed in the patch panel shall be the same configuration, Manufacturer and type as the corresponding copper wire connector provided in the remote workstation outlet locations connecting to the respective patch panel outlet, unless indicated otherwise.
6. Each multimedia, audio/video/TV multimedia and intrusion detection/access control outlet. Provide a Balun, to match the circuit impedance of the premise wiring and to the outlet signal type.

2.08 TELEPHONE/VOICE TERMINAL BLOCKS

A. General

1. Terminal blocks Type 110, shall consist of wiring blocks, connecting blocks, direct wire/patch cord cross connection and designation strips. Arrange in unitized, modular, vertical mounting sections, for telephone/voice.

2. Completely 100% front accessible for cross connections, terminating conductors, training, and fanning of cables. Rear access for any reason shall not be permitted.
 3. Telephone/voice terminal blocks shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified Requirements. Telephone terminal blocks and connections performance shall comply with ANSI/TIA/EIA-568C and related Standards, Addendums and TSB and shall comply with and be listed under UL 1863. Category rating shall match the cables connecting to the patch panel.
 4. The telephone/voice terminal blocks shall provide cross connection of telephone/voice four pair premise copper wiring from telephone/voice handset outlets to multiple copper wire telephone/voice feeder cables and external free standing telephone equipment.
 5. Each full height vertical section terminal block assembly shall terminate a minimum of 900 pairs (including specified spares for future construction phases) of telephone/voice conductors, plus associated cross connection wiring and patch cords in a nominal 20-inches wide by 90-inches high space. Provide multiple vertical sections of terminal block assemblies adjacent to each other, total quantity as required for quantity of telephone/voice conductor pairs and telephone/voice feeder cable pairs shown on the Drawings and Requirements, plus specified spares.
 6. Each telephone/voice terminal block vertical section assembly shall provide 15% or 100 (whichever is the larger quantity) of spare unused conductor pair terminals for future telephone/voice connections.
 7. Provide a common ground bus in each terminal block section with a minimum of six ground conductor termination positions, #10AWG through #6AWG.
 8. Terminal blocks shall be the product of the same Manufacturer.
- B. Wiring Blocks
1. One piece molded, die-electric thermoplastic blocks. The wiring block shall support and secure all the components of the terminal block assembly, and provide cable/conductor training and organization.
 2. Fire retardant complying with UL 94V-0.
 3. Standoff type support legs for mounting to backboard with pre-drilled anchor holes.
 4. Non-conductive electrically quiet front assembly.
 5. Horizontal index strip rows, for termination of not less than twenty-five conductor pairs on each row. Color coded and marked in groups of four pairs or five pairs to match connecting cables.
 6. Removable retainers at the ends of each horizontal connecting block index strip row, shall support cross connect wires at corner turns.
 7. Distribution rings shall retain cross connect wire horizontal routing between terminations.
 8. A full width, horizontal trough between each 100 pair wiring block shall provide a path for patch cord training and retention.

C. Connecting Blocks

1. Connecting blocks shall provide gas tight conductor electrical connections with conductor insulation displacement punch down slots, for insertion onto the telephone/voice wiring block index strips.
2. Connecting blocks shall electrically connect one-to-one between each conductor terminated at the wiring block index strips, and each cross connect/patch cord conductor terminated/connected to the opposite front side of the connecting block.
3. Both sides of the connecting blocks shall terminate telephone/voice UTP 22-26AWG stranded or solid copper wire individually insulated conductors. The front side of the connecting blocks shall also provide "plug-in" connections for portable patch cords, 110 style "plug-in" connectors.
4. Connection blocks shall be 4-pair insulated copper conductor type.
5. Provide insulated, removable termination caps for each connector block.
6. Connector blocks shall be marked to indicate tip and ring conductors and to indicate polarization.

D. Designation Strips

1. Designation strips shall provide retention of interchangeable labels. The labels shall show circuit identification of each terminated conductor pair.
2. The designation strips shall mount on the center and outside positions of the wiring block.

E. Telephone/Voice Cross Connection

1. The cross circuit connection between incoming and outgoing feeder cables and telephone voice outlet wiring shall be provided in the terminal block assembly.
2. The cross connection wiring shall terminate incoming and outgoing circuit conductors between respective connecting blocks.
 - a. Direct connect cross connection shall provide internally wired one-to-one conductor twisted pair cross connection. Provide cross connection of each 4-pair telephone/voice outlet cable to corresponding 4-pairs of the telephone/voice feeder cable and cross connection of feeder to feeder cables, as applicable.
 - b. Patch panel cross connect, 110 terminal connector style, plug-in. Provide two twisted pair, 110 connector type portable patch cords.
 - c. Prewired 50 pin-Amphenol connectors:
 - 1) Provide factory prewired fifty pin Amphenol connectors for connection from telephone/voice terminal blocks to the telephone switch equipment and Telephone Utility Company outside telephone service lines.
 - 2) Provide fifty pair ANSI/TIA/EIA-568C and related Standards, Addendums and TSB cables, connected to fifty pin Amphenol connectors at one end (telephone equipment connection) and connected to the respective telephone/voice terminal wiring blocks at the other end.
 - 3) The 50 pin Amphenol connectors shall group together and be positioned at the top of the respective terminal block section near the ceiling.
 - 4) The pin-to-pin conductor assignments shall conform to the Telephone Switch Manufacturer's Requirements.

- 5) The Amphenol connector/cable assemblies shall connect to and extend the telephone/voice outlet premise wiring from telephone/ voice terminal block to the telephone switch equipment. The Amphenol connector/cable assembly shall connect to and extend the Telephone Utility Company outside telephone service lines to the telephone switch equipment.
- d. Prewired "RJ" style modular jacks
 - 1) Provide factory prewired eight position/contact plug-in "RJ" style jacks for patch panel portable patch cord cross connects, located on the front side of the terminal blocks.
 - 2) The pin-to-pin conductor assignments shall conform to the Telephone Switch Manufacturer's Requirements.

2.09 EQUIPMENT RACK

A. General

1. An equipment grounding bus, nominal 19-inches long, UL labeled as a ground terminal bus, shall be provided on each equipment rack. The ground bus shall be bolted to the rack main metal frame member with 1-inch standoff non-insulating bolts. Provide a minimum of ten drilled and taped bolt holes in the ground bus with ground lug bolts, for connection of equipment grounding conductors to the ground bus, size to accept ground conductors #14-#4AWG.
2. Vertically mounted, cable management metal rings (aluminum or stainless steel) shall be provided full height, continuously along the front and rear of each vertical rail of the equipment rack. The rings shall be bolted to the equipment rack. The rings shall train and dress portable patch cords connecting between outlet connectors located in the equipment rack or in adjacent equipment racks.
3. Provide horizontal cable management panels with multiple cable training rings on each panel (not less than five rings for each panel). Management panels (for up to 24-outlet grouping) nominal 19-inches wide by 1.75-inches high by 3-inches deep and/or (for up to 48-outlet groupings) 3.5-inches high by 3 inches deep, for EIA rack installation. Rings shall provide horizontal routing and support by grouping portable patch cords connecting between patch ports in the same equipment rack or adjacent racks. Patch cords shall be grouped and bundled with "Velcro" tie wraps and shall not overlap patch fields or rack mounted equipment.

The cable management panels shall be installed on both the front and rear of the equipment racks, mounted both above and below horizontally between groups of patch ports as follows:

- a. One cable management panel (front and rear of rack) for each group of forty-eight or less copper wire outlets for patch ports.
- b. One cable management panel (front and rear of rack) for each group of forty-eight fiber optic outlet patch ports.
4. The entire rack assembly including any support arms shall comply with Seismic Earthquake Requirements for install location Structural Standards.
 - a. The assembly shall provide support for the weight of the equipment installed on the rack, but in no case less than 500-pounds of equipment, plus the weight of the rack

and connecting cables. A 2.0 time's safety factor shall be included in the equipment rack assembly structural design.

5. Provide plug strip Transient Voltage Surge Suppressors with RF Suppressor (TVSS) and Power Distribution Units (PDU). Horizontal strip, mounted in each equipment rack. Each unit shall contain not less than six "plug-in" on the rear of the TVSS and not less than two plug-in on the front of the TVSS protected outlet plugs.
 - a. Provide two TVSS/PDU units in each equipment rack, to supply "dual-corded" equipment.
 6. Provide pre-drilled mounting holes the entire length of equipment vertical mounting frames, EIA-310D-19 inch (nominal) wide standard spacing for indicated equipment. Racks shall provide 17.75-inches (nominal) equipment horizontal mounting space between vertical rails.
 7. Provide all floor standing equipment racks with wall bracket support arms extending from the stationary portion of the rack to adjacent wall. Provide "dual-rail arm" cable "runway tray", horizontally from each equipment rack, to the wall directly behind the equipment rack
 - a. The tray shall extend from and bolt to the top of the equipment rack "fixed" top rail.
 - b. The tray side rail arms shall be a minimum of 6-inches deep, with "ladder" type rungs spanning horizontally between the side rail arms. The rail arms shall be parallel with each other. The rail-to-rail arm spacing shall be the same as the equipment rack width.
 - c. The rungs shall be spaced not more than 6-inches on center between the side rails, along the length of the side rail arms. The rungs shall have a minimum cable-bearing surface of not less than 0.75-inches, lengthwise along the tray.
 - d. The runway tray shall support a minimum of 200 pounds per linear foot live conductor/cable loading, with not more than 0.25-inches deflection at mid-span.
 - e. Provide a continuous horizontal support "C" channel along the wall behind the equipment racks and bolt the dual-rail arm cable runway tray to the channel at the wall. The channel elevation on the wall above the finish floor shall support the runway tray horizontally (± 0.2 -inches), from the equipment rack to the wall.
 - f. Equipment racks shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified Requirements, ANSI/TIA/EIA-568C including related Standards, Amendments and TSB.
 - g. The wall mounted horizontal support channel shall be securely through bolt to wall structural member, a minimum of 16-inches on center. The horizontal support channel shall extend a minimum of 6-inches past each side of the runway tray. Support channels as manufactured by Unistrut-P1001C Series; or B-Line; or Kindorf.
 8. Provide a copper ground – bus for equipment bonding, in each equipment rack.
 9. Equipment racks shall be Manufacturer's standard rust inhibitor primer. Manufacturer's standard color finish paint over primer, unless noted otherwise.
- B. Floor Standing Modular Frame Equipment Racks
1. Provide a modular frame equipment rack, bolt together modular rack system with all accessories for a completely assembled equipment rack unit. The rack system, when configured for specific equipment, shall support and organize network servers,

keyboards, printers, tape drive units, RAID units, CRT's, UPS units, telephone switching equipment, desk top work spaces, etc.

2. Nominal overall dimensions 31-inches deep by 72-inches wide by 84-inches high. Left/right or right/left orientation as indicated on Drawings. Minimum weight capacity of the entire rack assembly shall be 1500 pounds.
 3. Manufacturer's standard finish painting, crème white color for metal surfaces. Horizontal flat support surfaces shall be post-formed, laminate top finish, white color.
 4. "8L-01/8L-02" vertical support upright assemblies; shall be slotted the full height to "hook-on", lock in and support adjustable height (in 1-inch increments), modular components, with integral floor support "feet". Open back frame - "LF31". Minimum of three vertical support and open back frames in each complete assembly.
 5. Provide vertical (on upright supports) and horizontal (on modular "hook-on" components) wire management raceways integral to the assembly.
 6. Network server configuration – equipment rack unit:
 - a. "LE28" computer tower "roll-out" horizontal floor shelf; nominal 47-inches wide by 24-inches deep. Shelf shall pull out on "ball-bearing" rails, with 23-inch extension for access to computers. Provide one tower shelf for rack unit. Minimum weight capacity 750 pounds mount at floor.
 - b. "LE25"-computer tower horizontal shelf with ± 12 inch end panels and two shelf support brackets; nominal 47-inches wide by 22-inches deep, fixed mounted. Provide one tower shelf for rack unit. Minimum weight capacity 500 pounds. Mounting height ± 30 -inches.
 - c. "LB32" horizontal work surface; nominal 24-inches wide by 27-inches deep. Provide one work surface assembly for each rack unit. Minimum weight capacity 300 pounds. Install on left or right side of rack as shown on Drawings. mounting height ± 28 -inches.
 - d. LF10/LF11/W162 – General equipment shelf; nominal 72-inches wide by 15-inches high by 16.7 inches deep, with two horizontal shelf surfaces, full width of rack, ± 10 -inches nominal vertical height between shelves and five vertical shelf dividers. Minimum weight capacity 300 pounds. Provide one general equipment shelf assembly for each rack unit. Mount at top of rack.
 - e. "LA-09" – Keyboard platform. Retractable keyboard platform with auxiliary mouse pad and up-down 15 degree adjustable tilt and adjustable 360 degree swivel. Nominal 23-inches wide by 11 inches deep. Provide three keyboard platforms for each rack unit. Install below, upper tower computer shelf and work surface.
- C. Plug Strip Transient Voltage Surge Suppressor (TVSS).
1. General
 - a. Self-contained unit combining plug-in receptacle strip and TVSS. Rated 20 amp, nominal 120-volt +10%, 60Hz, AC, 2400 watts full continuous load. Internal 20 amp resettable overload protection circuit breaker. Red illuminated on-off switch. 9-foot, 12AWG 3-conductor grounded, high abuse heavy duty jacketed AC, line cord with NEMA 5-20P cap.

- b. 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.
 - c. Protected 120-volt outlets shall be NEMA 5-15R 15-amp or 20-amp NEMA 5-20R AC 60Hz receptacles, as applicable for connected equipment loads. Provide not less than eight protected outlet plugs on each unit. Each individual or group of two receptacles (duplex) shall be connected to separate protected load isolated filter banks.
 - d. 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.
 - e. Non-blocking plug-in locations/orientation, for plug-in self-contained “power-brick”, equipment power supplies.
 - f. As manufactured by Liebert; or TRIPP LITE.
2. Operation
- Self-contained RFI and EMF shielded housing with mounting slots for temporary mounting of the unit. Protected outlet receptacles shall supply over current protected and filtered, electrical line voltage power to the connected equipment. Line noise RFI and EMI interference filtering suppression, transient voltage surge and spike protection shall occur in all three modes of operation line to ground, line to neutral and neutral to ground rated as follows:
- a. 13,000 amp, 210 joules (watt-seconds) peak withstands capacity.
 - b. Transient response time less than 5-nano seconds.
 - c. 140-volt AC RMS initiate spikes suppression 330 volt maximum let through.
 - d. RFI and EMI Suppression-Provide spectrum analysis test dB attenuation reports showing RFI filtering over specified frequencies.
 - e. Diagnostic indicator lights located on the TVSS housing shall provide alarm alert for each of the following conditions:
 - 1) Loss of AC power.
 - 2) Damage, malfunction in the TVSS suppression circuits.
 - 3) Improper AC electrical outlet wiring.
 - f. Standards Testing, Listing and Certification Compliance:
 - 1) IEEE 587 A and B compliance.
 - 2) UL 1449 transient voltage surge suppressers.
 - 3) UL 1363 temporary power taps.
 - 4) UL 1283 electromagnetic interference filters.
3. Rack Mounted TVSS
- a. TVSS units installed in equipment racks shall comply with all of the same Performance Requirements including as follows.
 - 1) EIA/TIA – Equipment rack horizontal mount style (19-inches or 24-inches as applicable).
 - 2) Minimum of two front mounted outlets and not less than six rear mounted outlets.
 - 3) Position in each equipment rack as directed by Owner’s Representative.
 - 4) Provide two TVSS units in each equipment rack, for “dual-corded” network equipment.

D. Power Distribution Unit (PDU)

1. General

- a. Self-contained unit combining main circuit breaker, multiple plug-in individual circuit breaker branch protection load receptacles, PDU metering status monitoring and network communication. All PDU components self-contained in a NEMA-1 metal enclosure.
- b. Non-blocking plug-in locations oriented for plug-in self-contained “power-brick” equipment supplies.
- c. Standards Testing
 - 1) UL 60950-1 Information Technology Equipment.
 - 2) CAN/CSA-C22.2 No.60950-1-03 Information Technology Equipment.
 - 3) FCC, Title 47, Part 15 Subpart B for Class B operation as defined by ANSI Standard C63.4.
 - 4) ROHS Complaint.
 - 5) ISTA Procedure 1A and 2A.
- d. Provide two PDU units in each equipment rack, to supply two TVSS units in each equipment rack.
- e. Shall be a product of the same Manufacturer as the TVSS unit. As manufactured by Liebert; or TRIPP LITE.

2. System Description

- a. Remote monitoring and/or control capabilities for power distribution at each load/ equipment rack level. For data/network equipment line voltage plug-in and TVSS line voltage plug-in electrical distribution.
- b. PDU shall meter and monitor electrical attributes of an individual Rack PDU, including real-time remote and local display of monitoring of aggregate and branch electrical parameters (status, thresholds, alarms) including voltage, ampere, and kW. Rack equipment PDU and Branch load monitoring and control.
- c. Self-contained metering and communications
 - 1) Local display ampere-meter demand load meter to monitor plug-in demand load and total PDU load.
 - 2) Digital Fast Ethernet LAN RJ-45 communications port for Ethernet SNMP and IP network monitoring of electrical status. Multi-user site-wide software license, compatible with PC-computer and IP-WEB HTTP protocols.
 - 3) Provide network array-interface for connection of multiple PDU units positioned in the same location.
- d. Nine foot input power (heavy duty high abuse) cord with appropriate conductors and input NEMA plug-in connection. Provide input overload protection with Hydraulic-Magnetic main input circuit breaker. Provide load output NEMA plug-in branch connection with overload circuit breaker protection for each load receptacle.
- e. Equipment rack mounting horizontal position form factor.

3. Electrical Power ratings shall be as follows and as additionally indicated on Drawings. Refer to Drawings for twist-lock verses straight-blade configurations.

- a. Single main input circuit breaker 30 amp, 208/120 volt 3-phase 5-wire “WYE” grounded 60Hz AC.

- b. Branch load circuit breakers with a single plug-in receptacles for each load circuit breaker. Balance loads on each circuit phase.
 - 1) Three 20-amp 1-pole circuit breaker and three NEMA 5-20R receptacles. Also provide matching caps.
 - 2) One 30-amp 2-pole circuit breaker and one NEMA 14-30R receptacle. Also provide matching cap.
 - 3) Additional circuits and receptacles as indicated on Drawings.
- 4. Provide heavy duty high abuse flexible copper wire 300-volt insulated 15-foot long jacketed electrical cord. Connect from PDU to wall-outlet receptacle with same electrical rating as PDU. Rated for PDU voltages and amperes.
- 5. PDU units installed in equipment racks shall comply with all of the same Performance Requirements including:
 - a. EIA/TIA – equipment rack horizontal mount style (19-inches or 24-inches) as applicable.
 - b. Position in each equipment rack as directed by Owner’s Representative.
- 6. Provide two Category-6A 4-pair UTP 15-foot long portable patch cable connects, PDU to respective network patch panel port.

2.11 WALL MOUNT FIBER OPTIC CABLE INTERFACE CABINET (WMIC)

- A. General
 - 1. Metal (14 gauge) enclosure, with full height hinged metal door. Door shall be pad-lockable. Nominal size 12-inches deep by 18-inches wide by 36-inches high. Enclosure shall mount directly on the wall.
 - 2. WMIC shall be UL listed, complying with National Electrical Code, ETL Tested and Certified to comply with or exceed specified Requirements, ANSI/TIA/EIA-568C including related Standards, Amendments and TSB.
 - 3. Interface cabinets shall be the product of the same Manufacturer.
- B. The WMIC shall provide the following self-contained functions internal to the WMIC enclosure.
 - 1. Fiber cable splicing for "through splicing" of non-UL listed fiber optic cables, where the cables do not terminate in the building.
 - 2. Fiber cable management, training and strain relief.
 - 3. Transition from non-UL flame spread listed fiber optic cable, to UL flame spread listed fiber optic cables where the cables terminate in the building.
- C. Cable routing rings shall organize optic fibers in a 360 degree loop inside the WMIC housing and provide cable strain relief.
- D. Fiber Optic Splice Trays
 - 1. Provide fiber optic cable splice trays.
 - 2. Tray holders shall provide mounting and support for each splice tray.
 - 3. Provide two splice trays for each group (24 or less fibers per group) fiber optic fibers routed through the WMIC, but in no case provide not less than four splice trays in the WMIC.

2.12 UNIVERSAL SPLICE ENCLOSURES - USE

A. General

1. The universal splice enclosure shall provide splicing for multiple cables containing multiple, network copper wire conductors or fiber optic fibers.
2. The enclosure with the connecting cables installed shall be water tight, continuously submersible in up to 10-foot depth of water without leaking water into the enclosure interior.
3. The enclosure with splices shall be completely re-enterable to allow access to the interior splices, adding cables, and removing cables, without compromising the water tight integrity of the enclosure.
4. The universal splice enclosure assembly shall be UL listed.
5. The USE shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified Requirements, ANSI/TIA/EIA-568C including related Standards, Amendments and TSB.
6. USE shall be the product of the same Manufacturer.

B. Fiber Optic Splices

1. Provide fiber optic splice trays inside the USE. Each splice tray shall provide space for up to 12 splices in lieu of 24-splices on the tray.
2. A splice tray holder shall rigidly anchor splice trays inside the USE, with sufficient slack cable, to allow individual removal of each splice tray.
3. Provide one splice tray for each twelve fibers passing through the USE, but not less than eight splice trays in the use enclosure.

C. Copper Wire Splices

2.13 SPLICE TRAY FIBER OPTIC FIBERS

A. General

1. Trays shall be suitable for installation in USE, WMIC, RMSE and RTDE enclosures.
2. The trays shall be the product of the same Manufacturer as the respective enclosures.
3. Splice trays shall be UL listed, complying with national Electrical Code, ETL tested and certified to comply with or exceed specified Requirements, ANSI/TIA/EIA-568C including related Standards, Amendments and TSB.

B. Splice Trays

1. A metal or non-metal splice tray shall provide space for up to 24-splices of individual fiber cable single mode and multimode optical fibers. The trays shall provide individual splice holder inserts for each splice to adapt the tray for mechanical or fusion splices, with or without splice sleeves.
2. The tray shall incorporate integral fiber tie down clamps, fiber routing rings, provide strain relief and two full 360-degree fiber loops around the tray perimeter with sufficient slack fiber for removal of the tray for access and splicing of the fiber cable. The tray shall insure the minimum bending radius of the optical fibers is not violated.
3. Provide a removable clear plastic tray top cover for each tray, to protect and isolate the fibers.

2.14 WORK STATION OUTLETS

A. General

1. Engrave outlet cover plates with the port number corresponding to the port number at the respective terminal block, patch panel, or head-end equipment.
2. The outlet cover plates shall be factory prepunched and formed to accommodate the installed outlet connector with attachment screws.
3. Workstation outlets shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified Requirements, ANSI/TIA/EIA-568C including related Standards, Amendments and TSB.
4. Workstation outlets shall be the product of the same Manufacturer.

B. Computer/Data Workstation Copper wire Outlets

1. The outlets shall be the same configuration and type as the corresponding connector provided in the copper wire patch panel outlet, unless noted otherwise.
2. ANSI/TIA/EIA-568C, and related Standards, Addendums and TSB.
3. The copper wire outlet connectors for twisted pair wire connections in computer workstation outlets shall be universal outlet connector RJ-45 type.

C. Telephone/Voice Handset Twisted Pair Wire Connection Work Station Outlets

1. The copper wire outlet connectors provided in telephone/voice handset outlets, shall be universal outlet connector type, unless noted otherwise, ANSI/ TIA/EIA-568C and related Standards, Addendums and TSB.
 - a. RJ-45 type

D. Outlet Boxes

1. General for Low Voltage Outlets Requirements
 - a. Shall be UL approved and labeled for Life-Safety Appliances.
 - b. UL listed and label for low voltage CEC/NEC Class-2 wiring and devices.
 - c. Shall be adjustable to fit into the wall/ceiling and attach into the wall/ceiling thickness at each install location.
 - d. Provide cable "Strain-Relief" attachment and "Sharp-Edge" protection for each outlet cable connections.
2. Wall mounted
 - a. Flush or surface wall mounted outlet box and size as indicated on the Drawings, but in no case less than 4.69-inches by 4.69-inches by 2.125-inches deep.
 - b. Two gang wide extension ring for outlet box to extend outlet flush with finish surface, or as noted on the Drawings.
 - c. Two gang wide cover plate, or as noted on the Drawings.
3. Low Voltage Outlets in Fire rated walls and ceilings
 - a. Provide metal outlets for low voltage devices installed (recessed into) in fire rated walls or fire rated ceilings.
 - b. Provide metal outlet box enclosed type, for each outlet location. Provide UL labeled and listed "Fire-Wrap" complete coverage protection on the exterior of each outlet

box. The combined outlet box and "Fire-Wrap" protection shall be equal or greater than the respective wall or ceiling fire-rating location.

4. Low Voltage Outlets in Non-Fire Rated walls and ceilings
 - a. Outlets for low voltage devices installed (recessed into) walls or ceilings, only where the wall/ceiling is not fire-rated.
 - b. Provide the following for each outlet location
 - 1) Metal outlet box, enclosed type. All locations where one or more conduit(s) are required to connect to the outlet, then only metal outlet box shall be provided.
 - 2) Or device mounting bracket with trim ring, without (backless) enclosed outlet box. Do not use bracket-trim/ring configuration where conduit connection to the outlet with conduit is required, provide metal outlet boxes. Shall provide attachment for low voltage device(s), cover plates and low voltage wire strain relief.
 5. Low Voltage outlet installed into accessible suspended ceiling with removable ceiling panels.
 - a. Support outlet independent of ceiling supports and ceiling.
 - b. Provide a minimum of three independent hanger wires for each outlet. Attach hanger wires to building structure above ceiling and to outlet.
 6. Low Voltage Outlets in existing walls and existing ceilings
 - a. Outlets installed (recessed into) existing walls or (recessed into) existing ceilings. Cut and patch to match existing surfaces for outlet installation.
 - b. Provide "cut-in" retrofit mounting-attachment into existing ceiling/wall construction. Shall be UL rated for retrofit into "old-work".
 - c. Provide the following for each outlet location,
 - 1) Metal outlet box, enclosed type. Required for all Fire rated construction locations. Also permitted for non-Fire rated construction locations.
 - 2) Or device mounting bracket with trim ring. Permitted only for non-Fire rated construction locations only where no conduit connection to the outlet is required. Do not use in Fire rated construction locations. Do not use where conduit connection to outlet is required.
 - d. Where the existing wall/ceiling existing fire rating is indeterminate, Contractor shall assume the existing fire rating is not less than 2-hours. Provide metal outlet box and Fire-Wrap for each recessed outlet box.
- E. Multi-outlet Raceway Work Station Outlets
1. Copper wire outlet:
 - a. Where copper wire connection is indicated for the workstation outlet, provide one universal outlet connector for each outlet.
 - b. Each universal outlet connector shall be single connector housing type.
 - c. Provide a rectangular cutout and metal device plate in the raceway sized to Outlet Manufacturer's recommendations. The workstation copper wire outlet shall mount a modular faceplate kit with outlet bezel and faceplate sized to match the workstation outlet.

- d. Offset the location of outlets for electronic network systems 6-inches in the raceway from other outlets, do not "stack" outlets one above the other in the raceway.
- 2. Fiber optic outlet:
- F. Combination Outlets
 - 1. Infrastructure outlet connectors shown at the same location for either wall box outlet locations and floor box outlets locations.
 - 2. The outlet connectors shall be installed in a common outlet box with a common cover plate in the respective wall location or floor location.
 - 3. In infrastructure patch panels install the connectors in the respective patch panels.

2.15 PORTABLE PATCH CORDS

- A. General
 - 1. Provide portable patch cords for all copper wire and fiber optic cable infrastructure outlets:
 - a. For interconnecting electronic network equipment to electronic network workstation outlets.
 - b. For interconnecting equipment rack patch panel outlet patch locations with each other.
 - c. For interconnecting patch panel outlets equipment rack mounted hubs, switches, routers, telephone equipment, A/V equipment, access control and intrusion detection equipment etc.
 - 2. Patch cords shall be factory assembled tested and certified with factory terminated plugs at each end. Field terminated portable patch cords shall not be permitted. Terminated plugs shall incorporate integral bending radius limiting molded "boots" and strain relief. Patch cord assemblies shall be rated for "heavy duty", "high-abuse" service.
 - 3. Patch cords shall be UL listed, complying with National Electrical Code, ETL tested and certified to comply with or exceed specified Requirements. ANSI/EIA/T1A-568C, related Standards, Addendums and TSB.
 - a. NEC - OFNG/OFN for fiber optic portable patch cords.
 - b. NEC - MPP/CMP/CMR/CMG/MPG for copper wire twisted pair portable patch cords.
 - c. NEC - CATV for coaxial cable portable patch cords.
 - 4. Patch cords which are not installed shall be delivered to the Owner in cardboard boxes. The patch cords shall be neatly bundled and tied together. Mark each box with quantity and type of cords contained in the box.
 - 5. Patch cords shall comply with the same Cable Communication Performance Requirements, Protocol Requirements and Testing Requirements as the respective infrastructure cables and outlets to which the patch cords are intended to be connected (plug-in). Patch cords shall be the product of the same Manufacturer.
 - 6. The outer jacket of each portable patch cord shall be imprinted with date, Manufacturer's model and catalog number and AHJ listing identification.
 - 7. Provide a permanent, visible, factory applied identification number on each end of each patch cord. The identification number shall be the same on each end. However, the numbers shall increase sequentially on each patch cord and shall be unique and not

duplicated on other patch cords. Permanently apply the identification numbers on the cable jacket or connectors.

B. Twisted Pairs, Copper Wire Portable Patch Cords

1. Twisted Pairs portable patch cords, general:
 - a. "Male" eight position modular "RJ" male style jacks install on each end of the patch cord cable. The jack shall be provided with a rear "fin" to prevent the plug tab from snagging when pulled backwards through adjacent wiring.
RJ-45 style "male" jack, typical unless noted otherwise.
 - b. Patch cord cable shall be UTP and ANSI/EIA-Category rating, shall match respective premise wiring, 4-pair twisted, stranded copper individually insulated wires, thermoplastic jacket over all the wires and shield.
 - c. Connectors shall comply with FCC 68.5 and Part 68 Subpart F.
 - d. Connectors UL listed and shall comply with UL-94V-O.
 - e. Contacts gold plated with not less than a 750 insertion/withdraw cycle rating.
2. Portable patch cord quantities and lengths for connecting port-to-port equipment rack patch panels
 - a. Patch cord quantity: Provide one complete patch cord assembly for each copper wire equipment workstation outlet patch port in the equipment rack patch panels. One-to-one straight through pin-to-pin wiring. Provide additional spare patch cords, quantity equal to 25% of the total quantity of patch cords provided for copper wire computer workstation outlets in the equipment rack patch panels. Cable jacket color shall be blue:
 - b. Provide the following lengths of copper wire patch cables for copper wire equipment rack patch panel outlets.
 - 1) 2-feet long - 10% of total quantity
 - 2) 4-feet long - 30% of total quantity
 - 3) 6-feet long - 30% of total quantity
 - 4) 10-feet long - 20% of total quantity
 - 5) 16-feet long - 10% of total quantity
3. Portable patch cord quantities and lengths - for connection from equipment workstations to equipment workstation outlets, located remote from equipment racks.
 - a. Patch cord quantity: Provide one complete patch cord assembly for each copper wire workstation outlet located remote from the equipment rack patch panels. Provide additional spare patch cords, quantity equal to 15% of the total quantity of patch cords provided for each copper-wire computer workstation outlets. Cable jacket color shall be blue:
 - 1) Infrastructure network outlet segments the pin-to-pin patch cord wiring configuration and jacks shall be compatible with the equipment protocol communications interface, and the respective workstation outlet.
 - b. Provide the following lengths of copper wire patch cables for equipment copper wire infrastructure network workstation outlets. The patch cords shall provide internal cross-over wiring to conform the pin-to-pin connections required between the equipment workstation outlet and the equipment protocol communications interface installed in the respective workstation equipment:
 - 1) 8-feet long - 30% of total quantity

- 2) 15-feet long - 70% of total quantity
 - 4. Portable patch cord quantities and lengths for connection from electronic equipment rack patch panel ports to equipment installed in equipment racks, such as HUB's, servers, switches, router, telephone and concentrator equipment ports. Cable jacket color shall be white.
 - a. Patch cord quantity: Provide one complete patch cord assembly for each copper wire outlet port located in electronic equipment. Provide additional spare patch cords, quantity equal to 25% of the total quantity of the equipment rack equipment ports.
 - 1) The pin-to-pin patch cord wiring configuration and jacks shall be compatible with the respective equipment and patch panel outlets as applicable.
 - b. Provide the following lengths of copper wire patch cables for outlet ports located in electronic equipment installed in equipment racks. The patch cords shall provide quantity of conductors, wiring shall conform the pin-to-pin connectors and jack/ connectors to the ports in the equipment mounted in the equipment racks.
 - 1) 4-feet long - 15% of total quantity
 - 2) 6-feet long - 30% of total quantity
 - 3) 10-feet long - 35% of total quantity
 - 4) 16-feet long - 20% of total quantity
 - 5. Portable patch cord quantities and lengths for connection of equipment requiring customized pin-to-pin wiring configurations and/or customized port connector configurations. Cable jacket color shall be tan.
 - a. Patch cord quantity: Provide one complete patch cord assembly for each outlet port install as part of the Contract and not identified in any other patch cord descriptions. The patch cords shall be customized and configured to comply with the respective Manufacturers recommendations.
 - b. Provide one patch cord for each port-to-port connection length as required for actual installation condition.
 - 1) Provide 100% spare but not less than one spare patch cord for each custom configuration.
- C. Telephone/Voice Copper Wire Portable Patch Cords-110 style
- 1. 110 style jacks for plugging into the 110 style connecting blocks located in the telephone /voice terminal blocks.
 - 2. Patch cords shall be UTP 4-pair twisted; 24AWG stranded copper individually insulated wires with a thermoplastic jacket over all the wires. Cable shall be ANSI/TIA/EIA-568C.
 - 3. Patch cord quantity and length - telephone/voice terminal block:
 - a. Provide one complete patch cord assembly for each copper wire telephone/voice outlet connecting to the telephone/voice terminal block. Provide additional spare patch cords, quantity equal to 25% of the total quantity of patch cords provided for telephone/voice 110 patch cords.
 - b. Provide the following lengths of copper wire patch cables for telephone/voice 110 style connecting block portable patch cords.
 - 1) 3-feet long - 25% of total
 - 2) 5-feet long - 50% of total
 - 3) 15-feet long - 25% of total

D. Fiber Optic Portable Patch Cords

1. General

- a. Provide fiber optic fiber connectors installed on each fiber end of the patch cord cable. The fiber optic portable patch cord shall be "single" with one fiber strand type, for each patch cable. The connector shall be mechanically and optical compatible with the respective connecting patch panel couplers and network work equipment couplers.
- b. The entire patch cord assembly total insertion loss shall be less than 1.0dB at the specified operating wavelengths.
- c. Operating temperature range 30-degrees centigrade through +60 degrees centigrade. Cables shall be flame retarding.
- d. Each fiber shall be individually identified with factory color-coding and factory imprinted label. The outer cable jacket shall be imprinted with date, Manufacturer's model and catalog number, along with agency listing identification. The cable jacket color shall be yellow.
- e. All fiber optic patch cord cable shall be a product of the same Manufacturer.
- f. Optical fiber shall be coated, 900 micron diameter uniform coating, with uniform tight buffering over the coating, uniform dielectric strength member surrounding the buffering coating and an overall jacket around each optical fiber assembly.
- g. A dielectric strength member shall surround the fiber assemblies.
- h. An outer dielectric jacket shall envelope the entire cable.
- i. The cable shall be UL listed and comply with NEC and NFPA Requirements for each installation location shown in the Contract Documents.
- j. Patch cord quantity and length
 - 1) Patch cord quantity: Provide one complete patch cord assembly for each fiber optic patch panel outlet in the equipment rack.
 - 2) Provide one complete patch cord assembly for each computer workstation fiber optic outlet remote from the patch panel.
 - 3) Provide additional spare patch cords, quantity equal to 25% of the total quantity of patch cords provided.
- k. Provide the following quantities and lengths of fiber optic patch cords.
 - 1) 3-feet long - 20% of total
 - 2) 6-feet long - 35% of total
 - 3) 10-feet long - 30% of total
 - 4) 20-feet long - 15% of total

2. Multimode patch cords

- a. Patch cord cable shall be fiber optic cable with equal or better characteristics as the premise fiber optic cables.

2.16 CIRCUIT PROTECTORS

A. General

- 1. The circuit protectors shall be UL listed, complying with National Electrical Code, ETL Tested and Certified to comply with or exceed specified Requirements, ANSI/TIA/EIA-568C including related Standards, Amendments and TSB.

B. Circuit Protectors

1. Cables containing non-dielectric electrical conducting components entering from the exterior of the building shall be provided with individual circuit protectors combining both lightning circuit protection and TVSS circuit protection on each circuit conducting component, as required in CEC Articles 770 and 800.
2. Install circuit protectors in the respective backboard/equipment rack where copper wire conductors terminate, connect each protector to room/closet ground bus equipment with #10AWG green insulated bond/ground copper conductors.

PART 3 EXECUTION

3.01 NETWORK CABLE TESTING AND COMMISSIONING (ADDITIONAL REQUIREMENTS)

A. General

1. In addition to the testing recommended in ANSI/TIA/EIA-568C and related Standards, Amendments and TSB. End-to-End test 100% of all individual optical fiber, individual copper wire conductors, each outlet and each connector in all terminated and unterminated cables, portable patch cord, outlets and patch panels provided in the Contract, shall be tested after installation as a complete channel pathway installation, splicing outlets and termination is completed, including the following end-to-end tests on each installed individual circuit;
 - a. Each circuit wire and fiber map and length
 - b. Each circuit insertion Loss
 - c. Each circuit NEXT (Pair-to-Pair) Loss
 - d. Each circuit NEXT Loss (Power Sum) PS
 - e. Each circuit ELFEXT Loss (Pair-to-Pair)
 - f. Each circuit ELFEXT Loss (Power Sum) PS
 - g. Each circuit return Loss (RL)
 - h. Each circuit propagation delay
 - i. Each circuit propagation delay-skew
2. The test equipment and (Tester) shall comply with the Accuracy Requirements for Field Testers as defined in the ANSI/EIA/TIA Standards for the specific cable type. The Tester including the appropriate interface adapter shall meet the specified Accuracy Requirements. The Tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy. The Tester shall be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. The Contractor shall provide proof that the interface has been calibrated within the period recommended by the Vendor.
3. The Pass or Fail condition for the channel pathway link-under-test is determined by the results of the required individual tests (ANSI/EIA/TIA) Any Fail result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass. A Pass or Fail result for each parameter is determined by comparing the measured values with the ANSI/EIA/TIA test limits for that parameter. The test result of a parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field test. The Field Test

Equipment Manufacturer shall provide documentation as an aid to interpret results marked with asterisks.

4. Provide all test equipment, Certified Testing Personnel, and setups. Shall comply with ANSI/EIA/TIA and Equipment Manufacturer's Recommendations and Standards of practice.
 5. Provide six copies of all test reports, bound in three ring binders. Provide three digital CD/DVD ROM copies. Organize test reports into rows-and-columns spread-sheet format, with data common groupings by IDF and NDF location. Submit to Owner's Representative.
 6. The Contractor shall repair or replace equipment, cables, outlets, connectors, splices, terminations, etc. identified during testing as not complying with the Contract Documents, without additional cost to the Contract. Retest all replaced or repaired components at Contractor's expense.
- B. Twisted Pair Copper Wire Testing
1. Channel insertion loss (dB).
 2. Channel near-end cross-talk NEXT loss (dB).
 3. Channel equal-level far-end cross-talk ELFEXT (dB).
 4. Channel return loss (dB).
 5. Channel power sum PSACR (dB).
 6. Channel propagation delay, propagation speed, and delay skew.
 7. Channel wire map and circuit length.
 8. Channel ring-out test for continuity and correct point-to-point matching terminals.
 9. Channel DC resistance and capacitance.
 10. Channel attenuation-to-cross-talk ratio Acr.
- C. Coaxial Cable Testing
1. Channel full specified frequency spectrum attenuation insertion loss (dB).
 2. Channel wire mapping, ring-out and circuit length.
 3. Channel propagation delay and propagation speed.
 4. Channel impedance and continuity for center conductor and shields.
- D. Fiber Optic Cable Testing, Optical Testing for Each Specified Wave-Lengths for Both laser and LED sources.
1. Channel link insertion losses (dB) OLTS.
 2. Channel loop-back attenuation (dB).
 3. Channel signature Optical Time Domain Reflectometer – OTDR, for installation characterization testing (event and attenuation resolution dead zone at specified wave lengths, shall be less than 10-feet).
 4. Channel continuity and correct point-to-point matching terminals.
 5. Channel propagation delay and propagation speed.
 6. Channel fiber optic mapping, circuit length, and tracing.

3.02 FIBER OPTIC CABLE TYPE

- A. General
 - 1. Cables shown as fiber optic type shall comply with the following installation locations.
 - 2. Provide matching compatible outlets and terminate all fiber optic cables into matching fiber optic connectors.
 - 3. Fiber optic cable installed in indoor locations without enclosed raceway or conduit.
 - a. Provide non-metallic, flexible corrugated continuous inner duct-raceway and install fiber optic cable in the innerduct.
 - b. Innerduct shall be heavy duty, plenum-rated, Limited-Combustible (LC) type UL FHC – 25/50, orange color. Support innerduct 36-inches on center, independent of ceiling supports and independent of other equipment supports.
 - c. Innerduct size shall be selected to insure percentage-fill with fiber optic cables shall not exceed 30%, but in no case less than 1.25-inch diameter innerduct.
- B. Provide loose tube gel filled or indoor/outdoor type fiber optic cable for any of the following installation location conditions.
 - 1. Inter building (between buildings)
 - 2. In a conduit or raceway located underground below grade.
 - 3. In an exposed outdoor conduit or raceway not located underground or below grade.
 - 4. Do not install loose tube gel filled type fiber optic cable inside a building or exposed on a building without providing Rigid Steel (RGS) conduit raceway for the loose tube gel filled fiber optic cable along the entire length of the cable inside the building or on the building.
- C. Provide tight buffered or indoor/outdoor type fiber optic cable for any of the following installation location conditions.
 - 1. Intra-building (inside a building) where raceway continuously encloses the cable and the raceway is not located underground, below grade.
 - 2. In an exposed outdoor conduit or raceway not located underground or below grade.
- D. Provide plenum rated type fiber optic cable for any of the following installation location conditions in building spaces.
 - 1. Any building space air plenum (supply or return) when a conduit or enclosing raceway is not provided for the entire cable length. Additionally, Cables shall be rated Limited-Combustible (LC) type UL FHC-25/50.
 - 2. All building space locations where the cable is installed without a conduit or the cable is not fully enclosed in a raceway along the entire cable length in a building. Additionally, Cables shall be rated Limited-Combustible (LC) type UL FHC-25/50.
 - 3. Building spaces and/or cavities that are 100% fully protected with fire sprinklers, including fire sprinklers located above in ceiling cavities and fire sprinklers located below in access floor cavities. Cables installed in these locations shall be rated with one or more of the following additional characteristics.
 - a. Limited-Combustible (LC) UL FHC-25/50 plenum rated cable.
 - b. Or plenum rated cable without the UL FHC-25/50 Limited-Combustible (LC) rating.

- E. Optical Fiber Quantity:
1. The minimum fiber quantities in each fiber optic cable shall be as follows, but in no case less than indicated on the Drawings.
 2. Between main IDF (SUB-MDF) in separate buildings and the MDF main terminal rack fiber optic patch bay for the entire site/campus.
 - a. Twenty-four optical fibers, multimode plus six optical fibers, single mode.
 3. Between satellite IDF terminal rack fiber optic patch bays and the main terminal rack IDF (sub-MDF) patch bay located in the same building.
 - a. Twenty-Four optical fibers, multimode plus six optical fibers, single mode.
 4. Between a terminal rack patch bays (IDF or MDF):
 - a. To an individual workstation outlet located inside the same building - two multimode optical fibers, (typical only for locations where fiber is specifically shown on the Drawings for the specific work station outlet).
 - b. To each network file server outlet location whether or not shown on the Drawings, four optical fiber, and multimode.
 5. Between a terminal rack patch bay and individual multimedia network (television/video /audio) workstation outlets and/or intrusion/access program display devices located inside the same building - two optical fibers, multimode.
 6. Other locations as indicated on the Drawings or described in the Contract Documents.

3.03 COPPER WIRE CABLE TYPE

- A. General
1. Cables shown as copper wire type shall comply with the following installation conditions, unless noted otherwise on the Drawings.
 2. Provide matching compatible outlets and terminate all copper wire cables into matching copper wire connectors.
- B. Cable Types and Quantities - Cable types and quantities shall be as follows unless specifically noted otherwise on the Drawings. The following minimum type and quantity of copper wire cables from each individual workstation/device outlet, to the respective terminal equipment patch panel/bay, (unless specifically noted otherwise), but in no case less than what is shown on the Drawings and in no case less than one 4-pair cable to each outlet "Jack" position:
1. Two Category-6A, UTP 4-pair cable:
 - a. Each network workstation outlet location.
 - b. Each network "wireless-access-point" outlet location.
 2. One Category-6A UTP 4-pair cable, for each telephone handset (instrument) workstation outlet location.
 3. Trunking-Cables shall be Category-5E.
 - a. 100-pair between buildings main IDF (SUB-MDF) and campus main MDF.
 - b. 50-pair inside building between SUB-IDF to buildings main IDF (SUB-MDF).
 8. Other locations as indicated on the Drawings or described in Contract Documents.

- C. Provide plenum rated copper wire cable for any of the following installation location conditions in building spaces.
 - 1. Any air plenum (supply or return) when a conduit or enclosed raceway is not provided for the entire cable length. Additionally, cables shall be rated Limited-Combustible (LC) type UL FHC-25/50.
 - 2. All building space locations where the cable is installed without a conduit or the cable is not fully enclosed in a raceway along the entire cable length in the building. Additionally, cables shall be rated Limited-Combustible (LC) type UL FHC-25/50.
 - 3. Building spaces and/or cavities that are 100% fully protected with fire sprinklers, including fire sprinklers located above in ceiling cavities and fire sprinklers located below in access floor cavities. Cables installed in these locations shall be rated with one or more of the following additional characteristics.
 - a. Limited-Combustible (LC) UL FHC-25/50 plenum rated cable.
 - b. Or plenum rated cable without the UL FHC-25/50 Limited-Combustible (LC) rating.
- D. OSP Insulated Copper Wire Cables
 - 1. Outside – Plant (OSP) CEC/NEC rated, UL listed, labeled and approved insulated copper wire cable assemblies. Moisture barrier resistant and UV resistant cable jacket. Non-flammable, water blocking, non-conductive gel internally filled infrastructure cable assembly.
 - 2. Provide rated insulated copper wire OSP type cable for any of the following copper wire infrastructure cable install locations.
 - a. In underground conduit or in conduit under the building.
 - b. In conduit exterior to the building, or in conduit exposed outdoor on the building.
 - c. Outdoor aerial with aerial messenger wire cable carrier.
 - 3. Except for aerial install locations, install all OSP cable in continuous conduit pathways, end-to-end.

3.04 CABLE INSTALLATION

- A. General
 - 1. Cables connecting to equipment racks and terminal blocks shall be installed with not less than 6-feet of slack cable between the equipment rack/terminal block and terminal backboard. The slack cable shall be coiled and supported on the backboard and/or cable tray.
 - 2. Cables in terminal closets and terminal rooms shall be trained, dressed and racked on the plywood backboards. Provide cable, metal support arms and re-enterable type cable support rings not less than 12-inches on center mounted onto the plywood along the entire length of all cables.
 - 3. Provide separate routing paths on plywood backboards for fiber optic cables, computer data and copper wire cables and telephone/voice copper wire cables and multimedia, audio/video, TV cables. Provide separate routing paths on plywood backboards for shielded copper wire cables and unshielded copper wire cables.
 - 4. Cables shall be routed parallel to floors and walls. Do not route cables diagonally on backboards.

5. Spare cable slack
 - a. Provide 25-feet of cable slack where unterminated cables are specified at terminal backboards.
 - b. Provide a minimum of 18-inches of slack cable in each workstation outlet box and outlet locations.
 - c. Provide 10-feet of cable slack in ceiling above each work station outlet.
 - d. Provide 24-inches of slack in each cable at patch panel locations.
 - e. Coil and "Velcro" wrap slack cable.
 6. Provide "horizontal wiring" cables installed from individual equipment locations and workstation outlets to respective MDF/IDF terminal closet/room patch panel. Cables shall be continuous without cutting or splices.
 7. Provide "backbone" cables installed from each IDF location to respective MDF/ Sub-MDF location terminal closet/room patch panels. Cables shall be continuous without cutting or splices.
- B. Cable Pulling Lubrication
1. Cable pulling lubricants shall be specifically approved by the Cable Manufacturer. The following lubricants shall be used where approved by the Cable Manufacturer.
 - a. Slip X -300, American Colloid Co.
 - b. Bishop #45, Bishop Electric.
 - c. MacLube CA51, MacProducts.
 - d. Minerallac H2B,- Minerallac Electric.
 - e. Winter grade #7437-PC, General Machine Products.
 - f. Gel-lube 7/5, Cable associates.
 - g. Polywater, A, C, G - American Polywater.
 2. Lubricants shall be continuously applied as cable enters raceway.
- C. Cable Installation:
1. Do not pull conductors until factory test reports have been submitted and reviewed.
 2. Minimum bending radius of fiber optic cables shall not be less than the following. Maximum pulling tension shall not exceed the following. In no case shall the Manufacturer's recommendations be violated.
- | <u>Cable Type</u> | <u>Cable Fiber Quantity</u> | <u>Min. Bend Radius</u> | <u>Max. Pulling Tension</u> |
|-------------------|-----------------------------|-------------------------|-----------------------------|
| Loose Tube | 2-84 | 9 inches | 600 pounds |
| Loose Tube | 86-192 | 10 inches | 600 pounds |
| Tight Buffered | 2-12 | 5 inches | 400 pounds |
| Tight Buffered | 14-24 | 7 inches | 600 pounds |
| Tight Buffered | 26-28 | 11 inches | 1100 pounds |
| Tight Buffered | 48-72 | 12 inches | 1200 pounds |
3. The minimum bending radius for copper wire cables shall be 10 times the cable outside diameter. The maximum pulling tension and minimum bending radius shall not violate Manufacturer's recommendations.
 4. Cables installed in manholes and pullboxes on terminal backboards shall be installed on wall mounted cable support racks.

5. Provide a full 360-degree loop of cable around manhole and pullbox interiors.
6. The attachment of pulling devices directly to the cables shall be with individual split mesh basket grips. Direct connection for pulling cables to cable fibers and copper wires shall not occur. Securely tape cable ends to prevent moisture or pulling compound from penetrating cable.
7. The attachment of the pulling device to the cable basket grips shall be made through a swivel connector.
8. The Contractor shall ensure that the cables are fed straight into the raceway taking care to avoid short bends, sharp edges and cable "cross-overs".
9. All lashings used for temporary bunching of the individual cables shall be removed before the cables enter the raceway.
10. Cables shall be "pulled through" or pulled from a "center of run pull" without splices or terminations and minimize cable rolling tension. Lead-out the cables at all manholes, pullboxes and conduits taking care to feed them in again by hand for the next portion of the cable run.
11. For each cable pull where a cable direction change is required, flexible feed-in tubes, pullout devices, multi-segmented sheaves etc. shall be used to insure proper cable pulling tensions and side wall pressures. Cables shall not be pulled directly around a short right angle bend. Any device or surface the cable comes in contact with when under pull-in tension shall have a minimum radius 50% greater than the final specified minimum installed cable bending radius. The maximum possible size radius sheaves and feed-in tubes, usable in the available working space, shall be provided in all situations, to insure the minimum possible cable side-wall pulling pressure. Do not use devices with multi-segment "roller" type sheaves.
12. Cable lengths over 50 feet shall be machine pulled not hand pulled into and through all raceways. Cables shall be pulled in a continuous, smooth operation without jerking or stop-start motion after initiation of pull. Maximum cable pulling speed shall be less than 50 feet per minute. Minimum cable pulling speed shall be greater than 15 feet per minute.
13. Cables shall be pulled straight into or out of the raceway without bends at the raceway entrance or exit. Pull in cable from the end having the sharpest bend (i.e., bend shall be closest to reel). Keep pulling tension to minimum by liberal use of lubricant, hand turning of reel, and slack feeding of cable into duct entrance. Employ not less than one man at reel and one at manhole or pull-hole during this operation. Cables shall be pulled directly from cable reels.
14. Cables shall be trained or racked in trenches, vaults, manholes and pull boxes with consideration given for the minimum specified bending radius of the cable and the possibility of cable movements due to load cycling. The cables shall be racked and supported in such a manner that adequate space is allowed for splicing and the cables shall always be fanned out from the duct or conduit so as not to cross other ducts, conduits or cables. To prevent damage from falling objects or personnel entering the manhole the cables shall not pass directly under the manhole opening.
15. Cable shall be supported in manholes, pull boxes and vaults a minimum of 18-inch on center with cable racks. Provide hot dip galvanized, T-slot racks and support arms. Secure cables to racks with porcelain supports for each cable on the racks. Loosely lash

cables to racks. Splices shall be directly supported, on racks. Do not install cables more than one feeder on the same rack hook.

16. Cables shall be routed the long way around manhole, pull-hole, etc. with not less than a full 360-degree loop around the perimeter walls unless noted otherwise.
17. Existing conductors shall be protected at all times when Contract work occurs in the same area, including but not limited to pullboxes, vaults manholes, cable trenches etc. Provide temporary electrical insulating blankets and barriers over existing conductors to reduce the possibility of accidental mechanical damage to existing conductors.
18. Where cable tray is provided, all cables shall be routed and trained on the cable tray. The cables shall enter the cable tray and route along the tray prior to entering any equipment racks or computer works station outlets.
19. A dynamometer to measure pulling tension shall be used on all cable runs in excess 200-feet or with more than 180 degrees in bends. The actual pulling tension value shall be calculated and recorded for each pull.
20. Bends shall not be made in cable splices or terminations.
21. The portions of cables installed without raceways or cable tray supports shall be installed with metal "J-hook" cable supports.
 - a. The "J-hooks" shall provide multi-tiered "J" shaped hooks, with wide flat cable support base (0.5 inch wide minimum) and smooth rounded corners. Specifically designed for copper wire and fiber optic infrastructure cable support as manufactured by Erico Inc.
 - b. The individual "J-hook" attachment to the building structure shall be metal, "beam clamp", "hanger rod", clevis hanger styles as applicable for each attachment location.
 - c. Install "J-hooks" not more than 48-inches on center along the entire cable length and within 6 inches of each cable change in direction. Locations of "J-Hooks" and tension of cables shall insure between 4-inches and 6-inches of cable sag between adjacent hooks. Secure cables to "J-hooks" with re-enterable cable tie wraps. "J-hook" supported cables, bundle cables together with re-enterable tie wraps not less than 12 inches on center along the entire cable length.
 - d. Each J-hook shall not support more than 12 individual cables. Provide multiple "tiered" J-hooks for additional cable quantities at each location.
 - e. "Bridle rings" shall NOT be used to support cables.
 - f. Cables shall not lie directly on nor attach to ceilings, ceiling hangers, lighting fixtures, air ducts, piping, or equipment.
22. Re-enterable cable tie wraps shall be, "limited-combustible" and air plenum rated, reusable, color coded. Chemically and mechanically compatible with the respective cables and install locations. Shall allow multiple open-close operations for securing cables.
23. Electronic network cables containing non-dielectric components shall be installed with a minimum separation from other electrical power conductors and equipment as follows:

<u>Equipment Type</u>	<u>Minimum Separation</u>
a. Lighting fixtures	12 inches
b. Electric motors, electric solenoids, electric Heaters	40 inches

- c. Transformers 48 inches
- d. Circuits over 100 volts to ground, in metallic raceways 5 inches
- e. Circuits over 100 volts to ground, in non-metallic raceway or without any raceway 12 inches
- f. Circuits over 100 volts to ground, suspended on overhead pole lines 48 inches

D. Movement, Storage, and Handling of Cable:

1. Reels of cable shall not be dropped from any height, from trucks or other transporting equipment.
2. Lift and move cable reels using following methods:
 - a. Crane or boom type equipment-insert shaft (heavy rod or pipe) through reel hubs and lift with slings on shaft, with spreader or yoke to reduce or avoid sling pressure against reel head.
 - b. Forklift type of equipment may be used to move smaller, narrower width reels. Fork tines should be placed so that lift pressure is on reel heads, not on cable, and shall reach all the way across reels so lift is against both reel heads.
 - c. Reels may be moved short distances by rolling. Reels shall be rolled in the direction indicated by arrows painted on reel heads. Surfaces over which the reels are to be rolled shall be solid clear of debris, and also clear of protruding stones, humps, etc. which might damage the cable if the reel straddles them.
3. Storage of reels of cable:
 - a. Cable ends shall be sealed prior to shipment to prevent moisture entry into cable. Cable ends shall remain sealed at all times including during installation. Where ends seals are removed, reseal cable ends by stripping cable finishes back 2-inches down to insulation. Then apply four layers of an insulating tape criss-cross over the cable end and carry back at least 4-inches onto cable outer finish. Add a containing cover of two layers of vinyl electrical tape completely over the end seal.
 - b. Cable reels shall be shipped with factory applied lagging (protective cover) left in place until removal is absolutely necessary. Additional covering such as tarpaulin, plastic sheeting, etc. shall be used if cable is to be stored outdoors.
 - c. Store reels of cable on a firm surface, paved, or on planking to prevent settling into soft ground.
 - d. Use fencing or other barriers to protect cables and reels against damage by vehicles or other equipment moving about in the storage area.

3.05 CABLE SPLICES

A. General

1. Splice(s) in cables shall occur only in the following locations:
 - a. Pullboxes or manholes.
 - b. Terminal backboard, closets or rooms.
 - c. Equipment racks.
 - d. Wall mounted interface cabinet.
 - e. Do not splice cables in conduit, cable tray, raceways or plenums.

2. Polarity and color-coding shall be maintained consistent through splices, terminations and outlets for the entire electronic network system.
 3. Cable splices in outdoor areas, manholes, pullholes shall be water tight, inside universal splice enclosures.
- B. Fiber optic cable splices unless specifically indicated otherwise below, fiber optic cable splices between fiber optic cables fibers shall be fusion type splices.
1. Splices between loose tube gel filled fiber optic cable fibers shall be fusion type splices.
 2. Splices between indoor/outdoor fiber optic cable fibers shall be fusion type.
 3. "Pigtail" splices of tight buffered and indoor/outdoor fiber optic cable fibers to loose tube gel filled cables shall be fusion type splice.
 4. Splices between tight buffered fiber optic cable fibers to indoor/outdoor fiber optic cables shall be fusion type splice or mechanical type splice.
 5. Splices between tight buffered fiber optic cable fibers shall be mechanical type splice or fusion type splice.
 6. "Pigtail" splices of tight buffered fiber optic cable fibers to tight buffered fiber optic cable fibers shall be mechanical type splice or fusion type splice.
 7. Fiber optic splices shall be performed to maintain the data transmission rates specified for the entire respective system.
- C. Copper Wire Splice
1. Copper wire extending from infrastructure workstation outlets to respective equipment rack patch panel outlets shall not be cut or broken and shall be continuous end to end.
 2. Copper wire extending from telephone/voice workstation outlets to respective terminal blocks shall not be cut or broken and shall be continuous end to end.
 3. Continuity of cable shields (where occurs), polarity and color coding shall be maintained across all splices.
 4. Copper wire splices shall be performed to maintain the data transmission rates specified for the entire respective system.

3.06 CABLE TERMINATIONS

A. General

1. Infrastructure workstation outlets connecting to ports in patch panels and terminal blocks shall be grouped together in the patch panel and terminal block by outlet function, room location and building area location (i.e. Group #1 Room #120 1st floor; Group #2 Room #200 east wing, etc.). Each group shall be identified with engraved (etched) nameplates indicating grouping identification and individual port numbers.
2. Polarity and color coding of cable connections at splices, terminations and outlets shall be consistently maintained throughout the entire electronic network system.
3. Terminate all cables onto respective outlets connectors, interconnection couplers and terminals. Terminations shall comply with Manufacturer's recommendations, ANSI/TIA/EIA-568C related Standards, Amendments and TSB.

4. Fiber optic cable fiber strands and copper wire cable conductors terminated at outlet locations shall be connected with a strain relief device attached to the cable jacket to prevent cable tension from being transmitted to the termination connectors.
 5. Cable terminations shall be performed to maintain the data transmission rates specified for respective entire system.
- B. Fiber Optic Terminations
1. Individual fiber optic fibers shall each be terminated with a fiber optic fiber connector. The connector for each fiber shall be "plugged" into separate fiber optic fiber interconnection couplers on the rear of each respective outlet.
 2. Each fiber optic termination ferrule shall be inspected, after completion of the termination, visually with a fiber optic inspection microscope and an interferometer, to insure fiber "undercut", "protruding" fiber, over polish and under polish of fiber termination ends does not exist in the finished termination ferrule.
 3. Fiber optic cables terminated between two fiber optic patch panels located in separate equipment racks. The fibers shall be paired together (Duplex-Pair) for purposes of identification and connection transmit/receive pair. Each pair of connectors for fibers shall be "plugged" into separate, physically adjacent fiber optic fiber duplex-pair interconnection couplers at each patch panel. The horizontal/vertical arrangement of paired patch panel fiber couplers shall match at both ends of the fiber cable.
 4. Fiber optic cable fiber strands terminated at patch panels shall be installed with a minimum of 540 degrees of each fiber strand looped around the splice tray individual fiber "training" rings.
 5. Fiber optic cable connecting from infrastructure workstation outlet to a fiber optic patch panel.
 - a. The connectors for fibers shall be "plugged" into separate, physically adjacent fiber optic fiber interconnection couplers.
 - b. The patch panel coupler shall be color coded to identify the polarity of the transmitting and receiving optical fibers.
 6. Fiber optic cable connections at workstation outlets.
 - a. The connectors for fibers shall be "plugged" into separate physically adjacent fiber optic fiber interconnection couplers in the outlet.
- C. Copper Wire Terminations
1. Where occurs, the shield on metal shielded copper wire shall be terminated and connected to the shield grounding connection at each termination point.
 2. Twisted wire pairs shall not be untwisted for a length of more than 0.4-inch at any location and the cable jacket shall not be striped back not more than 0.5 inch any location including splices and terminations.
 3. Unless specifically directed otherwise by the Owner's Representative, Pin assignment for wiring terminations shall comply with ANSI/TIA/EIA-568C type T568A or Type T568B as required for compatibility with the electronic network equipment. The termination type shall be consistent throughout the Project Contract area.
 4. Copper wire termination's shall be performed to maintain the transmission rates specified for the respective entire system.

3.07 EQUIPMENT RACKS

A. General

1. Install, assemble, mount and connect devices and equipment in the respective equipment racks, bolted securely to the rack frame with stainless steel hardware. "Star" style lock washers shall be provided to insure an electrically continuous ground path between the equipment/devices and rack frames.
2. Provide blank metal filler panels to close unused equipment "front" mounting space in equipment racks, Manufacturer's standard finish color.
3. Provide a copper wire outlet connector in the respective equipment rack for each remote copper wire infrastructure workstation outlet and copper wire cable shown connected to the respective equipment rack, plus the spare copper wire outlet connectors required in the Contract Documents. The copper wire outlet connectors in the equipment racks shall be provided in equipment rack mounted copper wire patch panels. In no case shall the quantity of equipment rack mounted copper wire outlet connectors be less than the quantity of cables indicated on the Drawings, plus required spaces/spares.
4. Provide fiber optic fiber connectors and fiber optic fiber interconnection couplers in the respective equipment rack for each remote fiber optic infrastructure workstation outlet, and fiber optics cable fiber shown connected to the respective equipment rack, plus the spare fiber optic fiber connectors required in the Contract Documents. The fiber optic fiber connectors and fiber optic fiber interconnection couplers in the equipment racks shall be provided in equipment rack mounted fiber optic fiber distribution enclosures (RTDE). In no case shall the quantity of equipment rack mounted fiber optic fiber connectors and fiber optic fiber interconnection couplers be less than the quantity of cables indicated on the Drawings, plus required spaces/spares.
5. Fiber optics cable fibers specifically shown as non-terminated "splicing-thru" in the equipment rack shall route through fiber optic splice only enclosures (RMSE), mounted in the respective equipment rack.
6. The maximum quantity of cable terminations, in each equipment rack mounted patch panels shall not exceed the following. To insure not less than 50% of the rack space remains available for equipment installation:
 - a. 100% copper wire outlet connectors, 196 maximum per rack.
 - b. 100% fiber optic fiber terminations, 144 maximum per rack.
 - c. Combination of copper wire outlet connectors and fiber optic fiber terminations in the same rack; 48 maximum fiber optic fibers plus 144 maximum copper wire outlet connectors per rack. Eighteen maximum fibers plus 48 maximum copper wire in 30 inches high.
 - d. In addition to the quantity of patch panel outlets for termination of incoming and outgoing cables, provide not less than an additional 15% of patch panel spare outlets of each type, in each equipment rack for future use.
7. Provide additional equipment racks, quantity of racks to ensure the maximum specified quantity of terminations in single rack are not exceeded and the quantity of cable terminations complies with the Requirements of the Contract Documents.

8. Terminal racks, equipment locations, patch panels, and cross connects shall be arranged to allow for natural cabling progression, minimize crossing of cables and allow easy access to each system component.
 9. Equipment Rack Anchorage:
 - a. Equipment racks installed on raised "access floor" systems, shall be supported and anchored with bolts that extend into the "structural" floor located below the "access floor".
 - b. Securely anchor the support arms of swing gate racks to the wall structural support system.
 - c. Securely anchor fixed support base of the racks to the floor.
 - d. Mounting method shall support the total rack weight including installed equipment, but in no case less than 500 pounds with a 2.0 times safety factor.
 - e. Attachments and anchorages shall comply with the Requirements for earthquake seismic rating at the install location.
 10. Unless specifically noted, otherwise provide the following equipment rack types:
 - a. Floor standing equipment racks containing patch panel locations, computer/data network HUBS/switches and computer data network concentrators, shall be Swing Gate style equipment racks.
 - b. Floor standing equipment racks containing multimedia, audio/video, TV head end equipment, shall be Metal Enclosed equipment racks.
 - c. Wall mounted external to dedicated IDF/MDF terminal rooms/closets (i.e. inside individual classrooms) shall be Mini-Equipment racks.
 11. Install ground bus, PDU/TVSS, cable management rings, equipment, patch panel and patch panel outlets, etc. in equipment racks.
 12. Equipment rack terminology:
 - a. The location containing the main campus equipment rack location shall be identified as the Main Distribution Frame – (MDF).
 - b. The locations remote from the MDF containing satellite equipment racks shall be identified as Intermediate Distribution Frames (IDF).
 - c. A individual building located on a multi-building campus site with multiple equipment rack locations in the building, the building main rack location shall be identified as Sub-MDF (or building MDF) and the remaining equipment rack locations in the building shall be identified as IDF.
- B. Swing Gate Racks
1. Position the swing gate rack frame to provide a minimum of 30-inches clear space behind the moveable swing gate, for deep recess rack mounted equipment enclosure clearance. 42-inches in front of each rack to allow space for swing-gate 90-degree open position and still allow Personnel passage way with the swing gate open. Not closer than 30-inches from rack frame to side-adjacent walls, to allow rack to swing full open with installed equipment.
 2. All incoming cables shall enter from the back of the rack. The cables shall cross the hinge side of the rack with sufficient cable slack to allow opening and closing of the swing gate.

3. Provide unobstructed open-close operation clearances of the moveable swing gate. Do not install the edge of the rack closer than 30 inches to an intersecting perpendicular surface or wall.
 4. The bottom of the moveable swing gate frame shall be approximately 6-inches above the finish floor.
 5. Multiple swing gate equipment racks installed adjacent to each other along a common backboard/wall shall be spaced not less than 44-inches center line to center line and to insure the rack-gate can swing open a full 90-degree Arc with 24-inches deep rack mount equipment enclosures. Adjacent equipment rack with side-by-side hinges on the same side of the rack (left-right) may reduce the edge-to-edge rack side by side spacing to 6-inches for the respective combined two rack location.
 6. The fixed non-moving bottom of the rack shall be securely anchored to floor.
- C. Floor Standing Equipment Racks
1. General:
 - a. Securely anchor racks to floor.
 - b. All incoming cables shall enter through the top or bottom of the racks.
 - c. The front of the racks shall maintain a minimum of 42-inches of clear working space.
 - d. Multiple floor standing racks shall be installed directly adjacent to each other (i.e. side by side), with not less than 6-inches (edge-to-edge) space between adjacent racks.
 - e. Cables entering racks shall enter into the top of the rack from overhead cable tray, or from wall along wall support arms to rack.
 2. Floor standing metal enclosed equipment racks:
 - a. The rear of the rack shall maintain a minimum of 36 inches clear working space.
 - b. Provide a minimum spacing between adjacent (edge-to-edge) racks of not less than 6-inches.
 3. Floor standing open (non-swing gate) equipment racks.
 - a. The rear of the rack shall maintain a minimum of 54-inches clear working space behind the rack frame rails for adequate installation depth of HUBS/switches equipment, for "walk" behind access to equipment and for cable terminations access.
 - b. Provide a minimum spacing between (edge-to-edge) racks of not less than 6-inches.
 4. Floor standing modular frame equipment racks:
 - a. The rear of the racks shall abut against the wall, or as shown on the Drawing.

3.08 TELEPHONE/VOICE TERMINAL BLOCKS

- A. The telephone/voice terminal blocks shall be assembled in vertical sections, for wall mounting. Install adjacent vertical sections with not less than 8-inch blank space between sections, for cable training space.
- B. Install terminal blocks on plywood terminal backboard with #8 x 1-inch wood screws. Minimum 6-inches on center, along each side of each terminal block.

C. Terminal block wire pair capacity:

1. The minimum wire termination capacity shall not be less than 600 pairs of telephone/voice conductors, at any telephone/voice terminal block.
2. The quantity of wire pair terminations provided at each terminal block shall be based on the following formula. However, under no case shall any terminal block wire pair capacity be less than the specified minimum.
Total quantity of telephone/voice feeder copper wire pairs connected to the terminal board = QFP
Total quantity of telephone/voice outlets connected to terminal board - QTO
 $(QFP) \times (QTO \times 4) + (\text{specified spares}) = \text{Minimum terminal block pair capacity.}$

3.09 MDF AND IDF CIRCUIT TERMINAL ROOMS AND CLOSETS

A. Terminal Backboard

1. A ¾-inch thick marine "A-C" grade plywood backboard shall fully cover each wall of terminal closets and terminal rooms, including all MDF and IDF rooms/closets. Provide backboard on the wall for equipment racks, incoming cable raceways and terminal blocks. Plywood shall extend continuous from the finish floor to 8-feet above the finish floor on all walls. "A" side of plywood shall be exposed.
2. Attach plywood to wall structural framing with mechanical fasteners a minimum 6-inches on center vertically on walls at each framing vertical member, and along the length of the wall, but not less than 16 inches on center horizontally along the length of the wall.
3. Paint plywood terminal backboards after installation and prior to mounting any equipment. One coat of wood paint fire resistant primer and two coats of fire resistant/intumescent, non-conductive finish coats of paint. Finish color matt/flat white, acrylic enamel fire resistant/retardant latex paint.

B. Cable Tray

1. Locations with equipment racks, and/or terminal blocks are installed in the same room/closet (MDF or IDF).
 - a. Provide a horizontal cable tray above the equipment racks and terminal blocks in each circuit terminal room and closet.
 - b. Provide a horizontal cable tray continuous "loop" around the perimeter inside each MDF and IDF room, within 12-inches of the ceiling. Parallel with and adjacent to all walls in the room.
2. Ladder type cable tray 18 inches wide by 6 inches deep; length-end wall to end wall, of the closet or room.
3. Install the cable tray centered above all equipment racks, and around the room perimeter at ceiling/walls and terminal blocks with ceiling and wall suspension system. Install trays not more than 36-inches above and not less than 12-inches above the top of the equipment racks.
4. Where multiple segments of cable trays occur in terminal closets and rooms, provide interconnecting cable trays between each segment located in the respective room/closet.

C. Conductor Training and Support

1. Provide conductor/cable training and racking support distribution rings installed on backboards. As manufactured by Newton 3042 Series, Saunders or equal.
2. Support rings shall be spaced a minimum of 10-inches on center along all cable/ conductor routing paths on backboards and within 4-inches of each change in cable/ conductor direction.
3. The capacity of support rings shall be equal to the weight and quantity of conductors/ cables passing through the respective support ring plus 100% spare capacity for installation future conductors/cables. In no case shall support rings be smaller than 3 inches.
4. Attach support rings to backboards with not less than two 3/8-inch diameter by 1½-inch long threaded wood anchor bolts for each individual bracket.

D. Environment Space Monitoring (MDF and IDF)

1. In each room/closet provide one automatic environmental monitor. Self-calibrating, simultaneous monitoring and software programmable, with alarm set points. Shall measure and monitor ambient conditions and provide data-logging for conditions in the space for the following:
 - a. One ambient temperature port and plug-in indoor sensor.
 - b. One ambient humidity port and plug-in indoor sensor.
 - c. One spare plug-in port for an external digital sensor.
2. Digital Fast Ethernet LAN RJ-45 communications port, with alarm alerting and communications software for remote monitoring of the ambient conditions via the LAN. Multi-user site wide software license, compatible with PC-computer and IP-WEB HTTP remote operations.
3. Local internal audio and visual alert annunciators, with local silence and reset.
4. 120 volt, 60Hz AC input power supply operation. Equipment rack mount self-contained unit housing configuration. Provide all interconnect cabling and connectors.
5. Provide the environmental unit in one of the equipment racks located in each of the respective spaces.
6. As manufactured by Avtech-Room Alert; or SensaTronic-Environmental Systems; or IT Watch Dog-Climate Monitors.

3.10 GROUND (ADDITIONAL REQUIREMENTS)

A. Electronic Equipment MDF, IDF and Terminal Rooms and Closets

1. Terminal Equipment Ground Bus (TEGB) - Provide a wall mounted TEGB ground bus in each MDF location. Also provide a TEGB where two or more equipment racks and/or terminal blocks are provided in each IDF. The TEGB ground bus shall be copper ¼-inch by 2-inches (nominal) by 12-inches long (minimum). Install the TEGB on the wall with a minimum of two "stand-off" electrical insulators. Drill and tap the ground bus and provide bolted type ground lugs for connection of each ground conductors size #10AWG - #1AWG. Provide spare unused ground lugs on the TEGB.

2. Provide 1.25-inch conduit with 1#1AWG copper insulated ground conductor from the TEGB homerun to the building main ground reference bus. Provide 1.25-inch conduit with 1#1AWG copper insulated ground conductor from the TEGB homerun to the nearest building main structural steel member and to the nearest metal cold water pipe larger than 0.6-inch diameter pipe.
 - a. Provide the same ground connections from the equipment rack ground bus where only a single equipment rack occurs in the IDF location.
 3. The ground conductor required from the TEGB to the building main ground reference bus may be looped and connected between separate TEGB ground bus locations if all of the following conditions are met.
 - a. The ground conductor is increased to 1.5-inch conduit with 1#2/0AWG copper insulated and the total end to end length does not exceed 300-feet.
 - b. The building exceeds two floors in height.
 - c. Not more than four TEGB buses are connected to the same "looped" ground conductor.
 - d. The TEGB ground conductor is continuous (not cut, spliced or broken) along its entire length.
 - e. The TEGB ground conductor is connected to the TEGB ground buses with a UL listed "Exothermic" welding process.
- B. Equipment Racks:
1. Provide a separate 12AWG copper stranded green insulated ground conductor from each individual equipment element in the rack to the respective rack ground bus.
 2. Provide a separate #8AWG copper insulated ground conductor from each equipment rack ground bus to the TEGB terminal equipment ground bus located in the same space.
 3. Where only one equipment rack is installed, provide 1.25-inch conduit with 1#1AWG copper insulated ground homerun conductor from the equipment rack ground bus homerun to the building main ground reference bus and provide 1.25-inch conduit with 1#1AWG copper insulated ground conductor from the TEGB or single equipment rack ground bus (as applicable), to the nearest building main structural steel member and to the nearest metal cold water pipe larger than 0.6-inch diameter pipe.
 4. Provide 1.25-inch conduit with 1#4AWG copper insulated ground conductor from each wall mounted fiber interface cabinet to the respective TEGB ground buses.
 5. Provide a 1#10AWG copper insulated ground conductor connecting in a continuous loop to all miscellaneous cable trays and metal support equipment located in the terminal closet or room and connect to the TEGB ground bus.
- C. Telephone/Voice Terminal Blocks:
1. Provide a separate #8 copper insulated ground conductor from each terminal block section ground bus to the TEGB - Terminal Equipment Ground Bus.
 2. Provide a separate #6 copper insulated ground conductor from the terminal room/closet to the lightning ground system.

3.11 WALL MOUNTED FIBER INTERFACE CABINET - WMIC

3.12 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

A. General

1. Fiber optic and copper wire cables shall be identified in each manhole, pull box, equipment rack, patch panel and computer workstation outlets.
2. Infrastructure documentation, identification labels and color coding shall comply with ANSI/TIA/EIA-606A Administration Standard for Telecommunications Infrastructures, Class-1 thru Class-4. Provide management software MS-Windows-based single user license, with all as-built data entry documentation information complete.

B. Identification tags shall include the following information:

1. Cable name as indicated on Drawings (i.e., HV1, F4, MSB3 etc.).
2. Installation month and date (i.e., 3/92, 4/78 etc.).
3. Conductor size conductor type (i.e., loose tube fiber; #24AWG ScTP Category 5, 200-pair, telephone/voice etc.).
4. Feeder taps to equipment or building shall also be identified with equipment name or building (i.e. library, SW1, Rack #21, etc.)

C. Identification Tags

1. Tags shall be 1/8-inch thick 98% lead, approximately 2-inch square with chamfered corners. Two holes shall be drilled for attachment to primary cable. Lettering shall be 1/8-inch high, engraved or die stamped. Attach tags to primary cables with two #14AWG (THWN insulated) solid copper conductors "twist-tied", with insulated CAP wire-nut on the tie-wire ends, to cover sharp edges of tie-wire conductor.
2. Alternate identification tags, at the Contractor's option in lieu of lead tags. Provide polypropylene tag holders with interchangeable, yellow polypropylene tag with black alphanumeric characters sets. Characters shall be approximately .25-inch high. As manufactured by Almetek industries "EZTAG" - Ledgewood, New Jersey.

D. Equipment and outlet naming identification and color-coding shall comply with ANSI/EIA/TIA latest revision.

1. Naming method for equipment, outlets and cables; where a position in the naming string is unused, provide multiple "*****" symbols.

Typical naming string "ADM-02-1141-PP17-1271"

- a. "ADM" - Abbreviated Building Name or Number (i.e., Administration, B127, etc.)
- b. "02" - Floor Level #2 or as applicable.
- c. "1141" - Outlet, Equipment or Terminal Room/Closet name or room number as applicable.
- d. "PP17" - Terminal Rack Patch Panel Identification.
- e. "1271" - Individual Outlet or Port Identification.

2. Connecting hardware color coding shall be as follows:

"Green" - Main central terminal location for entire site.

"White" - Distributed terminal locations other than the main terminal.

"Blue" - Horizontal wiring hardware systems for workstations.

- E. Provide warning nameplates on fiber optic patch panels, fiber optic outlets, and any location where fiber optic cables are terminated. Minimum 1/8-inch high engraved/ etched letters. "WARNING - LASER LIGHT SOURCE. DO NOT LOOK DIRECTLY AT OUTLET OR FIBER CABLE ENDS. RISK OF SEVERE EYE DAMAGE OR BLINDNESS".

END OF SECTION 27 20 00
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SECTION 27 51 00
INTEGRATED COMMUNICATION SYSTEMS

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 Specifications Sections and Drawings for related work required to be included as work under Division 26.
 - 2. General Provisions and Requirements for electrical work.
- B. Principal items of work shall include, but not be limited to the following:
 - 1. Furnishing/installing and connecting to an existing public address/clock and intrusion detection system including interior and exterior speakers, motion sensors, door contacts, keypad and clocks where indicated on Drawings.
 - 2. Furnishing and installing all connectors, power supplies, and equipment as may be required, as specified herein.
 - 3. Performing necessary revisions to or furnishing and installing and connecting all wiring and terminal strips, in cabinets and on backboards, necessary to provide for Functions and Requirements specified herein. All conductors or cables shall be installed in conduits or raceways, unless indicated otherwise. Contractor must include all terminations from the field and from the existing equipment headend equipment and all cross-connect wires in his warranty. Contractor is to determine if existing field terminations are warrantable and either replace them or include them in the warranty.
 - 4. Engineering design, testing, materials, components and supervision necessary to provide a complete operable installation.

1.02 SUBMITTALS

- A. Submit product data sheets and descriptive literature for all component parts.
- B. Submit block writing diagrams of the public address/paging system.

1.03 QUALITY ASSURANCE

- A. Contractor shall warrant and guarantee that all work executed and materials furnished are free from defects of material and workmanship for a period of 2 years from acceptance date of Contract Completion, not including specific items of work which require a guarantee or warranty of a greater period of item as set forth in the Specifications. Immediately upon receipt of written notice from the District, Contractor shall repair or replace at no expense to the District any defective material or work which may be discovered before the final acceptance of work or within guarantee period, any material or work damaged thereby, and all adjacent material or work which may be displaced in repair or replacement required hereunder. Examination of failure to examine work by the District shall not relieve Contractor from these obligations.

- B. If the Contractor fails to repair or replace material or work as indicated above within 24 hours of receiving a written notice, the District, with its own Personnel or by Contract, may proceed with repair or replacement and assess the cost thereof against Contractor when necessary for keeping school open or safety operating, if the Contractor does not respond accordingly.
- C. Ordinances and Regulations:
 - 1. All work of this Section shall conform to California Building Code and California Electrical Code.
- D. Permits and Inspections: Obtain and pay for permits and inspections required and deliver certificates of inspection to the District Inspector.
- E. All work shall be done by a qualified Contractor holding all the licenses required by the legally constituted authorities having jurisdiction over the work. Contractor shall have completed at least three projects of equal scope to systems described herein, and shall have been engaged in business of supplying and installing specified type of systems for at least 5 years. Contractor shall maintain a fully equipped service organization capable of furnishing adequate repair serve to the equipment.
- F. Installation shall be carried out under direction of a qualified Engineer at the Contractor's expense.

1.04 QUALIFICATION OF BIDDERS

To qualify as an acceptable Bidder, whether the bid is submitted to the District, his Agent, a General Contractors or a Sub-Contractor shall be qualified Sound Contractor and shall hold a valid C61 License issue by the Contractors State License Board of California. The System Bidder or Contractor shall hereinafter be referred to as the Contractor. The Contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work. The Contactor shall be the Factory-Authorized Distributor for the brand of equipment offered and shall have been engaged on the business of supplying and installing the specified type of system for at least 5-years. The Contractor shall maintain a fully-equipped service organization capable of furnishing adequate repair service to the equipment. The Contractor shall be financially able to provide a performance bond covering the work and the guarantee described. The Contractor shall provide that bond if requested.

1.05 EQUIPMENT QUALIFICATIONS

- A. All equipment shall be exclusively as produced by the Manufacturers' names herein and on the Drawings in order to match existing equipment on the site and operational and maintenance systems within the District. No substitutions or equals will be approved.
- B. All of the Electronic Systems Equipment shall be furnished and installed by the Authorized Factory Distributor of the equipment. The Contractor shall furnish a letter from the Manufacturer of all major equipment, which certifies that the Installing Communication Contractor is the Authorized Distributor and that the equipment has been installed according to factory intended practices. The Contractor shall also furnish a written guarantee from the Manufacturer that they will have a Service Representative assigned to this area for the life of the equipment.

PART 2 PRODUCTS

2.01 MATERIALS

Comply with Pertinent Provisions of Section 26 05 01.

2.02 EXISTING CAMPUS CENTRAL EQUIPMENT

- A. Visit site and become thoroughly familiar with existing public address/clock, intercom, telephone and intrusion detection system equipment prior to submitting a bid. Include within this Contract all costs to modify and/or add to the existing central equipment as required to fully serve the new construction.
- B. Provide auxiliary components and/or accessories where required to interface new and existing equipment.
- C. Provide all system programming including the necessary product handlers so that all perimeters are entered into the system and annunciator displays text, which is customized to the facility.

2.03 PUBLIC ADDRESS/CLOCK SYSTEM

- A. The existing public address and clock systems on campus shall be expanded as required to serve the new construction. Provide final connections to equipment rack and for re-programming of the system to account for the new construction.
 - 1. Speakers
 - a. Interior speakers shall be 8-inch diameter paper cone type with T25 25V line matching transformer. Frequency range to be 30 to 15,000 Hz. Interior wall-mounted speakers shall be mounted in Soundolier #198-8/161 backbox/baffle.
 - b. Exterior speakers shall consist of an Atlas #AAPF-15 series loudspeaker with T-11 transformer in a Soundolier #L20-211/VP161-APF backbox and cover or equal. Housing shall include a baffle and shall be painted to match surrounding surfaces.
 - 2. Clocks
 - a. Analog clocks shall be 12-inches round, 24 volt, AC correction, semi-flush with sweep second hand and quick disconnect.
 - 3. Cabling
 - a. Cable run in conduits below grade shall be Teflon-coated or otherwise approved by the Manufacturer for the purpose. Repull any existing site runs and add conductors necessary to add new cabling and return existing rooms to operation.
 - b. Cable serving clocks shall be two or three conductors solid copper #16 AWG with overall jacket.
 - c. Cable serving exterior speakers shall be a twisted pair of #14 AWG solid copper conductors with overall and jacket. Each speaker shall have separate conductors homerun back to termination location as indicated on plans.
 - d. Cable serving interior speakers shall be a twisted pair of #16 AWG conductors with overall shield and jacket. Each speaker shall have separate conductors homerun back to termination location as indicated on plans.
 - e. All cabling shall be of the type approved or the areas where it is used.

- f. Provide twelve pair, 24 awg, OSP telephone cable from the main signal room to the new portable building, locations as shown on Drawings.

2.04 INTRUSION DETECTION SYSTEM

- A. Provide additions to existing campus intrusion detection system control panel and re-program as required to account for the new devices.
- B. Provide all necessary hardware, wiring and connections for a complete and fully operable system.
- C. Keypads shall allow individual zones to be bypassed.
- D. Motion sensors shall be Detection Systems Inc. #DS774 Series for wall mounted types and #DS938 for ceiling mounted types. Sensors shall be dual performance, dual event devices to minimize false alarms or equal passive infrared devices detecting thermal motion signals. Sensor coverage patterns shall be as required for optimum coverage at each individual location. Sensor shall be adjustable Gimbal mounted with plate and outlet box
- E. Magnetic switch shall be fully concealed in the door frame, Sentrol or equal.
- F. Each intrusion detection system terminal cabinet shall contain a 12 volt DC power supply with a minimum 7 amp hour battery backup for motion sensors and POPEX (Zonex) modules. All popits and detectors shall be clearly marked on the exterior with its own address. All motion detectors shall have their own unique address. All popits shall be centrally located in the terminal cabinet and secured to ¾-inch thick marine "A-C" grade plywood backboard.
- G. Cabling shall be Westpenn or equal as required for system operation. All cabling shall be shielded.

PART 3 EXECUTION

3.01 MATERIALS

Comply with Pertinent Provisions of Section 26 05 01.

3.02 WIRING DESIGNATION AND TERMINAL CABINET MAKE UP

- A. All #22AWG and #24AWG connections throughout the system shall be made by spring tension clip "punch block" Siemens Type 66 terminals or equal. Wires of #16 gauge and larger shall be terminated on barrier screw terminals. All conductors in terminal cabinets shall be carefully formed and harnessed in a workmanlike manner.
- B. All wiring for complete communications system shall be new wire. Multi-pair cables may be used between buildings. Any wires pulled through in ground junction boxes shall be continuous with no splices. The wiring shall be intact with no cuts in the protective outer jacket. All splices to be made in above ground junction boxes, using terminal strips in all cases.
- C. Provide all cabling from building terminal cabinets to each outlet shown on the plans.
- D. Provide labeling for each conductor with identification as its use and function as per District Requirements.

3.03 PORTIONS OF CABLES

- A. The portions of cables installed without raceways or cable tray supports shall be installed with "j-hook" cable supports.
- B. The "j-hooks" shall provide multi-tiered "treed" "J" shaped hoods, with wide flat cable support base (0.5-inch wide minimum) and smooth rounded corners, specifically designed for Category-5 and fiber optic cable support. As manufactured by Erico Inc.
- C. The individual "j-hook" attachment to the building structure shall be "beam clamp", "hanger rod", clevis hanger styles.
- D. Install "j-hooks" not more than 36 inches on center along the entire cable length, at each cable change in direction, to insure less than 6 inches of cable sag between adjacent hooks. Secure cables to "j-hooks" with cable tie wraps. "J-hook" supported cables, bundle cables together with tie wraps.
- E. "Bridle rings" shall not be used to support cables.
- F. Cables shall not lay directly on ceilings, ceiling hangers, lighting fixtures, air ducts, piping, or equipment.

3.04 MOTION SENSORS

Locate motion sensors to provide optimum coverage of the space and to avoid conflicts with the architectural aesthetics of the building. Submittal Drawings shall show the exact locations of all system sensors.

3.05 COORDINATE CONCEALED DOOR SWITCH INSTALLATIONS WITH FINISH HARDWARE MANUFACTURER.

3.06 INSTALLATION

- A. The wiring of the system shall be executed in accordance with the Drawings and the Equipment Manufacturer's wiring diagrams. Should any variations in these Requirements occur, the Contractor shall notify the Architect before making any changes. It shall be the responsibility of the Factory-Authorized Distributor of the specified equipment to install the equipment and guarantee the system to operate as per Plans and Specifications.
- B. Furnish all conductors, equipment plugs, terminal strips, etc., and labor to install a complete and operable system.
- C. The labor employed by the Contractor shall be regularly employed in the installation and repair of communication systems and shall be acceptable to the Owner and Architect to engage in the installation and service of this system. The systems shall be installed in accordance with NFPA 70 and other applicable Codes.
- D. Impedance and Level Matching: Carefully match input and output impedance's and signal levels at signal interfaces. Provide matching networks where required.
- E. Control Circuit Wiring:
 - 1. Install control circuits in accordance with NFPA 70 and as indicated. Provide number of conductors as recommended by System Manufacturer to provide control functions indicated or specified.

2. The Contractor shall provide necessary transient protection on the AC power feed, all station lines leaving or entering the building, and all central office trunks. All protection shall be as recommended by the Equipment Supplier and referenced to earth ground.
- F. Weatherproofing: Provide weatherproof enclosures for items to be mounted outdoors or exposed to weather.
- G. Grounding:
1. Provide equipment grounding connections for Integrated Electronic Communications Network systems as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
 2. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.
 3. The Contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.
 4. The Contractor shall note in his System Drawings, the type and location of these protection devices as well as all wiring information.
 5. The Contractor shall furnish and install a dedicated, isolated earth ground from the central equipment rack and bond to the incoming electrical service ground buss bar.

3.07 CLEANING AND PROTECTION

The Contractor shall thoroughly clean all equipment and materials. All exposed parts of the equipment, cabinets, and other equipment shall be left in a clean condition, unblemished and free of all dirt, dust, smudges, spots, fingerprints, etc., the Contractor shall remove all debris and rubbish occasioned by the electronic systems work from the site. The Contractor shall thoroughly clean all buildings of any dirt, debris, rubbish, marks, etc., caused by the performance of this work.

3.08 EXISTING CONDUITS

- A. Include within this Contract sufficient labor costs to locate, trace, and verify existing conduits related to the new construction. Examine each site including terminal cabinets, panels and ceiling spaces in order to identify existing conduits and plan layout of new conduits.
- B. Notify the Architect immediately if existing conduits are discovered to be broken or in any other way not usable as specified.
- C. All new wiring shall be installed in conduit, unless noted otherwise.

END OF SECTION 27 51 00

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SECTION 28 46 20
FIRE DETECTION AND ALARM SYSTEMS

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 Specifications Sections and Drawings for related work required to be included as work under Division 26 00 00, 27 00 00, and 28 00 00.
 2. General Provisions and Requirements for electrical work.
- B. This Specification provides the Minimum Requirements for the Fire Alarm and Detection System. The system shall include, but not limited to all equipment, materials, labor, documentation and services necessary to furnish and install a complete, operational system to include but not limited to the following functions:
1. Smoke and fire detection.
 2. Off-premise notification.
 3. Mass Notification system.
 4. One-way voice communication notification system.
 5. Two-way voice communication system.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. Submit eight copies of the following to the Architect for Approval.
1. A listing of all fire alarm components and equipment including the California State Fire Marshal (CSFM) listing numbers.
 2. CSFM listing sheets of all devices being used.
 3. Manufacturers' standard catalog data for fire alarm components.
 - a. The submittal shall be arranged in the order of the Specification and shall list the Specification paragraph number, the name, the proposed Model and Manufacturer for each item as well as a reference indicating the specific piece of data which can be easily located in the brochure.
 - b. The Manufacturers' data sheets shall be marked to indicate the specific item being proposed in cases where the sheet covers several types or sizes of item. The data sheet shall completely describe the proposed item.
 - c. Where modification to the equipment is necessary to meet the Operational Requirements of the Contract Documents and the data sheets shall include complete Mechanical and Electrical Shop Drawings detailing the modification.

4. A listing of the outlet rough-in needed for every device and equipment item. The applicable symbol which illustrates that rough-in item on the Job Plans shall be drawn on the proposal, opposite the description of the rough-in to facilitate locating the data by Field Personnel.
5. Elevation and dimensional information.

1.03 APPLICABLE STANDARDS

- A. The Equipment shall be listed, labeled, and approved for the application shown in Contract Documents, as fire alarm equipment complying with the following Requirements:
 1. List of applicable Codes:
 - a. Building Standards Administrative Code, Part 1, Title 24 C.C.R.
 - b. California Building Code (CBC), Part 2, Title 24 C.C.R.
 - c. California Electrical Code (CEC), Part 3, Title 24 C.C.R.
 - d. California Mechanical Code (CMC), Part 4, Title 24 C.C.R.
 - e. California Plumbing Code (CPC), Part 5, Title 24 C.C.R.
 - f. California Fire Code (CFC), Part 9, Title 24, C.C.R.
 - g. California Referenced Standards Code, Part 12, Title 24, C.C.R.
 - h. Title 19, C.C.R., Public Safety, State Fire Marshal Regulations.
 - i. California Energy Code (CEC, Part 6, Title 24 C.C.R.
 2. NFPA Standards and Guides:
 - a. NFPA 13, Automatic Sprinkler Systems.
 - b. NFPA 14, Standpipes Systems.
 - c. NFPA 14, Dry Chemical Extinguishing Systems.
 - d. NFPA 17A, Wet Chemical Systems.
 - e. NFPA 24, Private Fire Mains, (included in NFPA 13).
 - f. NFPA 72, National Fire Alarm Code, (California Amended).
 - g. NFPA 253 Critical Radiant Flux of Floor Covering Systems.
 - h. NFPA 2001, Clean Agent Fire Extinguishing Systems.
 3. The fire alarm system shall conform to the applicable Standards and Guides referenced in CBC Chapter 60.
- B. Written Certification by the Fire Alarm Equipment Manufacturer shall be submitted to the Architect, stating that the system and its component parts are listed and approved by the California State Fire Marshal and the Installation has been Tested, is Operational and Conforms to the Requirements as set forth in Part 3, Article 24, Title 19, California Code of Regulations.

1.04 EQUIPMENT AND INSTALLING QUALIFICATIONS

- A. The Equipment shall be manufactured by Silent Knight/Farenhyt to match existing fire alarm equipment within the District.
- B. The Specification is based on the equipment of Manufacturers who have been approved by the District and the Manufacturers herein named shall be considered as meeting the Requirements of this Specification. For all items which are identified by part number and Manufacturer the Performance Specifications which are published in the most recent

Manufacturer's data sheets available at the time of bidding this Project shall be applicable to the present work as though fully written out herein.

- C. All Equipment shall conform to all local applicable Codes and Ordinances, and shall be listed by Underwriters Laboratories.
- D. To Qualify as an Acceptable Bidder, whether the bid is submitted to the District, his Agent, a General Contractor or a Sub-Contractor, the System Bidder or Contractor shall be qualified Fire Alarm Contractor and shall hold a valid C10 License issued by the Contractors State License Board of California. The System Bidder or Contractor shall hereinafter be referred to as the Contractor. The Contractor shall hold all other licenses required by the legally constituted Authorities Having Jurisdiction over the work. The Contractor shall be the Factory Authorized Distributor for the branch of equipment offered and shall have been engaged in the business of supplying and installing the specified type of system for at least 5-years. The Contractor shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The Contractor shall be financially able to provide a performance bond covering the work and the guarantee described. The Contractor shall provide that bond if requested.
- E. Installation Certification
 - 1. Work and material for cables, cable terminations and related components shall be performed by Certified Installers. The Installer shall be certified by the respective Product Manufacturers.
 - 2. The Manufacturers of the indicated work and material shall provide an Installer Education/Training and Certification Program for the supplied products.
 - 3. The Installers performing the Contract Work for the indicated products shall have attended and successfully completed each of the respective Manufacturer's installation training education programs for the specified products.
 - 4. Submit six copies of the Manufacturer's Certifications for each Installer performing the work. The submittal shall be approved prior to initiating any related Contract Work.
 - 5. Contract Material installed and work performed by Installers not complying with these Requirements shall be removed. Removal of work and material not in compliance with these Requirements shall done at the Contractors' expense, without any additional cost to the Contract and without any Additional Contract completion due date extensions. New material and work required to replace the non-complying removed work and material shall be provided at the Contractors' expense, without any additional cost to the Contract and without any Additional Contract completion due date extensions.

PART 2 PRODUCTS

2.01 GENERAL SYSTEM OPERATION

- A. System shall be microprocessor-based, addressable, and power-limited with Class B supervised circuits, one-way and two-way emergency audio communications.
 - 1. The microprocessor shall execute all supervisory and control programming to detect, report the failure or disconnection of any system module or peripheral device and initiate programmed control sequences. An isolated supervision "watchdog" circuit shall monitor the microprocessor and, upon failure, shall activate the system trouble circuits.

2. The automatic fire detection and alarm system shall consist of main control panel, transponder panel(s), notification alarm devices, remote annunciator, automatic detection devices, manual stations, printer, and CRT/keyboard, installed and wired in accordance with the Drawings and shall function as specified herein.
 3. The system shall be programmable in the field, by a non-computer trained person. All programmed information shall be stored in non-volatile memory.
 4. The system shall operate both addressable and non-addressable ionization, thermal and photoelectric detecting devices, manual stations, water-flow switches, and external control modules.
 5. The control panel shall provide power, annunciation, supervision and control for the fire detection and alarm system. The system shall be designed such that alarm indications override trouble and control conditions.
 6. External Circuit Supervision shall not require additional wires other than the pair used for detection or alarm (only 2-wires shall be used from the control panel to each loop of initiating devices and 2-wires for the notification alarm devices). These 2-wires shall provide both supervision and notification alarm signals. There shall be no loss of Supervision for Class "B" wired addressable devices. Class "A" Supervision may be provided by adding an additional pair of wires.
- B. Alarm Conditions
1. Actuation of any manual or automatic alarm initiating device, connected to the system shall cause the following automatic functions.
 - a. All notification alarm signaling units shall activate continuously. Audible notification alarms shall sound the California State Coded Signal.
 - b. The respective zone alarm lamp or annunciator alphanumeric readout on the central control panel, and remote annunciator panel, shall be activated.
 - c. Activate the Digital Alarm Communicator system.
 2. Actuation of HVAC air duct smoke detectors shall stop the designated fans and motors in the building's air distribution system.
 3. Actuation of smoke detectors on either side of smoke doors shall energize the release mechanism on the smoke door causing the door to close.
 4. Notification alarm signal duration shall be capable of continuous sounding or adjustable from 3 to 10-minutes.
 5. Perform any additional functions as specified herein or shown on the Drawings.
- C. Trouble Condition
1. A single open or single trouble condition in a manual or automatic fire initiating wiring circuit shall activate the respective zone trouble lamp or annunciator readout on the fire alarm control panel and sound a trouble signal at the control panel.
 2. A single open or single trouble condition in the notification alarm signaling wiring circuit shall activate the trouble lamp or annunciator readout in the control panel and sound a trouble signal at the control panel.
 3. 120 volt AC normal power shall be monitored with indication by a "Power On" lamp. Upon normal power outage, the system shall activate power trouble condition lamp or annunciator readout, and indicate a trouble condition.

4. The control panel shall monitor the standby batteries and, upon a low battery condition, activate the low battery lamp or annunciator readout and indicate a trouble condition.
 5. System ground detection shall be provided for the entire system. Upon ground detection, activate the ground detection lamp or annunciator readout and indicate a trouble condition.
- D. Control Panels Employing Alphanumeric Readouts shall display the trouble condition along with a prompt to review the list chronologically. The end of the list shall be indicated.

2.02 FIRE ALARM CONTROL PANEL

A. General

1. The fire alarm control panel shall be software programmable, microprocessor controlled, solid state, electronic integrated system. The panel shall be the product of one Manufacturer. The control panel shall provide power, annunciation, supervision and control for the detection and alarm system. The detection system shall remain 100% operational, responding to an alarm condition while in the routine maintenance mode.
2. Addressable detection and control devices shall be individually identified by the system, and any quantity of addressable detection devices shall be in alarm and any quantity of addressable control units shall be operable at any time up to the total number connected to the system.
3. The microprocessor shall access the system program, which is stored in non-volatile programmable memory, for all Control-By-Event (CBE) functions. The system program shall not be lost upon failure of both primary and secondary power. Volatile memory shall not be acceptable.
4. A means shall be provided for acknowledging each abnormal condition. Each activation of the appropriate acknowledges button shall sequentially acknowledge every point in the system. After all the points have been acknowledged, the LEDs shall glow steady and the panel audible signal will be silenced. The total number of alarms, supervisory, and trouble conditions shall be displayed along with a prompt to review each list chronologically. The end of the list shall be so indicated.
5. An alphanumeric annunciator readout shall indicate on the control panel the activation by type, loop, and address of the specific device, sub-loop or alarm/monitor/control point via an alphanumeric display. An audible alert shall sound at the control panel and an alarm light shall flash.
6. If the microprocessor fails, the system shall executive a default signaling program. This program shall enable the control panel to sound the audible signals and summon the Fire Department. In addition, a red LED shall light to indicate the communication loop wherein the alarm originated. Inability of the system to sound signals or summon the Fire Department during micro-processor failure shall not be acceptable.
7. Protected access to the system controls shall be provided to allow the user/ operator access to the following system functions:
 - a. Status of all addressable points.
 - b. Status of all events logged.
 - c. Set/change the real-time clock and date.

- d. Perform an operational manual test of the system from the control panel, including actuation of any initiating device and trouble circuit without alarming the remote central station. The panel shall automatically return to normal mode in the event the panel remains unattended in the service mode.
 - e. Retrieve from event log the last 300 alarms, or control points and 300 trouble conditions.
8. Individual input (monitor) and output (control) device addressability shall all be performed on the same pair of wires. Wiring shall be Class "A" or "B". When Class "B" wiring is used, no special wiring sequence shall be required on addressable device circuits. An unlimited number of wiring branches shall be permitted with no loss of supervision.
9. A minimum of 25% addressable monitor, trouble and control points shall be provided.
- B. Cabinet
- 1. A metal tamper resistant cabinet shall contain the control panel components. Panel shall be surface or flush mounting as indicated on the Drawings. Provide a full height tamper resistant hinged locking cabinet door. The door shall have transparent, high impact windows to allow visual observation of all indicators and switches without opening the panel door.
 - 2. "In-Out" circuit conductors shall terminate on numbered screw-type terminals.
 - 3. All groups of circuits or common equipment shall be clearly marked and shall be expandable by inserting interchangeable units.
- C. The Control Panel shall provide positive protection against the fire alarm system inadvertently being left in a non-operating status. The alarm system shall automatically restore and resound alarms and trouble signals, if subsequent alarm initiating or trouble signals are received under any of the following conditions:
- 1. After the alarm or trouble silence switch have been activated.
 - 2. Prior to resetting system after previous alarm or trouble conditions.
- D. The System Indicating and Operational Control Devices shall be mounted on the control panel face behind the panel door and shall provide the following minimum functions:
- 1. Individual visual indicating pilot lights annunciator or alphanumeric readout to monitor the following alarm system conditions:
 - a. Input power.
 - b. System common alarm.
 - c. System common trouble.
 - d. Alarm or trouble signal silenced.
 - e. Ground fault.
 - f. Battery condition.
 - g. Each individual alarm, control or initiating zone-activation.
 - h. Each individual alarm, control or notification zone-trouble.
 - i. Report, by specific device number, any device removed from an addressable initiating circuit, all other devices shall continue to function.

2. Manual control switches to allow the following system controls:
 - a. Alarm silence.
 - b. Trouble silence.
 - c. Test all indicating pilot lights and readouts.
 - d. System reset, including remote devices connected to the alarm panel.
 - e. Alarm test to initiate an alarm condition from the control panel.
 - f. Alarm disconnect for system testing without activating the Digital Alarm Communicator system.
 - g. Changing the status of configured circuits (arming or disarming and changing status of relays). If any change in status degrades system operation as configured, a trouble condition shall be reported and remain until system operation again meets configured status.
 - h. Perform multiple operations at the same time. These operations shall include but not be limited to timed functions and multiple configured sequences.
- E. Alarm Initiating Zone Modules.
1. Shall supervise and accept remote alarm actuating device input signals. An alphanumeric readout shall indicate separate zone alarm and trouble indicators for each zone.
 2. Zones shall be compatible, and designed to operate with the connected initiating devices either addressable or non-addressable type.
 3. A spare double throw set of software programmable auxiliary alarm relay contacts shall be provided for control of remote devices for each zone. Contacts shall be rated 120-volt 60Hz 3-amp.
 4. Each device on the system shall report as its own unique address.
- F. Notification Alarm Signal Control.
1. Shall supervise and activate remote notification alarm devices.
 2. Notification alarm shall be compatible and designed to properly operate with the connected audio and visual notification alarm devices, with no signal degradation.
 3. The notification alarm shall provide group notification signal control of all notification zones.
 4. The alarm modules shall be field resettable to provide either continuous or coded notification alarm signals. The Coded alarm signal shall provide an intermittent "On-Off" pulsed sound activation of audible notification alarm devices.
 5. A notification alarm circuit trouble indicating readout shall be provided for each notification zone.
- G. Audio
- The system shall be capable of delivering multi-channel audio messages simultaneously over copper and/or fiber media. All audio messages and live pages shall originate at the one-way audio control unit. The one-way audio control unit shall store pre-recorded audio messages digitally. These messages shall be automatically directed to various areas in a facility under program control. The system shall support remote cabinets with zoned amplifiers to receive, amplify and send messages through speakers over supervised circuits. The one-way emergency audio control shall provide control switches to direct paging messages as follows:

"All Call" to direct the page messages to all areas in the facility, overriding all other messages and tones.

"Page to Evacuation Area" to direct the message to the evacuation area(s), overriding all other messages and tones.

"Page to Alert Area" to direct page messages to the area(s) receiving the alert message and tones, overriding all other messages and tones.

"Page to Balance Building" to direct page messages to the areas) in the facility NOT receiving either the evacuation area or alert area messages.

"Page by Phone" switch to select the Firefighters telephone system as the source for paging.

The system shall be capable of delivering multiple audio messages simultaneously over copper and/or fiber media. All audio messages and live pages shall originate at the one-way emergency audio control unit. The one-way emergency audio control unit shall store pre-recorded audio messages digitally. These messages shall automatically directed to various areas in a facility under program control. The system shall support remote panels with zoned amplifiers to receive, amplify, and distribute messages through speakers over supervised circuits.

The two-way voice communications control unit shall provide two-way communications between remotely located phones and the command center. The control unit shall provide the ability to individually select and display each two-way voice communication circuit support up to five remote telephones in simultaneous two-way voice communications.

Audio Amplifiers (Multi-Channel)

Provide one 20-watt audio amplifier per paging zone. There will be a total of two 20-watt amplifiers (one per floor). The system software shall be capable of selecting the required audio source signal for amplification. To enhance system survivability, each audio amplifier shall automatically provide a local 3-3-3 1000Hz temporal pattern output upon loss of the audio communications with the one-way audio control unit, during an alarm condition. Audio amplifiers shall be power limited and protected from short circuits conditions on the audio circuit wiring. Each amplifier output shall include a dedicated, selectable 25/70 Vrms output. Provide a standby audio amplifier that will automatically sense the failure of a primary amplifier, and replace the function of the failed amplifier.

- H. Automatic Ground Detection shall detect either positive or negative voltages when earth connections of 50,000 OHMS or less occur, and activate the ground trouble signal.
 - 1. A ground fault Code shall provide indication of either a positive or negative ground fault and shall operate the general trouble devices as specified herein but shall not cause an alarm to be sounded.
 - 2. A short circuit error message shall be a standard feature of the fire alarm control panel. Each communication loop shall be monitored for short circuits and shall have a distinctive error message for visual indication of circuits and operating trouble devices as specified herein but shall not cause an alarm to be sounded.
- I. Power Supply
 - 1. The dedicated power supply shall be adequately sized to properly operate the equipment, including remotely connected, spare and future indicated equipment with all alarm devices in alarm condition. Provide 20% spare power supply capacity for future

expansion. Provide transfer modules and multiple power supplies as required for proper operation.

2. Input voltage 120/240 volt or 120/208 volt 60Hz AC.
 3. Surge transient voltage protection on the input and output phases of the power supply shall be provided.
 4. Supervised voltage types (i.e., 120-volt 60Hz AC, 24 volt AC, 24 Volt D.C., etc.) required by special connected equipment shall be supplied, including but not limited to:
 - a. Alarm initiating devices.
 - b. Notification alarm devices.
 - c. Control and annunciator panels.
 - d. Fire and smoke dampers.
 5. A solid-state power transfer circuit shall provide (UPS) Uninterrupted Power supply between internal standby power and line power automatically and instantaneously if normal power fails or falls below 15% of normal ("brown out" conditions).
 6. Individual circuit fuses shall be provided for smoke alarm detector power, main power supply notification circuits, battery standby power, and auxiliary output.
 7. Provide lock-on device on each power supply dedicated branch circuit breaker at panel.
- J. Battery Back-Up Operation
1. Internal batteries and battery power supplies shall be provided to allow 60-hours continuous automatic normal operation of the entire control panel and fire alarm system after the failure of the incoming utility power. Sufficient battery capacity shall remain at the end of 60-hour period to provide 10-minutes of continuous operation of all connected notification alarm devices.
 2. Batteries shall be maintenance free, sealed, lead-acid or lead calcium or gelled electrolyte type rated 25% larger than required to provide power for the entire system upon loss of normal 120 VAC power for a period of 60-hours with 15-minutes of alarm signaling at the end of this 60-hour period.
 3. The battery charger shall be automatic, dual rate with capacity to recharge completely discharged batteries in 18-hours. Charger shall be temperature compensated.
- K. Lightning and Transient Voltage Surge Protection shall be a standard feature of the fire alarm control panel and shall be incorporated in the power supply circuit, common control circuits, signal circuits, and telephone line circuit.
- L. Circuitry shall be provided in the control panel to permit transmission of trouble and alarm signals over leased or privately owned telephone cables to a remote receiving panel. A reverse polarity or a master box circuit as required shall be provided in the control panel. There shall be a supervised disconnect switch to allow testing of the fire alarm signal without transmitting an alarm signal to the central station.
- M. The Alphanumeric Annunciator (printer and CRT/keyboard) shall list upon request:
1. Alarms with time, date and location.
 2. Troubles with time, date and location.
 3. Status of output functions, "On" or "Off".
 4. Sensitivity of addressable smoke detectors.

5. Detection device number, type and location.
 6. Status of remote relays, "On" or "Off".
 7. Acknowledgment time and date.
 8. Signal silence time and date.
 9. Reset time and date.
- N. The System shall also provide the following:
1. Counting the number of addressable detectors within a "Zone".
 2. Which are in alarm.
 3. Counting "zones" which are in alarm.
 4. Counting the number of addressable detectors which are in alarm.
 5. Alarm on the system.
 6. Differentiating among types of addressable detectors such as smoke detectors, manual stations, water-flow switches, thermal detectors.
 7. Assigning priorities to types of detectors, zones or groups of detectors.
 8. Cross-zoning.
- O. Control Functions
1. Control functions shall be assigned on the basis of multi-relational system initiation patterns of detection devices including full logic element equations using as "anding" zones, counting zones, counting devices, "anding" groups, conditional "if", "then", "or" programming and "anding" types of detection devices.
 2. Control functions shall be assigned on the basis of, cycle, delay, count, time of day, day of week, day of month and with a holiday schedule of up to 30-holidays per year. Each addressable detection device shall report its condition to the system control unit not less than every 4-seconds in a manner such that failure of the connections to the internal electronics of the device will result in a trouble signal which identifies the specific device involved.
 3. The system shall be field programmable for the response of control points to monitored devices.
 4. The operating software program shall provide programmable control for the Event-Initiated-Programs (E.I.P.) which shall allow automatic operation of system control points in the event of an alarm condition. To program this E.I.P.s, the system shall use a specifically designed user friendly programming language, which shall not require knowledge of computer programming to learn and understand.
 5. The operating software shall support the following additional capabilities:
 - a. Three levels of designated and unique Priority Alarms for each point.
 - b. Designated "Sense Mode" for status interpretation for each point.
 - c. Designated Print/No Print/Vectoring Mode for each point.
 6. The input statement defines the conditions required to activate the associated output statement. The input statement shall consist of single or multiple monitor point status, subroutine status, time comparison and the utilization of AND, OR, NOT, COUNT, and DELAY logic functions.

7. The output statement defines the action to be taken by the control panel. The output statement shall consist of activation/deactivation of single or multiple control functions, subroutines and remote Annunciator status LED's. Output statements shall also include the "Alert" messages.
8. The software shall provide an "alert" message, unique to each point in the system, which will provide specific instructions for the operator on duty. These messages shall be up to five lines with up to seventy characters in each line. Each system monitor point shall have five specific alert messages when in alarm. Control points shall also be assigned alert messages.
9. The hardware and software shall have the capacity to accept up to sixty-four independent programs. Each program shall have "Edit" or "No Edit" capability. Each program shall be written in an equation format comparable to ladder-logic equations. The Equations shall consist of an input and an output statement.
10. Provide initial programming services for coding, loading and debugging the initial District specified programs, as part of the Contract.
11. Programming Command Definition
 - a. Timing command shall provide time delay and time control functions based on internal clock/calendar by time of day; day of week; day of month; month in year.
 - b. Count command shall provide a specific number of events to occur before a control action is initiated.
 - c. Pulse command shall provide on control for a specific period of time.
 - d. Cycle command shall provide on-off control for preset periods of time.
 - e. Print command shall provide printing of specified information after an event occurs.

2.03 FIRE ALARM DIGITAL ALARM COMMUNICATOR TRANSMITTER

- A. Enclosure shall be red.
- B. Panel shall be solid state with eight zones for off premise monitoring of the fire alarm control panel.
- C. System shall monitor alarm and trouble conditions. System shall be power limited.
- D. System shall include dual telephone line switcher for central station reporting. Telephone lines shall be supervised.
- E. System shall include dual battery harness, batteries, and battery charger.
- F. System shall be UL listed for central station fire signaling systems (NFPA 71).
- G. System shall be California State Fire Marshal approved for central station reporting.
- H. System shall be Notifier UDACT-2 Series. System shall be approved for connection to the fire alarm control panel.
- I. Verify Specific Requirements with District and central station prior to submittals.

2.04 MANUALLY ACTIVATED ALARM INITIATING DEVICES

Manual Fire Alarm Boxes shall comply with CBC Sections 11B-309 and 11B-403.

- A. An Electronic, Digital Multiplex, Addressable Module shall be incorporated into each device. The module shall communicate the status and trouble condition of each device with a unique

address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.

- B. Devices shall be suitable for use on a Class "B", 2-wire supervised alarm initiating circuit.
- C. Numbered Screw Type Terminals shall be provided for "In-Out" connections of the alarm circuit wiring.
- D. The Face of the Station shall have lettering indicating "FIRE" and operational instructions. Stations shall be tamper resistant, semi-flush mounting.
- E. Auxiliary Spare Switch Contact shall be provided for control of remote devices rated 120 volts - 60Hz, AC - 3AMP minimum.
- F. Stations shall provide visual indication the station has been activated. A key (and/or special tool) shall be required to gain access into the station to reset the station after being activated.
- G. Stations shall be "nonbreak-glass" type.
- H. RF and Transient Filtering shall be provided in the device electronics.
- I. Pull Stations shall be non-coded double action, requiring a two District manual "Pulling" actions to initiate the fire alarm system.
- J. Stations installed outdoors shall be weather resistant construction, double action to activate the pull station.

2.05 AUTOMATIC ALARM INITIATING DEVICES

A. General

- 1. An electronic digital, multiplex, addressable module shall be incorporated into each device. The module shall communicate the status and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.
- 2. Devices shall be suitable for use on a Class "B", 2-wire supervised alarm initiating circuit. Where initiating devices are shown connected to an existing system, devices shall operate on 2 or 4-wire circuits plus, 2-wire power circuit as required by the existing equipment.
- 3. Numbered screw type terminals shall be provided for "in-out" connectors of the alarm circuit wiring.
- 4. Auxiliary double throw spare relay contact shall be provided for activation of remote rated devices 120-volt 60Hz, AC, 1 amp minimum.
- 5. RF and transient filtering shall be provided in the initiating device electronics.
- 6. Initiating devices shall be reset from the control panel and shall not require individual resetting.

B. Smoke Detector

- 1. Detectors shall comply with UL standard 268, 167 and 168, and shall use solid state electronic circuits throughout.
- 2. The smoke detector shall operate on a total of two circuit wires. Alarm signaling and detector power shall use the same conductors. Detector sensitivity shall be factory set at 1.5%. Provide testing provisions in accordance with CFC 907.9.3 – 907.9.4.1, NFPA72.
- 3. A fine mesh insect screen shall be provided on all detector openings.

4. The detector shall lock-in on alarm and shall provide a visual alarm/trouble indicator light. An electromechanical test feature shall provide functional testing of the unit without smoke.
 5. The detector shall also incorporate a fixed temperature heat detector rated at 135 degrees F. The heat detector shall operate the alarm circuit and alarm/trouble light.
 - a. Photo electric type smoke detectors shall employ a Light Emitting Diode (LED) as the detector light source, activated by the presence of combustion smoke products. Failure of the LED shall activate the alarm/ trouble light on the detector.
 - b. Ionization type smoke detector shall employ the triple chamber (dual chamber) ionization principle, activated by the presence of combustion products. The ionization chamber shall be RF shielded.
 - c. Air duct smoke detector photo electric or ionization type for installation on a mechanical air ducts. Two air tubes shall extend into the air duct. The sampling tube shall extend across the entire width of the air duct. The second tube shall allow air to escape back into the duct.
- C. Fire Detector - Heat
1. Heat detectors shall be dual action electro-thermostatic combination rate of temperature rise and fixed temperature operation. An indicator shall be visible when detector has activated.
 2. The rate of rise element shall be self-restoring, after activation.
 3. The fixed temperature unit shall be set at 136 degrees F (190 degrees F for high temperature areas i.e. over 110 degrees F).
 4. Provide a wire guard cover for the detector.

2.06 NOTIFICATION ALARM DEVICES

A. General

1. Notification alarm devices shall activate automatically from the control panel. Devices shall operate on a Class "B" (Style Y), 2-wire supervised alarm notification circuit. Series wired alarm devices shall not be used.
2. Numbered screw type terminals shall be provided for "in-out" connections of the alarm circuit wiring.
3. Devices shall be installed in a box, 3½-inches deep maximum, flush mounting unless indicated otherwise on the Drawings. Size as required for the alarm indicating device and wiring connections. Provide a trim ring and metal grill cover assembly. Cover assembly shall be a minimum of 1/16-inch minimum thick flat stainless steel or aluminum. Finish color as selected by Architect. The word "Fire" shall appear on the grill minimum ½-inch letters. The grill shall be attached with screws to the box.
4. Each audible notification visual devices shall incorporate a visual alarm indicator. The visual alarm indicating device shall be an integral part of the audible alarm box assembly.
5. Audible notification device and visual notification devices shall be connected to separate notification alarm signal circuits. Do not connect these devices to the same circuit conductors.

B. Notification Appliances

1. Speakers

Low Profile Speaker

Provide low profile wall mount speakers at the locations shown on the Drawings. The low profile speaker shall not extend more than 1-inch (2.5cm) past the finished wall surface, and provide a switch selectable audible output of 2w (90dBA), 1w (87dBA), ½w (84dBA) or ¼w (81dBA) at 10 feet when measured in reverberation room per UL-464.

Wattage setting shall be visible with the cover installed. When the cover is installed, no mounting hardware shall be visible. In and out screw terminals shall be provided for all wiring. The low profile speaker shall mount in a North American 4-inches x 2½-inches square electrical box, without trims or extension rings.

2. Speaker-Ceiling Mount-8-inch

Provide 8-inches ceiling mounted speakers at the locations shown on the Drawings. In and out screw terminals shall be provided for wiring. Speaker baffles shall be round or square steel with white finish as required. Provide square surface mount boxes with matching finish where required. Speakers shall provide ½w, 1w, 2w, and 4w power taps for use with 25V or 70V systems. At the 4 watt setting, the speaker shall provide a 94dBA sound output a frequency of 1000Hz when measured in an anechoic chamber at 10 feet.

3. Speaker-Cone-4-inch

Provide 4-inches white speakers at the locations shown on the Drawings. Speakers shall have a 4-inch Mylar cone, paper cones are not acceptable. The rear of the speakers shall be completely sealed protecting the cone during and after installation. In and out screw terminals shall be provided for wiring. Speakers shall provide ¼w, ½w, 1w, and 2w power taps for use with 25V or 70V systems. At the 2-watt setting, the speaker shall provide a 90-dBA sound output over a frequency range of 400-4000Hz when measured in reverberation room per UL-1480.

4. Speaker-Reentrant Surface

Provide 4-inch surface re-entrant speakers at the locations shown on the Drawings. Speakers shall provide 2w, 4w, 8w, and 15w power taps for use with 25V or 70V systems. The re-entrant speakers shall utilize a high efficiency compression drivers. Cone type drivers are not acceptable. At the 15 watt setting, the speaker shall provide a 102dBA sound output over a frequency range of 400-4000Hz when measured in reverberation room per UL-1480. Weatherproof boxes shall be provided for outdoor mounting.

5. Speaker-Strobes

Low Profile Speaker-Strobe

Provide low profile wall mount speaker/strobes at the locations shown on the Drawings. The low profile speaker/strobe shall not extend more than 1-inch (2.5cm) past the finished wall surface, and provide a switch selectable audible output of 2w (90dBA), 1w (87dBA), ½w (84dBA), or ¼w (81dBA) at 10 feet when measured in reverberation room per UL-464.

Strobes shall provide synchronized flash output that shall be switch selectable for output values of 15cd, 30cd, 75cd and 110cd. Wattage and candela settings shall be visible with the cover installed. When the cover is installed, no mounting hardware shall be visible.

In and out screw terminals shall be provided for all wiring. The low profile speaker/strobes shall mount in a North American 4-inches x 2½-inches square electrical box, without trims or extension rings.

6. Speaker-Strobe 4-inch

Provide 4-inches red speakers/strobes at the locations shown on the Drawings. Speakers shall have a 4-inches Mylar cone, paper cones are not acceptable. The rear of the speakers shall be completely sealed protecting the cone during and after installation. In and out screw terminals shall be provided for wiring. Speakers shall provide ¼w, ½w, 1w, and 2w power taps for use with 25V or 70V systems. At the 2 watt setting, the speaker shall provide an 87dBA sound output over a frequency range of 400-4000Hz when measured in reverberation room per UL-1480. Strobes shall provide synchronized flash. Strobe output shall be determined as required by its specific location and application from a family of 15/75cd, 30cd, and 110cd devices.

7. Speaker-Strobe Ceiling 8-inch

Provide 8-inches ceiling mounted speaker/strobes at the locations shown on the Drawings. In and out screw terminals shall be provided for wiring. Speaker baffles shall be round or square, steel with white finish as required. Provide square surface mount boxes with matching white finish as required. Speakers shall provide ½w, 1w, 2w, and 4w power taps for use with 25V or 70V systems. At the 4 watt setting, the speaker shall provide a 94dBA sound output a frequency of 1000Hz when measured in an anechoic chamber at 10 feet. Strobes shall provide synchronized flash outputs. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 75cd, and 110cd devices.

8. Speaker-Strobe Re-entrant

Provide 4-inch red re-entrant speaker/strobes at the locations shown on the Drawings. Weatherproof boxes shall be provided for outdoor mounting. Speakers shall provide 2w, 4w, 8w, and 15w power taps for use with 25V or 70V systems. The re-entrant speakers shall utilize a high efficiency compression drivers. Cone type drivers are not acceptable. At the 15-watt setting, the speaker shall provide a 102dBA sound output over a frequency range of 400-4000Hz when measured in reverberation room per UL-1480. Strobes shall provide synchronized flash. Strobe output shall be determined as required by its specific location and application from a family of 15cd, 30cd, 75cd, and 110cd devices.

C. Visual Alarm Indicator

1. Lamp/Strobe internally illuminated projecting lens assembly, with flasher system. Unit shall flash on and off to provide visual indicating of fire alarm.
2. The word "fire" shall appear on the lens or lens plate.
3. Flash rate, one flash per second, with a flash duration of approximately 0.001 second, flash rate independent of audible device.
4. Light source, Xenon high intensity flash strobe tube white/clear color.
5. Strobe shall have a minimum output of 75 candelas with a maximum flash intensity of 120 candelas.
6. Strobe shall comply with NFPA Requirements.

2.07 REMOTE FIRE ALARM ANNUNCIATOR

- A. General
 - 1. The annunciator panel shall be powered and operated from the fire alarm control panel. "In-out" circuit conductors shall terminate on numbered screw-type terminals.
 - 2. A metal tamper resistant weatherproof cabinet shall contain the annunciator components. The panel shall be surface or flush mounted as indicated on the Drawings. Provide a full height tamper resistant, hinged locking cabinet door. Door shall have transparent high impact windows to allow visual observation of all indicators and switches.
 - 3. An electronic digital, multiplex, addressable module shall be incorporated into the annunciator. The module shall communicate the status and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.
- B. Each Alarm Initiating Zone (including spares) shall be individually annunciated in the annunciator panel.
- C. A Common Fire Trouble Alarm shall be annunciated in the annunciator panel from the fire alarm control panel.
- D. Annunciator Lamp Circuits shall be automatically supervised. Provide lamp test switch in the annunciator panel.
- E. An Audible Alarm/Trouble Buzzer with silence switch and automatic resound for subsequent alarm/trouble signals shall be provided. The annunciator panel shall be automatically reset when the control panel is reset.
- F. A Keyed Switch shall be provided for remote reset of the system. The annunciation panel shall also be automatically reset when the control panel is reset.
- G. Provide a Floor Plan of the facility framed under acrylic and mounted adjacent to the fire alarm annunciator. The Floor Plan shall be to scale and shall have room numbers clearly displayed on all rooms corresponding to the annunciator for the purpose of easily identifying the fire zones.

2.08 REMOTE EQUIPMENT MONITORING AND CONTROL

- A. An Electronic Digital Multiplex Addressable Module shall be provided at each device or equipment indicated to be controlled by the multiplex system. Multiple addressable control ports shall be provided in each module quantity as required for each point controlled or monitored. The module shall communicate the monitor status control action and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.
- B. Where Multiple Points are monitored or controlled, provide digital, multiplex, Multi-points, Monitor, Control Panel (MMCP). The panel cabinet shall be self-contained NEMA 1 construction and hinged locking door. Provide tamper switch detection zone on the cabinet door; provide 60 hour battery UPS backup and power supply, the same as required for the fire alarm control panel. Panel shall be expandable using plug-in circuit monitor/control printed circuit cards. Provide barriered numbered terminal strips.
- C. Each Control Point shall provide a supervised "dry" relay contact single pole double throw maintained contact rated 10-amp, 277 volt, 60Hz AC.

- D. Each Monitor Point shall provide not less than one of the following supervised methods of monitoring a remote device or equipment action or status.
 - 1. Remote "dry" contact operation normal open, normally closed or momentary contact operation.

PART 3 EXECUTION

3.01 IDENTIFICATION

- A. The Inside Cover of Alarm Initiating Devices shall be marked with the zone initiating number corresponding to the zone number in the control panel. Marking shall be with a felt-tip pen.
- B. Each Fire Alarm Terminal Cabinet shall be painted red.
- C. Provide Nameplate: "Power to Main Fire Alarm Control Panel" screwed onto the branch circuit overcurrent device supplying power to the main fire alarm control panel.

3.02 WIRING

- A. Review the Total System Point-to-Point Wiring Layout to assure that the correct number and type of wires and conduit sizes are installed.
- B. Final Connections, Testing, Adjusting and Calibration shall be made under the direct supervision of a Factory-Trained Technician of the System Supplier.
- C. All Wiring shall be in conduit.
- D. All Wiring in Cabinets shall be neatly formed, laced and made up on bolt and nut terminal blocks. Tag all spare conductors. All conductors shall terminate on terminal strips with spade lugs, of adequate size for all incoming and outgoing conductors. The strips shall be labeled as to their use and wiring diagram shall be placed on the cabinet door showing connections of all related equipment to these strips.
- E. Wiring Requirements for Shielding Certain Conductors shall be as recommended by the Manufacturer. Provide all conduit, raceways and conductors per Manufacturers recommendations and include all material and labor costs in the Contract price.
- F. The Conductors used for digital, multiplex communication between the fire alarm control panel and external remote initiation devices, control points and annunciators, shall be twisted, shielded, multi-conductor cable, #16AWG copper minimum with a separate internal ground / drain conductor, UL listed for fire alarm system use. One spare pair of multiplex conductors shall be provided in all main and branch device/equipment connections for future system use. "Tees" and taps at any junction box location in the communication lines, shall be permitted by the system to additional devices without affecting proper system operation.
- G. Wire Size: Wire shall be sized to insure installed circuit voltage drop does not exceed 10% to all devices.

3.03 OUTLET BOXES

Device Outlet Boxes shall be flush mounted unless indicated otherwise on the Drawings. Provide extension rings to finish flush with finish surface. Where the Drawings indicate surface mounted devices, outlet boxes shall be cast metal with threaded hubs. Where the conduit entrances are not exposed for surface mounted devices, provide flush outlet box behind the device box, and

omit the conduit hubs on the device box. Size device boxes and outlet boxes per Manufacturer's recommendation and as required by Code for wire fills.

3.04 SPECIAL INSTALLATION REQUIREMENTS

- A. Air Duct Smoke Detectors shall be installed in the supply air ducts and return air ducts with an air flow of 2000 CFM or greater, coordinate with Mechanical Contractor. Sampling tube shall extend across entire duct width. Provide ¾-inch conduit with 2#12 to respective motor control device to automatically shut down the respective fan motor upon detection of smoke in the air duct. Installation shall be in compliance with CMC 606.8.
- B. Water Flow Switches shall be installed on each main fire sprinkler rise pipe, coordinate with the Fire Sprinkler Contractor.
- C. Tamper Switches shall be installed on each main fire sprinkler shut-off valve, coordinate with the Fire Sprinkler Contractor.
- D. Equipment shall be weatherproof gasketed where installed in locations exterior to the building or where indicated on the Drawings. Weatherproof equipment shall be tamper resistant.
- E. Provide Clear Vandal Resistant Protective Cover for all audio-visual devices located in student restrooms and public hallways.
- F. Provide Wire Guard for ceiling mounted smoke and heat detectors located in student restrooms.
- G. Connect Fire Alarm Control Panel with security/intrusion control panel for monitoring by remote monitoring company.
- H. Connect fire alarm control panel with master clock system to turn off class passing schedule, with paging system to turn off system when fire alarm system in alarm condition.
- I. Conduit with Fire Alarm Wiring shall be painted red.
- J. Fire Alarm System shall be programmed per actual building and room designation. Submit printout for review.

3.05 TESTING

- A. The Entire Fire Alarm System shall be tested in the presence of the Local DSA Inspector and a Representative of the Manufacturer after the installation is complete.
 - 1. Individually activate each manual initiating station and verify correct alarm operation and control panel response.
 - 2. Individually test each automatic initiating device and verify correct alarm operation, control panel response and remote equipment operation.
 - 3. The communication loops and the notification alarm circuits shall be opened in at least two locations per building to check for the presence of correct supervisory circuitry.
- B. Test the Battery Back-up System by disconnecting the incoming normal power and allowing this alarm system to operate 24 hours on battery power. Sound the alarm system for 5-minutes at the end of 24 hours on battery power.

- C. Perform all Electrical and Mechanical Tests Required by the Equipment Manufacturer's Certification form. Measure and adjust each automatic detection detector to the maximum stable sensitivity setting. Detector tests shall be performed with the detector at its operational location and under normal operational environmental conditions in the area. Bench settings are not acceptable. An operational check-out test and report shall be performed. Submit six copies of test report results. The tests and report shall include, but not be limited to:
1. A complete list of equipment installed and wired.
 2. Indication that all equipment is properly installed and functions and conforms with these Specifications.
 3. Test of individual zones as applicable.
 4. Serial numbers locations by zone and model number for each installed detector.
 5. Voltage (sensitivity) settings for each ionization and photoelectric detector as measured in place with the HVAC system operating.
 6. Technician's name, certificate number and date.
 7. The completed manual and automatic monitoring and control system shall be tested to insure that it is operating properly. This test will consist of exposing the installed units to a standard fire test.
 8. Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a 90-day test period without any unwarranted alarms. Should an unwarranted alarm(s) occur, the Contractor shall readjust or replace the equipment and detector(s) and begin another 90-day test period. As required by the Architect, the Contractor shall recheck the detectors using the fire test after each readjustment or replacement of detectors. This test shall not start until the District has obtained beneficial use of the building under tests.
- D. After the Testing has been completed to the satisfaction of CFC 907.9 – 907.9.4.1 the Inspectors, provide the NFPA Certificate of compliance to the District, the Local Fire Official, the Architect and DSA.
- E. Upon the receipt of Certificate of Compliance, the Installer/Supplier shall supply the District with a written Operating, Testing and Maintenance Instructions, Point-to-Point As-Built Drawings, and Equipment Specifications. Maintenance provisions, CFC 907.4.5.

3.06 INSTRUCTIONAL SESSIONS

Provide a 2-hour instructional sessions conducted by a Factory-Authorized Technician at the Job Site after completion of all tests to instruct District Personnel on the use of the system. The First Session shall be videotaped and conducted prior to final acceptance of the Project. The Second Session shall be held within eleven months of final acceptance of the Project, when requested by the District.

**END OF SECTION 28 46 20
032218/212229**

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Clearing and protection of vegetation.
- B. Grubbing of root systems of trees and shrubs, abandoned utility lines and structures and other below grade obstructions and debris.
- C. Removal of existing debris.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.
- D. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- E. Section 02 41 00 - Demolition: Removal of built elements and utilities.
 - 1. Removal of paving and removal if indicated of abandoned utilities.
- F. Section 31 23 16 - Excavation: Site preparation for structure and paving.
- G. Section 31 23 23 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Site Plan: Showing:
 - 1. Areas for temporary construction and field offices.

1.04 QUALITY ASSURANCE

- A. Clearing Firm: Company specializing in the type of work required.
 - 1. Minimum of five years of documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Fill Material: As specified in Section 31 23 23 - Fill and Backfill

PART 3 EXECUTION

3.01 SITE CLEARING

- A. Comply with other requirements specified in Section 01 70 00.
- B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 SURVEY STAKING IN UNCLEARED EASEMENTS

- A. Flag centerline of utility lines prior to clearing. Contractor shall set offsets for clearing limits to suit the Work.
- B. When the clearing is completed, survey for utility construction in accordance with requirements specified in Section 01 70 00 - Execution and Closeout Requirements.
- C. Contractor shall replace all controls and stakes damaged or destroyed, at no change in Contract Time or Contract Price.

3.03 EXISTING UTILITIES AND BUILT ELEMENTS

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Protect existing structures and other elements that are not to be removed.

3.04 CLEARING

- A. Perform clearing Work within confines of Project area indicated on Drawings or specified elsewhere herein and with strict adherence to the Contract Documents and Geotechnical recommendations.

3.05 VEGETATION

- A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, lawns, and planting beds.
- B. Do not remove or damage vegetation beyond the limits indicated on drawings.
- C. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
 - 1. At vegetation removal limits.
- D. Remove only trees within area to be cleared that have been marked for removal. Confirm trees to be removed with District and Architect before beginning removal process.
 - 1. Cut trunks close and parallel to ground.
 - 2. Remove roots where under or within five feet of proposed structures.
 - 3. Neither remove nor prune trees and shrubbery in public rights-of-way except by written approval of authorities having jurisdiction.

- E. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.
- F. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
 - 1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
 - 2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
 - 3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
 - 4. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
- G. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to District.

3.06 GRUBBING

- A. At pipelines, remove all trees or stumps within five feet of the pipeline.
- B. Perform grubbing where indicated on Drawings or as specified herein. Grubbing shall include removal from the ground of all stumps, roots, buried logs and other vegetation not otherwise indicated to remain, and removal and disposal of resulting refuse.
- C. Completely grub areas where unsuitable surface material is to be removed.

3.07 DAMAGED VEGETATION

- A. Neatly prune damaged branches and severed roots.
- B. Apply wound paint to above-ground cuts and abrasions.
- C. If trees and shrubs indicated to remain are damaged excessively, as determined by Construction Manager, Architect or authorities having jurisdiction, remove and replace damaged plants with comparable plants.

3.08 DEBRIS

- A. Remove debris, junk, and trash from site.
- B. Remove logs, rocks and other debris.
- C. Dispose of Debris resulting from clearing and thoroughly clean rights-of-way.
- D. Leave site in clean condition, ready for subsequent work.
- E. Clean up spillage and wind-blown debris from public and private lands.

3.09 DISPOSAL

- A. Debris Disposal: Dispose of all cleared and grubbed materials in a legal manner off site.
- B. Hazardous Materials:
 - 1. Immediately notify the Construction Manager should hazardous materials or suspected hazardous materials be encountered.

2. Dispose of such materials in accordance with all applicable laws and regulations and as directed by authorities having jurisdiction.
 3. Unforeseen conditions will be resolved in accordance with the Conditions of the Contract.
- C. Burial and Burning: Debris shall not be buried or burned on site.

3.10 DUST CONTROL

- A. Refer to requirements of:
1. Section 01 50 00 - Temporary Construction Facilities and Controls.
 2. Section 31 22 00 - Grading.
- B. Minimize dust during clearing and grubbing to protect adjoining property and vehicles parked in the vicinity.
- C. Clean-up: Keep public thoroughfares clear of dust and debris by periodic sweeping and washing down, at least daily at the end of working hours.

END OF SECTION

SECTION 31 22 00

GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Coordinate work of this Section to compliment and coordinate with field conditions and Civil Drawing noted specific referenced requirements. Utilize the most stringent requirements.
- B. Removal of topsoil.
- C. Rough grading and consolidation/compaction the site for site structures and building pads.
 - 1. Preparation for excavation, trenching, backfilling and compacting Work.
- D. Excavation of subsoil, stockpiling for later reuse, and removal of excess from the site.
- E. Preparing of subgrade for walks, pavements and site retaining walls.
- F. Excavating, backfilling and compaction for wet utility lines.
- G. Finish grading.

1.02 RELATED REQUIREMENTS

- A. Document 00 31 00 - Available Project Information: Subsurface Investigations.
- B. Section 01 40 00 - Quality Requirements.
- C. Section 01 45 33 - Code Required Special Inspections and Procedures.
- D. Section 01 70 00 - Execution and Closeout Requirements.
- E. Section 31 10 00 - Site Clearing.
- F. Section 31 23 16 - Excavation.
- G. Section 31 23 23 - Fill: Filling and compaction.
- H. Section 32 12 16 - Asphalt Paving.

1.03 SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.
 - 1. Accurately record location of all changes in finish elevations and gradients which materially affect drainage.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: For conditions not covered in this Section, refer to applicable provisions of the California Building Code (CBC), Chapter 18A - Soils and Foundations, as amended and adopted by authorities having jurisdiction.
- B. Perform Work in accordance with locally adopted SSPWC standards.

1.05 PROTECTION

- A. Dust Control: Comply with requirements specified in Section 01 50 00 - Temporary Facilities and Controls.

- B. Protection:
 - 1. Comply with general requirements specified in Section 01 50 00 - Temporary Facilities and Controls.
 - 2. Provide protection for walks, curbs, drains, and trees and boxing around corners of existing buildings to prevent damage.
 - 3. Keep adjacent roads, streets and drives clear of dirt and debris from earthwork operations.
- C. Underground Utilities:
 - 1. Buried utility lines may exist.
 - 2. If such are encountered, notify Construction Manager, Architect and District and for directions to be followed for preservation, relocation or demolition of utilities.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: See Section 31 23 23.
- B. Shoring and Bracing: Provide all materials and services necessary to properly engineer and construct shoring for excavations. Selection of materials and design of shoring, underpinning and bracing of new and existing structures shall be solely the responsibility of the Contractor.
 - 1. Shoring design shall comply with State of California Trenching and Shoring Manual issued by Offices of Structure Construction; 2011.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.
- B. Verify the absence of standing or ponding water.
- C. Upon discovery of unknown utility or concealed conditions, discontinue affected Work and notify Construction Manager, Architect and District for direction. Unforeseen conditions shall be resolved in accordance with the General Conditions.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
 - 1. Maintain and protect existing utilities remaining which pass through Project area.
- D. Notify utility company to remove and relocate utilities, as required.
- E. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.

- F. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.
- G. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.
- H. Protect plants, lawns, and other features to remain as a portion of final landscaping.

3.03 ROUGH GRADING

- A.
- B. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
- C. Do not remove topsoil when wet.
- D. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- E. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
- F. When excavating through roots, perform work by hand and cut roots with sharp axe.
- G. See Section 31 23 23 for filling procedures.
- H. All permanent cut or fill slopes shall have a maximum slope of 2:1 (H:V) ratio, horizontal to vertical and shall comply with applicable requirements of the California Building Code (CBC).
- I. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.
- J. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.
- K. Grade top perimeter of excavations to prevent surface water from draining into excavation.
 - 1. Provide dewatering of excavations as required to ensure suitable conditions for concrete and backfilling operations.
- L. Uniformly grade areas as shown on Drawings to tolerances specified in this Section..
 - 1. Evenly grade between points where elevations are shown or between points of Work and existing grades.
- M. Slope rough grade away from building perimeter at gradient indicated.
 - 1. Unpaved area slope for a distance of 10 feet from the building: Not less than one unit vertical in 20 units horizontal or 5 percent.
 - a. CBC Section 1804A.4.
 - 2. When supported by soil conditions and climate; slope not less than 1:48 or 2 percent in unpaved areas.
 - a. CBC Section 1804A.4, Exception.
- N. Make grade changes gradual. Blend slopes into level areas.

3.04 SOIL REMOVAL AND STOCKPILING

- A. Stockpile topsoil to be re-used on site; remove remainder from site.

1. Topsoil and vegetation layers, root zones, and similar surface materials should be stripped and stockpiled for either reuse in landscape surface areas or removed from the site.
- B. Stockpile subsoil on site for backfill, if soil is appropriate.
 1. Stockpile subsoil to depth not exceeding 8 feet.
- C. Remove all lumped subsoil, boulders and rock in excess of 6 inches in greatest dimension.
- D. Stockpile subsoil to be re-used on site; remove remainder from site.
- E. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; cover to protect from erosion.

3.05 FINISH GRADING

- A. Before Finish Grading:
 1. Verify building and trench backfilling have been inspected.
 2. Verify subgrade has been contoured and compacted.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.
 1. Comply with CBC Section 1804A.3.
- C. Where topsoil is to be placed, scarify surface to depth of 6 inches.
- D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 6 inches.
- E. Place topsoil in areas indicated.
- F. Place topsoil where required to level finish grade.
- G. Place topsoil during dry weather.
- H. Remove roots, weeds, rocks, and foreign material while spreading.
- I. Near plants spread topsoil manually to prevent damage.
- J. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- K. Lightly compact placed topsoil.
- L. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.06 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).
- C. Top Surface Under Paving: Plus or minus 0.04 foot (1/2 inch) from required elevation.
- D. Top Surface Under Footings and Foundations: Plus 0, minus 0.2 foot (2.4 inch).
- E. Top Surface Under Slabs on Grade: Plus 0, minus 0.04 foot (1/2 inch).

3.07 REPAIR AND RESTORATION

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
- B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Architect as to remedy.
- C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.08 FIELD QUALITY CONTROL

- A. See Section 31 23 23 for compaction density testing.
- B. Field Quality Control:
 - 1. Field inspections and testing shall be performed in accordance with requirements specified in Section 01 40 00 and 01 45 33.
 - 2. Make required quality control submittals in accordance with requirements specified.
- C. Non-compliance: Should grade elevations, tests of fill or backfill indicate non-compliance with required elevations or density, Contractor shall over-excavate, recompact and retest until specified grade or density is obtained.
 - 1. Costs and Time associated with remedial Work and retesting shall be in accordance with provisions of the General Conditions.
 - 2. Retesting to demonstrate compliance shall be by a testing laboratory acceptable to District and shall be at Contractor's expense.

3.09 CLEANING

- A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.
- B. Leave site clean and raked, ready to receive landscaping.

3.10 PROTECTION

- A. Protect completed grading from erosion from weather and traffic.
- B. Over-excavate and recompact areas damaged by construction activities and weather.

END OF SECTION

SECTION 31 23 16
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavating for building volume below grade, footings, slabs-on-grade, paving, site structures, and utilities within the building.
- B. Trenching for utilities outside the building to on-site existing utilities.

1.02 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Control: Inspection of bearing surfaces.
- B. Section 01 50 00 - Temporary Construction Facilities and Controls: Dewatering excavations and water control.
- C. Section 01 70 00 - Execution and Closeout Requirements: General requirements for dewatering of excavations and water control.
- D. Section 02 41 00 - Demolition: Shoring and underpinning.
- E. Section 31 22 00 - Grading: Grading.
- F. Section 31 23 23 - Fill: Fill materials, filling, and compacting.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Field Quality Control Submittals: Document visual inspection of load-bearing excavated surfaces.

1.05 PROJECT CONDITIONS

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.

1.06 COORDINATION OF SPECIFICATION REQUIREMENTS

- A. Coordinate these Specification Section requirements with specifications included on Drawings. Comply with more stringent requirements and with those requirements of authorities having jurisdiction.
- B. Comply in full with the direction (recommendations) given in the Geotechnical Report.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 31 22 00 for additional requirements.
- C. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Architect.

3.03 EXCAVATING

- A. Underpin adjacent structures that could be damaged by excavating work, including utilities and pipe chases.
 - 1. Protect excavations from cave-in and from loose soil and other matter from falling in.
 - 2. Comply with all applicable industrial safety regulations.
 - 3. Shoring and Bracing: Provide all materials and services necessary to properly engineer and construct shoring for excavations. Selection of materials and design of shoring, underpinning and bracing of new and existing structures shall be solely the responsibility of the Contractor.
 - a. Shoring design shall comply with State of California Trenching and Shoring Manual issued by Offices of Structure Construction; 2011.
- B. Excavate to accommodate new structures, construction operations, and paving/site structures.
 - 1. Excavate subsoil from areas to be filled with topsoil, to construct foundations, footings, slabs on grade, paving and to achieve final finish grades.
 - 2. Over-excavate to working elevations for backfilling and compaction operations.
- C. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- D. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored, per CalOSHA requirements for Type C Soil.
- E. Do not interfere with 45 degree influence line of bearing splay of foundations.
 - 1. Avoid interference at footings by providing additional width, depth, and other provisions.
- F. Cut utility trenches wide enough to allow inspection of installed utilities.
- G. Hand trim excavations to accurate configurations and depths. Remove loose matter.
- H. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.
- I. At no additional cost, correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 23 23.
- J. Provide temporary means and methods, as required, to remove all water from excavations until directed by the Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- K. Determine the prevailing groundwater level prior to excavation. If the proposed excavation extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect. If the proposed

excavation extends more than 1 foot into the excavation, control groundwater intrusion with a comprehensive dewatering procedures, or as directed by the *Architect*.

- L. Remove excavated material that is unsuitable for re-use from site.
- M. Stockpile excavated material to be re-used in area designated on site 31 22 00.
- N. Remove excess excavated material from site.
 - 1. *Architect* or other constlant as selected by District to test soils prior to export for disposition.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.
- B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.
- C. Scarification, over excavation and all other excavations will be subject to the approval of the *Architect*.

3.05 PROTECTION

- A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

SECTION 31 23 23

FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Filling, backfilling, and compacting for paving, site structures, and utilities within the building.
- B. Backfilling and compacting for utilities outside the building to utility main connections.
- C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 31 22 00 - Grading: Removal and handling of soil to be re-used.
- C. Section 31 22 00 - Grading: Site grading.
- D. Section 31 23 16 - Excavation: Removal and handling of soil to be re-used.

1.03 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: Indicated on drawings.

1.04 REFERENCE STANDARDS

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop; 2017.
- B. ASTM D4829 - Standard Test Method for Expansion Index of Soils; 2011.
- C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2015.
- D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.
- E. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- F. DTSC-Clean Fill - California Department of Toxic Substances Control - Clean Imported Fill Material; Current.
- G. SSPWC - Greenbook: Standard Specifications for Public Works Construction; latest adopted edition.
- H. CT 202- Section 26-1.02B: Caltrans.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

- C. Compaction Density Test Reports.
- D. Provide proof that all imported materials conform to the requirements of DTSC-Clean Fill Imported Fill Materials for School Sites by proper documentation for the imported materials.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.
- B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where agreed to.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

1.08 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.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. General Fill: Subsoil excavated on-site.
 - 1. Graded.
 - 2. Free of lumps larger than 3 inches, rocks larger than 4 inches, and debris.
 - 3. Conforming to ASTM D2487 Group Symbol SP, SW, SM, or GM.
- B. Structural Fill: Imported borrow.
 - 1. Graded.
 - 2. Free of organic matter, debris, and oversize particles (e.g., cobbles, rubble, etc. that are larger than 3 inches, rocks larger than 4 inches. Fill shall contain at least fifty percent of material smaller than 1/4 inch in size.
 - 3. Imported fill materials: The soil shall be tested for potential contamination in accordance with DTSC-Clean Fill protocols. Submit to Geotechnical Engineer.
 - a. Import sandy soil shall be free of organics, debris and oversize particles (e.g., cobbles, rubble, etc. that are greater than 3 inches in the largest dimension).
 - b. Additionally, import soils shall not have any corrosion impacts to buried concrete; and be non-expansive (Expansion Index less than 50 per ASTM D4829).
 - c. Prior to import, geotechnical consultant shall evaluate and test the import soils in order to confirm the quality of the material.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify structural or other backfill materials to be reused or imported are acceptable to the satisfaction of the *Architect*. Approval shall be obtained in advance of re-use or importation onto the site.
 - 1. The soil shall be tested for potential contamination in accordance with DTSC-Clean Fill protocols.
 - 2. Provide imported fill materials compatible with on-site soils in addition to being suitable for its intended use with the following criterion, as allowed by the Geotechnical Engineer.
 - a. Predominantly granular in nature.
 - b. Containing no rocks larger than 6 inch maximum dimension.
 - c. Free of organic material (loss on ignition less than 2 percent).
 - d. Very low expansion potential (with an Expansion Index less than 21).
 - e. Low corrosion impact to the proposed improvements.
- B. Verify that survey bench marks and intended elevations for the Work are as indicated.
- C. Identify required lines, levels, contours, and datum locations.
- D. See Section 31 22 00 for additional requirements.
- E. Verify structural ability of unsupported walls to support imposed loads by the fill.
- F. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

- A. Scarify and proof roll subgrade surface to a depth of 8 inches to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with SSPWC, Type II or concrete fill and compact to density equal to or greater than requirements for subsequent backfill material.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Prior to placement of aggregate base course material at paved areas, compact subsoil to 95 percent of its maximum dry density in accordance with ASTM D1557.
- E. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Fill up to subgrade elevations unless otherwise indicated.
 - 1. Place fill soils compacted in horizontal lifts to a relative compaction of 90 percent or more in general accordance with ASTM D1557.
 - 2. Lift thickness for fill soils will vary depending on the type of compaction equipment used but should generally be placed in horizontal lifts not exceeding 8 inches in loose thickness.

3. Place fill soils at slightly above optimum moisture content as evaluated by ASTM D1557.
 4. Avoid damage to wet and dry utility lines when compacting fill and subgrade materials.
- C. Employ a placement method that does not disturb or damage other work.
 - D. Systematically fill and compact per geotechnical report. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
 - E. Maintain optimum moisture content of fill materials to attain required compaction density.
 - F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.
 - G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.
 1. Expansive soils ($EI > 20$) are not be placed with the upper 3 feet of subgrade soils. CBC Section 1803.5.3.
 - H. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
 - I. Correct areas that are over-excavated.
 1. Load-bearing foundation surfaces: Fill with concrete.
 2. Other areas: Use general fill, flush to required elevation, compacted to minimum 90 or 95 percent of maximum dry density in subgrade zone.
 - J. Compaction Density Unless Otherwise Specified or Indicated:
 1. Under paving, slabs-on-grade, and similar construction: 90 percent of maximum dry density.
 2. At other locations: 90 percent of maximum dry density.
 - K. Reshape and re-compact fills subjected to vehicular traffic.
 - L. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.
 - M. Remove surplus fill and backfill materials from site.

3.04 FILL AT SPECIFIC LOCATIONS

- A. Use general fill unless otherwise specified or indicated.
- B. Structural Fill:
 1. Use general fill.
 2. Fill up to subgrade elevations.
 3. Maximum depth per lift: 6 inches, compacted.
 4. Compact to minimum 90 percent of maximum dry density.
- C. At Footings:
 1. Use general fill.
 2. Fill up to subgrade elevation.

3. Compact each lift to 90 percent of maximum dry density.
 4. Do not backfill against unsupported foundation walls.
 5. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
- D. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches:
1. Bedding: Use general fill.
 2. Cover with general fill.
 3. Fill up to subgrade elevation.
 4. Compact in maximum 8 inch lifts to 90 percent of maximum dry density. Compact to 95 percent in subgrade zone.
- E. At Planting Areas Other Than Lawns :
1. Use general fill.
 2. Fill up to finish grade elevations.
 3. Compact to 90 percent of maximum dry density.
 4. See Section 31 22 00 for topsoil placement.
- F. Under Monolithic Paving :
1. Compact subsoil to 90 percent of its maximum dry density before placing fill.
 2. Use general fill.
 3. Fill up to subgrade elevation.
 4. Compact to 90 percent of maximum dry density.
 5. See Section 32 11 23 for aggregate base course placed over fill.

3.05 TOLERANCES

- A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.
- B. Top Surface of Filling Under Paved Areas: Plus or minus 1/2 inch from required elevations.

3.06 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.
 1. Laboratory Tests and Analyses: Where backfill is required to be compacted to a specified density, tests for compliance shall be made in accordance with requirements specified in Section 01 40 00 - Quality Requirements.
- B. Perform compaction density testing on compacted fill in accordance with ASTM D1556 or ASTM D6938.
 1. Field inspections and testing shall be performed and submitted in accordance with requirements specified in Section 01 40 00 - Quality Requirements.
 2. Allow testing service to inspect and approve each subgrade and fill layer before further fill, backfill or construction Work is performed.
 3. Alternate Density Test Method:

- a. Field density tests may also be performed by the nuclear method in accordance with ASTM D6938, providing that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D1556/D1556M.
 - b. In conjunction with each density calibration check, check the calibration curves furnished with the moisture gages in accordance with ASTM D6938.
 - c. If field tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of Work, on each different type of material encountered, and at intervals as directed by Architect or District's testing and inspection agency.
- C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 1557 ("modified Proctor") or AASHTO T 180.
- D. Non-compliance: If tests indicate work does not meet specified requirements, remove work, replace and retest.
- 1. Should tests of fill or backfill indicate non-compliance with required density, Contractor shall over-excavate, recompact and retest until specified density is obtained.
 - 2. Costs and Time associated with remedial Work and retesting shall be in accordance with provisions of the General Conditions.
 - 3. Retesting to demonstrate compliance shall be by a testing laboratory acceptable to District and shall be at Contractor's expense.
- E. Frequency of Tests:
- 1. Footing Subgrade Testing:
 - a. For each strata of soil on which footings will be placed, perform at least one test to verify required design bearing capacities.
 - b. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata when acceptable to *Architect*.
 - 2. Paved Areas and Building Slab Subgrade Testing:
 - a. Perform at least one field density test of subgrade for every 2,000 sf of paved area or building slab, but in no case fewer than three tests.
 - b. In each compacted fill layer, perform one field density test for every 2,000 sf of overlying building slab or paved area, but in no case fewer than three tests.
 - 3. Foundation Wall Backfill Testing: Perform at least two field density tests at locations and elevations as directed.
- F. Proof roll compacted fill at surfaces that will be under slabs-on-grade.

3.07 CLEANING

- A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 32 01 17
ASPHALT PAVEMENT REPAIR

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Bituminous Surfacing Repair: Areas removed for utility trenches, heaved by tree roots, cracked areas, protruding areas where pavement meets hard surfaces, depressed areas, holes and areas around new structures, and raveled bituminous pavement.
- B. Areas heaved by tree roots, cracked areas, holes, trenches, and areas around new structures.

1.02 RELATED REQUIREMENTS

- A. Section 02 41 00 - Demolition: Selective demolition, site demolition, structure removal.
- B. Section 31 22 00 - Grading.
- C. Section 31 23 16 - Excavation.
- D. Section 31 23 23 - Fill.
- E. Section 32 11 23 - Aggregate Base Courses.
- F. Section 32 12 16 - Asphalt Paving.
- G. Section 32 12 36 - Seal Coat for Asphalt Surfacing: Bituminous Surfacing.

1.03 REFERENCE STANDARDS

- A. SSPWC - Greenbook: Standard Specifications for Public Works Construction; latest adopted edition.

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.
- B. Sequencing: Ensure that maintenance of temporary pedestrian and vehicular traffic flow is achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's product literature, technical data, materials, and products, .
- C. Shop Drawings: Indicate areas to be repaired.
- D. Certificate: Certify that products of this section meet or exceed specified requirements.
- E. Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.

1.06 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide products by the same manufacturer.
- B. Comply with Standard Specifications for Public Works Construction, current edition.

- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Base course materials: Refer to Section 32 11 23 - Aggregate Base Courses.
- B. Asphalt paving materials: Refer to Section 32 12 16 - Asphalt Paving.
- C. Seal materials: Refer to Section 32 12 36 - Seal Coat for Asphalt Surfacing.
- D. Headers: Refer to Section 32 12 16 - Asphalt Paving.
- E. Bituminous Materials:
 - 1. Provide materials and products of the class, grade or type indicated, conforming to relevant provisions of Section 203 - Bituminous Materials of the latest SSPWC.

PART 3 EXECUTION

3.01 PAVEMENT REMOVAL

- A. Remove bituminous and concrete pavement in accordance with applicable provisions of Section 300 - Earthwork of the SSPWC.
- B. Pavement Heaved By Roots:
 - 1. Remove pavement to limits of distortion and expose roots.
 - 2. Trim roots to provide at least 12 inch clearance to pavement.
- C. Remove protruding bituminous surfaces flush with the surrounding grade using a suitable tool or equipment so that adjacent finishes are not blackened.
- D. Remove raveled and depressed bituminous pavement to limits indicated or required.
- E. Saw cut existing improvements, trim holes and trenches in bituminous and concrete pavement to permit mechanical hand tampers to compact the fill.
- F. Remove broken concrete by saw cutting. If the required cut line is within 30 inches of a score or joint line or edge, cut and remove to the score, joint line, or edge.

3.02 EXCAVATING, BACKFILLING AND COMPACTING

- A. Conform to requirements in Section 31 23 16 - Excavation or 31 23 23 - Fill, as required.
- B. Where subgrade or base is deemed to be unstable or otherwise unsuitable, excavate such materials to firm earth, and replace with a required material. Install and compact fill materials in accordance with the requirements of related Specification sections.

3.03 HEADERS

- A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.
- B. Install headers so the bottom surface has continuous bearing on solid grade.
 - 1. Where excavation for headers is undercut, thoroughly tamp soil under the header.

2. Compact backfill on both sides of header to the density of the adjacent undisturbed grade.
- C. Fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid earth a minimum of 12 inches.
 1. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers.
 2. Space stakes, not to exceed 4 feet on centers with top of stakes set one inch below top of header.
 3. Provide a minimum of two 12d galvanized common nails through each stake.
- D. Remove existing headers where new surfacing is installed adjacent to existing surfacing.
- E. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.
- F. Provide additional stakes and devices as required to fasten headers.

3.04 BASE COURSE

- A. Unless otherwise indicated, base course shall be crushed aggregate base, fine grade, 3 inches thick or equal to thickness of the existing base, whichever is greater.
- B. Fill grade and compact as specified in Section 31 22 00 - Grading.

3.05 RESURFACING

- A. Holes and Trenches:
 1. Remove loose dirt and backfill with cement-sand slurry allowing for surfacing one inch thicker than existing.
 2. Resurface flush with existing adjoining pavement installing the same type of materials and section provided in existing improvements.
- B. Other Areas:
 1. Other surface improvements damaged or removed shall be cut to a neat even line and excavated one inch below the bottom of the existing pavement.
 2. Resurface by following the original grades and installing the same type of materials provided in existing improvements.
- C. Where bituminous surfacing abuts concrete, masonry, walks or paving, tamp joint smooth, if necessary, as described above to obtain a uniformly even joint, true to line and grade. Tamp and smooth materials before asphalt cools.

3.06 REPAIRING AND RESEALING EXISTING SURFACES

- A. Preparation of Surfaces: Prior to filling cracks, clean existing bituminous surfacing of loose and foreign materials and coat with a film of asphalt emulsion.
- B. Repair of Existing Surfacing:
 1. Fill cracks 1/2 inch wide and less with RS-1 emulsion and silica sand or other required material.
 2. Cracks larger than 1/2 inch wide shall be filled with Type C2 Asphalt Concrete as specified.

- a. Cracks shall be filled to the level of adjacent surfacing.
3. Where low areas, holes, or depressions occur in existing surfacing, repair with emulsified asphalt.
 - a. Install material, strike off the emulsified asphalt with a straightedge flush with adjoining surfacing.
 - b. Finish with a steel trowel, and after dehydration, compact by rolling or tamping.
- C. Testing:
 1. Flood test entire area in presence of the Project Inspector.
 2. Entire area tested shall be free of standing water or puddles.
- D. Surface Seal:
 1. After surface has been repaired and tested, install seal coat over entire area indicated.
 2. Surface seal shall be as specified in Section 32 12 36 - Seal Coat for Asphalt Surfacing.

3.07 CLEANING

- A. Remove all stains on the Project site and adjacent properties caused by or attributed to the Work of this section.
- B. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.08 PROTECTION

- A. Protect installed Work from subsequent construction operations.

END OF SECTION

SECTION 32 11 23
AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aggregate base course.
- B. Paving aggregates.
- C. Soil sterilization.

1.02 RELATED REQUIREMENTS

- A. Section 31 22 00 - Grading: Preparation of site for base course.
- B. Section 32 12 16 - Asphalt Paving: Finish and binder asphalt courses.
- C. Section 32 13 13 - Concrete Paving: Finish concrete surface course.

1.03 REFERENCE STANDARDS

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop; 2017.
- B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.
- C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2015.
- D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.
- E. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- F. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2015.
- G. SSPWC - Greenbook: Standard Specifications for Public Works Construction; latest adopted edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Samples: 10 lb sample of each type of aggregate; submit in air-tight containers to testing laboratory.
- C. Materials Sources: Submit name of imported materials source.
- D. Certificates of Conformance: Aggregate and sterilant materials.
- E. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- F. Compaction Density Test Reports.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements: Where reference is made to Standard Specifications, the following shall apply.
 - 1. Perform off-site Work in public rights-of-way in accordance with requirements of authorities having jurisdiction, including SSPWC. For conditions not indicated otherwise on Contract Drawings, conform to Standard Details adopted by authorities having jurisdiction.
 - 2. Perform on-site Work as indicated and referenced on Contract Drawings and as specified herein.
- B. The quantity of volatile organic compounds (VOC) used in weed killer, tack coat, primer and other materials shall not exceed limits permitted under current regulations of:
 - 1. South Coast Air Quality Management District (AQMD).
- C. Source Quality Control: Obtain materials from one source throughout.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When aggregate materials need to be stored on site, locate where directed by District.
- C. Aggregate Storage, General:
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Sub-Base Material: Existing or imported materials as recommended in geotechnical report. Refer to Document 00 31 00 - Available Project Information.
- B. Aggregate Type Class II: Coarse or crushed aggregate, conforming to Municipality, SSPWC Section 200-2.2.
- C. Coarse Aggregate: Pit run washed stone; free of shale, clay, friable material and debris.
 - 1. Graded in accordance with ASTM D2487 Group Symbol GW.
- D. Herbicide: Comply with all applicable environmental protection and hazardous materials laws and regulations .
 - 1. Comply with current EPA acceptable standard and the California Department of Pesticide Regulations for soils sterilant.
 - 2. Obtain product approval from District, prior to purchase and use.
 - 3. Sterilant: Selected as appropriate for the environment in which is it to be placed.
 - 4. Contractor shall be licensed with the State of California to apply sterilant.
 - 5. Sterilant: Commercial grade for commercial application.

6. Payment for soil sterilization: Include full compensation for application and all materials and incidental work required.
7. Application Rate: 7 lbs. per acre. If another manufacturer is used follow their recommendations.
8. Basis of Design Product: Spike 80DF as manufactured by Dow AgroSciences; www.dowagro.com, or approved equal.

2.02 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.
- B. Where aggregate materials are specified using ASTM D2487 classification, testing of samples for compliance shall be provided before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Establishment of Grades
 1. Set grade stakes per Section 01 70 00 - Execution and Closeout Requirements.
 2. All work shall conform to the lines, elevations, and grades shown on the Drawings.
 - a. Use three consecutive points set on the same slope together so that any variation from a straight grade can be detected.
 - b. Report any such variation to the Architect. Contractor shall be responsible for any error in the grade of the finished work.
 3. Grade or location stakes lost or disturbed, shall be reset by the Surveyor at no additional expense to District.
 4. Areas having drainage gradients of 2 percent or more, provide elevation stakes, set with instrument, at grid intervals of 25 feet.
 - a. Intermediate stakes may be set by using a tightly-drawn string line over the tops of adjacent stakes.
 - b. Grade stakes must be set at all grade breaks, grade changes, etc.
 5. Areas having drainage gradients of less than 2 percent; provide elevation stakes, set with instrument, at 10 foot intervals.
 - a. Grade stakes must be set at all grade breaks, grade changes, etc.
- B. Verify that survey bench marks and intended elevations for the work are as indicated.
- C. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

- A. Stockpiling:
 1. Clear and level storage sites prior to stockpiling of material.

2. Stockpile all materials, including approved material available from excavation and grading, in the manner and at the locations designated.
 3. Aggregates shall be stockpiled on the cleared and leveled areas designated by the Construction Manager to prevent segregation.
 4. Materials obtained from different sources shall be stockpiled separately.
- B. Soil Sterilant:
1. Sterilize soil areas to receive paving.
 2. Apply soil sterilant in accordance with manufacturer's instructions and applicable environmental regulations.
 3. Take care to confine application to the areas to be paved. Sterilant shall not be applied within 2 feet of planting areas.
- C. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- D. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

- A. Place and compact aggregate base material in accordance with SSPWC, Subsection 301-2. Place aggregate base below curbs and gutters and paving also, compacted to 95 percent at vehicular traffic and 90 percent at pedestrian-only traffic.
- B. Application of Base Course:
1. After preparing the subgrade, Avoid all vehicular or machine traffic on the subgrade.
 - a. Should it be necessary to haul over the prepared subgrade, drag and roll the traveled way as frequently as may be necessary to remove ruts, cuts, and breaks in the surface.
 - b. Rake and hand tamp all cuts, ruts, and breaks in the surface of the subgrade that are not removed by the above operations.
 - c. Equip with pneumatic tires all equipment used for transporting materials over the prepared subgrade.
 2. Do not permit continued use of sections of prepared subgrade for hauling, so as to cut up or deform it from the true cross-section. Protect the prepared subgrade from all traffic.
 3. Maintain the surface in its finished condition until the succeeding layer is placed.
- C. Under Bituminous Concrete Paving:
1. It is required that areas of exterior asphalt pavement be underlain by a layer of aggregate base material which meets the requirements, Thickness of base layer is as shown on the Drawings and varies per the Usage Type area.
 - a. It is required that the upper 12 inches of soils below asphalt pavement base material be over-excavated and consist predominantly of satisfactory soil materials and/or approved imported fill.
 - 1) Engineered Fill: See Section 31 23 23 - Fill.
 - b. It is required that the exposed bottom surface soils, below overexcavation, be scarified to the recommended depth of 8 inches, moisture conditioned to achieve

optimum moisture content, but not higher than 2 percent above optimum, and then re-compacted to a minimum 90 percent relative compaction before any fill materials are placed.

2. The above subgrade preparation recommendations are based on the assumption that soils encountered during field exploration are representative of soils throughout the site.
 - a. However, there can be unforeseen and unanticipated variations in soils between points of subsurface exploration. For this reason, the actual subgrade preparation will have to be determined on the basis of in-grading observations and testing performed by representatives of the project geotechnical consultant.
 3. Provide grade stakes and elevations by a California Licensed Surveyor (LS) for the ~~Architect~~.
 - a. Verify that the over-excavation depths, shown on the construction drawings for asphalt concrete pavement structural sections, have been achieved prior to re-compaction.
 4. Correct irregularities by dressing down or filling as may be required, to bring areas to true subgrade elevations.
 5. Where filling is required, scarify the subgrade to bond the new material to the in place material; use additional material as required at no additional cost. Subject to the approval of the Architect.
 6. Remove excess material from the site to a legal disposal area.
- D. Under Portland Cement Concrete Paving:
1. Compact to 95 percent of maximum dry density and 90 percent at pedestrian-only traffic.
- E. Place aggregate in maximum 4 inch layers and roller compact to specified density.
- F. Level and contour surfaces to elevations and gradients indicated.
- G. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- H. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- I. Use mechanical tamping equipment in areas inaccessible to compaction equipment.
- J. Apply herbicide to finished surface.

3.04 TOLERANCES

- A. Subgrade Tolerances:
1. Subgrade for Pavement: Do not vary more than 0.02 ft..
 2. Subgrade for Subbase or Base Material: Do not vary more than 0.04 ft..
 3. Variations within the above specified tolerances shall be compensating so that the average grade and cross section specified are met.
- B. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- C. Scheduled Compacted Thickness: Within 1/4 inch.
- D. Variation From Design Elevation: Within 1/2 inch.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.
- B. Compaction density testing shall be performed on compacted aggregate base course in accordance with ASTM D1556 or ASTM D6938.
- C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180, ASTM D698 ("standard Proctor"), or ASTM D1557 ("modified Proctor").
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- E. Proof roll compacted aggregate at surfaces that are under slabs-on-grade and paving.

3.06 CLEANING

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 32 12 16
ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single course bituminous concrete paving.
- B. Double course bituminous concrete paving.
- C. Surface sealer.
- D. This section compliments and shall be coordinated with Civil Drawing specifications / requirements. The most stringent requirements shall be utilized.
- E. Asphaltic concrete paving for vehicular traffic and curbs, including necessary patching and repair of damaged new and existing paving.
- F. Patching and repair of existing asphaltic concrete paving for previous damage, for underground utility work and where damaged by new construction.

1.02 RELATED REQUIREMENTS

- A. Section 31 22 00 - Grading: Preparation of site for paving and base.
- B. Section 31 23 23 - Fill: Compacted subgrade for paving.
- C. Section 32 11 23 - Aggregate Base Courses: Aggregate base course.
- D. Section 32 13 13 - Concrete Paving: Concrete curbs.
- E. Section
- F. Section 32 17 23.13 - Painted Pavement Markings: Concrete bumpers.
 - 1. Parking and Traffic Control Pavement Markings.

1.03 REFERENCE STANDARDS

- A. AIA G701CMA - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types; 2015.
- B. AIA G701 - Acknowledgement of Substantial Completion of a Design-Build Project; 2004.
- C. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 2009a.
- D. SSPWC - Greenbook: Standard Specifications for Public Works Construction; latest adopted edition.
 - 1. Standard Specifications shall be as amended and adopted by authorities having jurisdiction, including the La Crescenta.
 - 2. Where reference is made to Standard Details, such reference shall be to the Standard Details accompanying the Standard Specifications, as amended and adopted by the authorities having jurisdiction.
 - 3. Wherever term "Agency" occurs in Standard Specifications, it shall be understood to mean District for purposes of the Contract.
 - 4. Wherever term "Engineer" occurs in Standard Specifications, it shall be understood to mean Architect for purposes of the Contract.

1.04 SUBMITTALS

- A. Materials List: List source and quality standard for all asphaltic concrete materials.
- B. Mix Design:
 - 1. Formulate a job-mix formula using the Hveem method in accordance with SSPWC Section 203-6.2 and submit for approval.
 - 2. Submit designs for asphaltic concrete prepared by a materials laboratory under direct supervision of a Civil Engineer licensed in the State of California or a standard mix design proven in actual performance.
 - 3. Resultant Mixture: Hveem properties conforming to SSPWC Section 203-6.4.3.
- C. Certifications:
 - 1. Weighmaster's Certificates or certified delivery tickets for each truckload of bituminous material delivered to site.
 - 2. Certificates of Conformance: Asphalt, aggregate and sterilant materials.
 - a. 20 days prior to the delivery of aggregates, asphalt materials, and paving mixes to the project site, submit certificates and test results of compliance of such materials with these specifications.
 - b. Submit certificates of compliance from the supplier for bituminous materials for paint binder, asphaltic concrete, and seal coat.
 - c. Submit weigh master's certificates or certified delivery tickets for each truck load of asphaltic material delivered to the project site.
 - d. Upon completion of the weed control treatment, and as a condition for final acceptance, furnish a written certificate stating the brand name of the sterilant and the manufacturer, and that the sterilant used had at least the minimum required concentration, and that the rate and method of application complied in every respect with the conditions and standards contained herein.
- D. Samples:
 - 1. Prior to the delivery of specified aggregate to the site, submit samples of the material for the Inspector's acceptance in accordance with SSPWC Section 4-1.4. Samples shall be typical of materials to be furnished from the proposed source and in conformance with the specified requirements.
 - 2. Provide aggregate base gradation and quality certifications, dated within 30 days of submittal.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with locally adopted SSPWC.
- B. Mixing Plant: Conform to Locally adopted SSPWC.
 - 1. Asphaltic Concrete Producers Qualifications: Use only materials furnished by a bulk asphaltic concrete producer regularly engaged in production of hot mix, hot laid bituminous concrete.
 - 2. Applicator Qualifications: Paving machine and roller operators shall be fully trained and experienced in the installation of asphaltic concrete paving on projects of similar size and complexity.

- C. Testing and analysis of granular base material and asphaltic concrete paving mix shall be performed under provisions of Division 1.
- D. Obtain materials from same source throughout.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code for paving work on public property.
- B. Where reference is made to SSPWC, the following shall apply.
 - 1. For conditions not indicated otherwise on Contract Drawings, conform to Standard Details adopted by authorities having jurisdiction, including Standard Details for Public Works Construction, as amended and adopted by those authorities.
 - 2. Perform on-site Work as indicated and referenced on Contract Drawings and as specified herein.
- C. The quantity of volatile organic compounds (VOC) used in weed killer, seal coat, tack coat, primer, and other materials shall not exceed limits permitted under current regulations of South Coast Air Quality Management District (AQMD).

1.07 FIELD CONDITIONS

- A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen; or when rain is imminent.
 - 1. Tack Coats: Minimum surface temperature of 60 deg F.
 - 2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
- B. Place bitumen mixture when temperature is not more than 15 F degrees below bitumen supplier's bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: Aggregate base, prime coat paint binder, bituminous surface course and other materials shall be as noted on the Contract Drawings and shall comply with requirements of authorities having jurisdiction.
- B. Asphalt Cement: ASTM D 946.
- C. Aggregate for Base Course: See Section 32 11 23 - Aggregate Base Course.
- D. Asphalt Concrete Materials: SSPWC, Subsection 203-6.
- E. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.
- F. Crack Filler:
 - 1. Cracks less than 1/2 inch in width: GuardTop Crackfiller or equal.
 - 2. Cracks 1/2 inch or greater in width: #4 Sheet mix asphalt.
- G. Primer: In accordance with locally adopted SSPWC.

- H. Tack Coat: Homogeneous, medium curing, liquid asphalt.
- I. Seal Coat: AIA G701, slurry type.
 - 1. Asphalt Emulsion, www.aema.org, SS1-h, per SSPWC Section 203-9.
 - 2. Acceptable Manufacturers:
 - a. Asphalt Coating Engineering; Sure Seal.
 - b. Diversified Asphalt Product; Over Kote: www.diversifiedasphalt.com.
 - c. SealMaster Pavement Products & Equipment; MasterSeal: sealmaster.net.
 - d. Vulcan Materials Company; GuardTop: www.vulcanmaterials.com.
 - e. Western Colloid Products; Park Top: www.westerncolloid.com.
 - f. Satin Seal by Blue Diamond Co., Long Beach, CA.
 - g. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

- A. Asphalt Surfacing Materials: Provide asphalt surfacing meeting the following requirement, furnished from a commercial asphalt central mixing plant.
- B. Asphalt Paving Mix:
 - 1. Standard Specifications, C2-PG-64-10.
- C. Use dry material to avoid foaming. Mix uniformly.
- D. Base Course: 4.5 to 5.8 percent of asphalt cement by weight in mixture in accordance with SSPWC Section 203-6.4.3, Type B.
- E. Binder Course: 4.5 to 6 percent of asphalt cement by weight in mixture in accordance with AIA G701C Ma.
 - 1. CSS-1 h and conform to the requirements of SSPWC, Section 203-3 Emulsified Asphalt.
- F. Parking Lot Wearing Course: 4.6 to 6.0 percent of asphalt cement by weight in mixture in accordance with SSPWC, Section 203-6.4.3, Type C2.
 - 1. Provide at least two courses of asphalt when Type C2 asphalt pavement is greater than 3 inches.
 - 2. Surface Course Minimum Thickness: 1 inch and a maximum of 2 inches.
- G. Playground Area Wearing Course: 4.8 to 6.5 percent of asphalt cement by weight in mixture in accordance with SSPWC, Section 203-6.4.3, Type D2.
 - 1. Provide at least two courses of asphalt when Type D2 asphalt pavement is greater than 1-1/2 inches.
 - 2. Surface Course Minimum Thickness: 1 inch and a maximum of 1-1/2 inches.
- H. Submit proposed mix design of each class of mix for review prior to beginning of work.

2.03 SOURCE QUALITY CONTROL

- A. Test mix design and samples in accordance with AI MS-2.
- B. Submit asphaltic concrete mix design proposed by the Contractor to the Engineer for review.
- C. Proposed mix to be tested for conformance with the specifications, including grading, asphalt content and stability.

2.04 ACCESSORIES

- A. Headers and Stakes:
 - 1. 2 x 6 inch nominal Redwood, Construction Heart Grade, or preservative treated douglas fir (PTDF), except at curves provide laminated 1 x 6 inch nominal PTDF., unless indicated otherwise on Drawings
 - 2. Stakes: 2 x 4 x 18 inch long Redwood, or 2 x 3 x 18 inch long PTDF; at 48 inch on center maximum.
 - 3. Nails: Common, use hot dipped galvanized only, 12d minimum.
- B. Pavement Reinforcing Fabric: Non-woven polypropylene fabric conforming to SSPWC, Subsection 213-1.
 - 1. Basis of Design Product: Petromat as manufactured by Propex Fabrics inc.; www.geotextile.com, or approved equal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Refer to - Available Project Information,
provided under separate cover, notes on Contract Drawings, and requirements of authorities having jurisdiction.
- B. Verify that compacted subgrade and granular base is dry and ready to support paving and imposed loads.
- C. Verify gradients and elevations of base are correct.
- D. Fine grading, checking, shaping, and compacting of subgrade shall be complete before start of asphaltic concrete Work.
- E. Soil Sterilant: Sterilize soil areas to receive asphaltic concrete paving. Apply soil sterilant in accordance with manufacturer's instructions and applicable environmental regulations. Take care to confine application to the areas to be paved. See Section 32 11 23 - Aggregate Base Courses for product information.
- F. Curbs and Gutters: Gutters shall be in place and cured prior to start of asphaltic concrete Work. Provide lumber ramping at all locations where rolling equipment or vehicles cross new concrete paving, curbs and gutters.
- G. Headers: Place headers with tops flush with finish asphaltic concrete surfaces. Back headers with stakes.
 - 1. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.
 - 2. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Compact backfill on both sides of header to the density of adjacent undisturbed earth.
 - 3. Fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid grade a minimum of 12 inches. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes, not to exceed 4

feet on centers with top of stakes set one inch below top of header. Provide a minimum of 2-12d galvanized common nails through each stake.

4. Remove existing headers where new surfacing is installed adjacent to existing surfacing.
 5. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.
 6. Provide additional stakes and anchorage as required to fasten headers in place
- H. Do not asphalt concrete on any surface, which contains ponded water or excessive moisture in the opinion of the Architect or consulting engineer.
1. If paving operations are in progress and rain or fog forces a shut down, loaded trucks in transit shall return to the plant, and no compensation will be allowed therefore.
 2. Provide canvas tarpaulins to cover all loads of asphalt from the time that the mixture is loaded until it is discharged from the delivery vehicle, unless otherwise directed in writing.

3.02 BASE COURSE

- A. See Section 32 11 23.
- B. Inspector will examine the base before the paving has begun. Correct any deficiencies before the paving is started.
- C. Wherever asphaltic pavement does not terminate against a curb, gutter, or another pavement, provide and install a redwood or pressure treated Douglas fir header at the line of termination.

3.03 PREPARATION - PRIMER

- A. Apply primer in accordance with manufacturer's instructions.
- B. Apply primer on aggregate base or subbase at uniform rate of 0.25 gal/sq yd.
- C. Apply primer to contact surfaces of curbs, gutters.
- D. Use clean sand to blot excess primer.

3.04 PREPARATION - TACK COAT

- A. Apply tack coat in accordance with SSPWC Section 302-5.4.
- B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 0.10 gal/sq yd.
- C. Apply tack coat to contact surfaces of curbs, gutters and previously placed or existing paving.
- D. Joining Pavement: Expose, cut and clean edges of existing pavement to straight, vertical surfaces for full depth of existing pavement.
 1. Paint edge with asphalt emulsion before placing new asphaltic concrete.
 2. Joints in New Paving: In accordance with SSPWC.

3.05 PLACING ASPHALT PAVEMENT - SINGLE COURSE

- A. Install Work in accordance with SSPWC Subsection 302-5.
- B. Asphalt concrete of the class indicated in Part 2 shall be laid in courses conforming to SSPWC Table 302-5.5(A), unless otherwise stated herein.

- C. Place asphalt within 24 hours of applying primer or tack coat.
- D. Place thickness as indicated on Civil Drawings to minimum 1 inch compacted thickness.
 - 1. Asphalt concrete work shall include full depth patching and variable thick asphalt concrete transition areas.
 - 2. Provide daily the Inspector, with copies of certificates of weight for all materials delivered to the job site and/or incorporated in the work.
 - 3. At no time shall the coarse aggregate that has segregated from the mix be scattered across the paved mat.
- E. Install gutter drainage grilles and frames and manhole frames in correct position and elevation.
- F. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position.
 - 1. Compact (roll) asphaltic concrete in accordance with SSPWC, Subsection 302-5.6, using machine rollers.
 - a. Compaction by vehicular traffic is prohibited.
 - b. Compact areas inaccessible to rolling equipment with machine-powered tamper.
- G. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.06 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

- A. Provide at least two courses of asphalt when Type D2 asphalt pavement is greater than 1-1/2 inches. The surface course shall be a minimum thickness of 1 inch and a maximum of 1-1/2 inches.
- B. Provide at least two courses of asphalt when Type C2 asphalt pavement is greater than 3 inches. The surface course shall be a minimum thickness of 1 inch and a maximum of 2 inches.
- C. Install Work in accordance with SSPWC Subsection 302-5.
- D. Place asphalt binder course within 24 hours of applying primer or tack coat.
- E. Place binder course to thickness as indicated on Civil Drawings, minimum 1 inch compacted thickness.
- F. Place wearing course within two hours of placing and compacting binder course.
- G. Place wearing course to thickness as indicated on Civil Drawings, minimum 1 inch compacted thickness.
- H. Install gutter drainage grilles and frames and manhole frames in correct position and elevation.
- I. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position.
 - 1. Compact (roll) asphaltic concrete in accordance with SSPWC, Subsection 302-5.6, using machine rollers.
 - a. Compaction by vehicular traffic is prohibited.
 - b. Compact areas inaccessible to rolling equipment with machine-powered tamper.

- J. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.07 SEAL COAT

- A. Apply seal coat after surface course application, in accordance with manufacturer's recommendations.
- B. Apply seal coat to surface course and asphalt curbs in accordance with SSPWC, Subsection 302-8.2.
- C. Add water to specified seal coat material. When air temperatures of 90 degrees F or more are encountered during application, consult manufacturer for recommendations.
- D. If pavement surface exhibits imperfections of roller marks, rock pockets, ridges or depressions as determined by the Architect, the addition of sand aggregate to seal coat, and amounts thereof, shall be as recommended by the manufacturer.
- E. A second application shall be made after first coat has dried to the touch. When sand is added to the first seal coat, two additional coats without extra sand shall be applied.
- F. Allow seal coat to dry before permitting traffic or striping.

3.08 PAVEMENT REPAIR AND PAVING

- A. Preparation of existing pavement: Where indicated, remove loose asphaltic concrete, cleanout "pot holes" and cracks, remove dirt, oil and other foreign materials.
- B. Repair holes with full paving section as specified. Repair "alligatoring" with asphalt "skin-patch". Fill all cracks larger than 1/4 inch wide with asphalt emulsion slurry.
- C. Tack Coat: Apply asphalt oil AR-4000 or AR-8000, as required for jobsite condition, at metered application rate of no less than a range from .2 to .3 gallons per square yard of fabric or as directed by manufacturer and to provide 100 percent fabric saturation and ample bonding for paving section.
- D. Fabric Reinforcement: Place fabric smooth side up in tack coat with 2 to 4 inch overlap. Hand-broom to remove wrinkles. Apply additional tack coat to joints and between overlapped fabric layers.
- E. Overlay Asphalt: Place single course asphalt, 1-1/2 inch compacted thickness, in conformance with specified standards in this section.

3.09 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.
- C. Variation from True Elevation: Within 1/2 inch.

3.10 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for quality control.
- B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.
- C. Pavement at all longitudinal joints shall have a Field Density of 95%, as described in SSPWC Section 302-5.6.2.

1. When the test results of the field cores are less than 95% Relative Compaction, remove a 1 foot wide section on each side of the longitudinal joint.
 2. Replace the removed pavement with an asphalt mix that meets the job specification at no additional cost to the District.
- D. Test: Flood test all paving to demonstrate positive drainage.
1. Before acceptance, water test all pavements to ensure proper drainage as directed by the Inspector.
 2. Flooding Method: By water tank truck.
 3. Fill depressions where the water ponds to a depth of more than 1/8 inch; or the slope corrected to provide proper drainage.
 4. The edges of the fill shall be feathered and smoothed so that the joint between the fill and the original surface is invisible.
 5. No standing water shall remain 1-hour after test.

3.11 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury for 2 days or until surface temperature is less than 140 degrees F.
1. After final rolling, prohibit all traffic on asphaltic concrete until mix has fully cooled and set. Minimum time, in all cases shall be 6 hours.

3.12 CLEANING

- A. After completion of paving operations, clean all existing and new improvements that have been soiled, especially by oil tracking from asphalt tanks or placement in general.
- B. For Substantial Completion review, broom clean and wash paving with hoses. Clean residue from landscaping installation.

END OF SECTION

SECTION 32 12 36
SEAL COAT FOR ASPHALT SURFACING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Surface sealer over new and existing asphalt surfacing.

1.02 RELATED REQUIREMENTS

- A. Division 01 - General Requirements.
- B. Section 32 01 17 - Asphalt Pavement Repair.
- C. Section 32 12 16 - Asphalt Paving.

1.03 REFERENCE STANDARDS

- A. SSPWC - Greenbook: Standard Specifications for Public Works Construction; latest adopted edition.
 - 1. Standard Specifications shall be as amended and adopted by authorities having jurisdiction, including the La Crescenta.
 - 2. Where reference is made to Standard Details, such reference shall be to the Standard Details accompanying the Standard Specifications, as amended and adopted by the authorities having jurisdiction.
 - 3. Wherever term "Agency" occurs in Standard Specifications, it shall be understood to mean District for purposes of the Contract.
 - 4. Wherever term "Engineer" occurs in Standard Specifications, it shall be understood to mean Architect for purposes of the Contract.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product information and application procedures for bituminous surfacing.
- B. Samples: Submit a 2 quart sample of undiluted seal coat at no additional cost to the District.
- C. Extra Materials: Provide 10 gallons in unopened containers.

1.05 QUALITY ASSURANCE

- A. Comply with SSPWC 203-9, "SEALCOAT – ASPHALT BASED".
- B. Obtain materials from same source throughout.
- C. Schedule a pre-construction conference at jobsite in advance of beginning of Work.
- D. Review and resolve conflicts involving requirements of specifications. Record discussions and furnish copies to all attendees.
- E. Beginning of Work means Contractor accepts all conditions.
- F. Agitate bulk materials during transport.

1.06 REGULATORY REQUIREMENTS

- A. Comply with local air quality management district regulations for emissions maximums.
- B. Maintain control of vehicular and pedestrian traffic during seal coating operations as required for other construction activities and in accordance with local traffic authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Asphalt Coating Engineering; Sure Seal.
- B. Diversified Asphalt Product; Over Kote: www.diversifiedasphalt.com.
- C. SealMaster Pavement Products & Equipment; MasterSeal: sealmaster.net.
- D. Vulcan Materials Company; GuardTop: www.vulcanmaterials.com.
- E. Western Colloid Products; Park Top: www.westerncolloid.com.
- F. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Seal Coat: The materials for sealcoat shall conform to Section 203-9 – “Sealcoat – Asphalt Based” of the SSPWC.

PART 3 - EXECUTION

3.01 PREPARATION OF SURFACES

- A. Before placing the sealcoat, the pavement surface shall be cleaned by sweeping, flushing or other means necessary to removal all loose particles of paving, all dirt, and all other extraneous material.
 - 1. This shall include vegetation in pavement cracks and between pavement and curb/gutter.
 - 2. Prior to removal an approved herbicide, which leaves behind a visible blue marker dye, shall be sprayed where vegetation exists.
 - 3. Surface contaminates, grease or oil spots shall be cleaned to allow for proper adhesion.
- B. Prior to applying sealcoat material, cracks wider than 1/8 inch: Clean and treated with weed killer, then fill with an asphalt-based crack filler (large cracks may require several applications).
 - 1. For best quality, it is recommended that all broken asphalt be removed and patched with new asphalt.
 - 2. It is also suggested that extreme low spots be filled with new asphalt.
 - 3. New asphalt must cure 30 days before application of sealcoat.
 - 4. Immediately before commencing the sealcoat operations, all surface metal utility covers (including survey monuments) shall be protected by thoroughly covering the surface with an appropriate adhesive and oiled or plastic paper.

- a. No adhesive material shall be permitted to cover, seal or fill the joint between the frame and cover of the structure.
 - b. A vertical tab shall be placed on each cover for locating after the seal application is complete.
 - c. The tab shall extend at least 3 inches above the existing pavement surface.
 - d. Covers are to be uncovered and cleaned of asphalt emulsion material by the end of the same work day.
 - e. Inspector shall inspect surfaces before the installation of seal coat.
- C. For best results, the asphalt, just prior to being sealed, should be sprayed with a mist of water in an amount that will leave the surface damp but with no puddles or visible water.
- 1. This procedure is critical when ambient temperature is hot with bright sunlight or when the pavement is excessively aged or porous.
 - 2. A prime or tack coat may be necessary on surfaces that have weathered excessively or are dusted.
 - a. The primer should be diluted with three parts clean, potable water and one part SS-1h emulsion and shall be applied at the rate of 0.05 gallon per square yard.
 - 3. Install barricades as required to divert traffic from operations. Install temporary “no parking” signs and similar notices.

3.02 APPLICATION

- A. Install sealcoat in accordance with manufacturer's written directions and recommendations.
- B. Sealcoat may be mixed with water to obtain desired consistency for job requirements to a maximum of 20% of the total volume.
 - 1. Care should be taken not to over dilute.
 - 2. Material after dilution shall be mixed with a mechanical agitator to maintain consistency and ease of application.
 - 3. Note that as the pavement increases in roughness, the amount of dilution should be decreased.
- C. Sealcoat shall only be applied when the atmospheric temperature is greater than 55 degrees F and if rain is not forecast for the period of 24 hours after application.
- D. On aged asphalt surfaces: For the first coat add 3 pounds of 30 mesh sand to each gallon. Apply second coat without the sand additive to the surface.
- E. The sealcoat material shall be applied in two applications. Unless otherwise specified, the total quantity applied (before dilution) shall be 50 gallons per 1,000 square feet.
- F. Sealcoat material shall be applied using a truck-mounted tank or wheeled container in continuous parallel lines and spread by means of brooms or rubber-faced squeegees either by hand or machine and in such a manner as to eliminate all ridges, lap marks, and air pockets.
- G. Hand tools shall be available in order to remove spillage. Ridges or bumps in the finished surface will not be permitted.
 - 1. Sealcoat material shall be homogeneous prior to spreading, with no visible separation of solids and liquids.

- H. When the first coat has completely dried to the touch, apply the second coat. While misting is not normally required before second coat, surface should be clean with no foreign materials on it.
- I. Install two coats of surface seal to new asphalt surfacing.
 - 1. First Coat: Install before flood testing.
 - a. When the first coat has completely dried to the touch, apply the second coat. While misting is not normally required before second coat, surface should be clean with no foreign materials on it.
 - 2. Clean surface and allow to dry before installing second coat.
 - 3. Second Coat: Installed after asphalt surfacing has passed flood test.
- J. Where new asphalt surfacing is installed adjacent to existing asphalt surfacing, overlap surface seal a minimum of 12 inches onto existing asphalt surfacing.
- K. Where existing asphalt surfacing is indicated to be patched and sealed, install two coats of surface seal after patching. Refer to Section 32 12 16 - Asphalt Paving.
- L. Drying Time:
 - 1. Sealcoat should be allowed to dry 24 – 48 hours before permitting traffic.
 - 2. When asphalt is cold or in shade, or air temperature is below 75 degrees F, based on general weather, humidity and temperature conditions, drying time may need to be extended.

3.03 PROTECTION OF SURFACES

- A. Protect sealed and unsealed surfaces from damage and traffic during performance of the Work of this section and until surface seal has thoroughly set and cured.
- B. Do not permit traffic of any kind for at least 24 hours after completion of installation.
- C. Protect the Work of this section until Substantial Completion.

3.04 TESTING

- A. District reserves the right to obtain samples, perform tests to ensure compliance with the Specifications, and to review weight slips and invoices of materials delivered to the Project site.

3.05 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.
- B. Striping for parking or traffic flow should be done only after the sealcoat has thoroughly dried. It is recommended that a high quality water based Traffic Line Paint be used for best results.

END OF SECTION

SECTION 32 31 13
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Posts, rails, and frames.
- B. Wire fabric.
- C. Concrete.
- D. Manual gates and related hardware.
- E. Accessories.

1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric; 2011a (Reapproved 2017).
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015, with Editorial Revision (2016).
- E. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009 (Reapproved 2015).
- F. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2016a.
- G. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2014a.
- H. ASTM F626 - Standard Specification for Fence Fittings; 2014.
- I. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures; 2013.
- J. CLFMI CLF-FIG0111 - Field Inspection Guide; 2014.
- K. CLFMI CLF-SFR0111 - Security Fencing Recommendations; 2014.
- L. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates; 2011.
- M. CLFMI WLG 2445 - Chain Link Fence Wind Load Guide for the Selection of Line Post and Line Post Spacing; June 2016.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.
- C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components. See CLFMI CLF-SFR0111 for planning and design recommendations.

- D. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines.
- E. Field Inspection Records: Provide installation inspection records that include post settings, framework, fabric, barbed wire, fittings and accessories, gates, and workmanship.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Fence Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.
- C. Structural Design: Fence, gates and all components shall be designed and constructed to withstand 90 mph wind loading. Pipe frame sizes indicated for particular uses are minimum. Comply with CLFMI Product Manual and CLFMI WLG 2445. Increase as required when privacy decorative slatting or windscreen specified.

1.05 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.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Provide fences and gates meeting life safety and accessibility requirements of California Building Code (CBC) Title 24, Part 2, Chapters 10 and 11B; and ADA Accessibility Guidelines for Buildings and Facilities, per latest amendments.
 - 1. Gates that are part of the accessible route shall meet all the requirements of an accessible door in compliance with CBC Section 11B-404.
 - 2. The lever of lever actuated latches or locks for an accessible gate shall be curved with a return to within 1/2 inch of the (face of) gate to prevent catching on the clothing or persons. California Referenced Standards Code T-24 Part 12, Section 12-10-202, Item (F).
 - 3. Swing doors and gate surfaces within 10 inches of the finish floor or ground shall have a smooth surface on the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16 inch of the same plane as the other and be free of sharp or abrasive edges. Cavities created by added kick plates shall be capped. CBC Section 11B-404.2.10
 - 4. Gate Hardware: Meet the requirements of CBC 11B-206.5 and 11B-404.2.9.
 - a. Latch: Latch, including padlock eye as integral part of latch, mounted 40 inches maximum, above finish grade. Comply with California Fire Code.
 - b. Hardware shall comply with local Fire Authority, California Building Code (CBC) Title 24, Section 1008.2, and California Fire Code (CFC) Section 503.5.2.
 - c. Hand activated opening hardware, handles, pulls, latches, locks, and other operating devices for an accessible gate shall have a shape that is easy to grasp with one

hand and does not require tight grasping, tight pinching, or twisting of the wrist to operate. CBC Section 11B-404.2.7 and 11B-309.4.

2.02 MANUFACTURERS

- A. Chain Link Fences and Gates:
 - 1. Allied Tube and Conduit Corp.: www.atcfence.com
 - 2. Anchor Fence, Inc.: www.anchorfenceinc.com.
 - 3. Master-Halco, Inc: <https://www.masterhalco.com>.
 - 4. Merchants Metals: <https://www.merchantsmetals.com>.

2.03 MATERIALS

- A. Posts, Rails, and Frames:
- B. Posts, Rails, and Frames: Formed from hot-dipped galvanized steel sheet, ASTM A653/A653M, HSLAS, Grade 50, with G90 (Z275) zinc coating. CLFMI CLF 2445
- C. Wire Fabric:
 - 1. ASTM A392 zinc coated steel chain link fabric.
 - 2. Class 1 weight of zinc coating 1.2 oz/ft² (366 g/m²).
- D. Ready-mixed, complying with ASTM C 94/C 94M; normal Portland cement; 2,500 psi strength at 28 days, 3 inch slump; 3/4 inch nominal size aggregate.

2.04 COMPONENTS

- A. Component Sizes listed below are basis of design.
 - 1. Sizes shall be as determined by fencing manufacturer for wind load of fencing with "tennis court" windscreen and design wind speed of 90 mph. CLFMI WLG 2445
- B. Line Posts: *see drawings*
- C. Corner and Terminal Posts: *see drawings*
- D. Gate Posts: *see drawings*
- E. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.
 - 1. Manufacturer's longest lengths, with expansion-type couplings, approximately 6 inches long, for each joint. Provide means for attaching top rail securely to each gate corner, pull, and end post.
- F. Gates:
 - 1. Gate Frame: 1.90 inch diameter for fittings and truss rod fabrication.
 - 2. Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories with additional horizontal and vertical members to insure proper gate operation.
 - 3. Use same fabric as for fence, installed with stretcher bars and bands at vertical edges and at top and bottom edges.

4. Install diagonal cross bracing consisting of 5/16 inch diameter truss rods with drop forged steel turnbuckles, per ASTM F626, where necessary to insure frame rigidity without sag or twist.
5. Swinging Gates: Meet the requirements of ASTM F900. Maximum gate leaf width 4'-0" and minimum gate width of 36 inches along path of travel and means of egress.
6. Chain Link Swing Gate:
 - a. Swing gates single leaf minimum 3'-0" opening by height indicated on Drawings. Minimum height to match fence.
 - b. Gate frame to be of welded construction.
 - 1) Weld areas to be protected with zinc-rich paint per ASTM A780/A780M.
 - c. The gate frame members are to be spaced no greater than 8' 0" (2.44 m) apart horizontally or vertically.
 - d. Pipe Frame: Grade 1, ASTM F1083.
 - 1) Exterior members: 1.900 inches (48.3 mm) OD.
 - 2) Interior members (when required): 1.660 inches (42.2 mm) OD.
 - e. Chain link fabric to match fence system.
 - f. Diagonal cross bracing: 3/8 inch diameter truss rods with drop forged steel turnbuckles. Provide where necessary to insure frame rigidity without sag or twist.
- G. Fabric: 1.75 inch diamond mesh interwoven wire, 6 gage, 0.1620 inch thick, top selvage knuckle end closed, bottom selvage twisted tight.
- H. Tension Wire: 6 gage, 0.1620 inch thick steel, single strand.
- I. Tension Band: 12 gauge, 0.105 inch thick steel by 3/4 inch (19mm) formed to a minimum 300 degree profile curvature for post attachment.
 1. Secure bands using minimum 5/16 inch (7.94 mm) galvanized carriage bolt and nut.
- J. Tension Strap: 3/16 x 3/4 inch thick steel per ASTM F626.
 1. Galvanized steel one piece length equal to 2 inches (50 mm) less than full height of fabric.
 2. Provide tension (stretcher) bars where chain link fabric is secured to the terminal post.
- K. Tie Wire: 9 gauge (0.148 inch (3.76 mm)) galvanized steel wire.
 1. Pre-formed hog ring ties: 9 gauge (0.148 inches (3.76 mm)) galvanized steel or aluminum. Tie wire and hog rings per ASTM F626.

2.05 MANUAL GATES AND RELATED HARDWARE (NON-EGRESS)

- A. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; fork latch with gravity drop and padlock hasp.
 1. Hinges: Hot dip galvanized pressed steel or malleable iron, structurally capable of supporting gate leaf and allow opening and closing without binding.
 2. Non-lift-off type hinge design shall permit gate to swing 180 degrees.
 3. Latch: Galvanized forked type with welded U-bracket on both sides. Capable of retaining gate in closed position and have provision for padlock.
 - a. Latch shall permit operation from either side of gate.

- B. Gate Holdback: Provide galvanized gate hold back keeper for each gate leaf over 5 feet (1524 mm) wide.
 - 1. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.
- C. Hardware for Double Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; drop bolt on inactive leaf engaging socket stop set in concrete, active leaf latched to inactive leaf preventing raising of drop bolt, padlock hasp; keepers to hold gate in fully open position.
 - 1. Drop bolt is not to be provided or installed on exit gates.
 - 2. Provide complete hardware set similar to single swinging gate including hold back.
 - 3. Provide galvanized pressed steel locking latch, requiring one padlock for locking both gate leaves, accessible from either side.

2.06 ACCESSORIES

- A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.
 - 1. ASTM F626 galvanized pressed steel, malleable iron, or aluminum alloy weather tight closure cap for tubular posts.
 - 2. Provide one cap for each post.
 - 3. When top rail is specified provide line post loop tops to secure top rail.
- B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.
 - 1. Rail ends: Galvanized pressed steel per ASTM F626, for connection of rails to post using a brace band.
 - 2. Top rail sleeves: 7 inches (178 mm) galvanized steel sleeve per ASTM F626.
- C. Other Fencing Accessories: Provide other pressed steel or cast iron accessories and fencing items necessary for a complete installation as required by Project conditions and as recommended by fencing manufacturer.

2.07 FINISHES

- A. Components (Other than Fabric): Galvanized in accordance with ASTM A123/A123M, at 1.7 oz/sq ft.
- B. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.
- C. Accessories: Same finish as framing.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify that areas are clear of obstructions or debris.

3.02 PREPARATION

- A. Removal: Obstructions or debris.

3.03 PREPARATION

- A. Fence Layout: Lay out fencing in advance of installation, noting locations for posts, gates, operators and accessories applicable to the installation. Space line posts maximum 10 feet o.c., unless otherwise indicated. Straight runs between braced posts shall not exceed 500 feet.
 - 1. Space line posts maximum 10 feet o.c., unless otherwise indicated.
 - 2. Straight runs between braced posts shall not exceed 500 feet.
- B. Excavation: Excavate line post holes as indicated on Drawings, minimum 10 inch diameter and to a depth of not less than 30 inches for post plus 3 inches below bottom of post.
 - 1. Excavate corner end, pull and gate posts minimum 12 inch diameter and to a depth of not less than 36 inches for post plus 3 inches below bottom of post.
 - 2. Footing depths shall be designed conforming to CLFMI published standards, based on fabric height, wind pressure and soil types.

3.04 INSTALLATION

- A. Install framework, fabric, accessories and gates in accordance with ASTM F567.
 - 1. Install fence in compliance with chain link fence manufacturer's instructions and recommendations. Do not begin installation and erection before final grading is completed, unless otherwise permitted.
 - 2. Footings: Install conforming to CLFMI published standards, based on fabric height, wind pressure and soil types.
- B. Place fabric on outside of posts and rails.
- C. Set intermediate, terminal, and gate posts plumb.
- D. Line Post Footing Depth Below Finish Grade: ASTM F 567.
- E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F 567.
- F. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.
- G. Gates: Install gates plumb, level and secure. Install as recommended by fence manufacturer. Adjust hardware for smooth operation and lubricate as required.
- H. Provide top rail through line post tops and splice with 6 inch long rail sleeves.
 - 1. Connect ends with sleeves forming a rigid connection, allow for expansion and contraction.
- I. Install center brace rail on corner gate leaves.
- J. Center Rails: Install mid rails between line posts and attach to post using rail end or line rail clamps.
- K. Bottom Rails: Install bottom rails between posts and attach to post using rail end or line rail clamps
- L. Do not stretch fabric until concrete foundation has cured 28 days.
- M. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
 - 1. Adjust fabric for rigid installation.

2. Tighten hardware, fasteners, and accessories.
 3. Bend ends of tie wires to preclude snagging.
- N. Position bottom of fabric 2 inches above finished grade or paving surface.
- O. Fastening: Fasten all fence and gate hardware secured in place by peening or welding to allow proper operation of components, but to prevent disassembly of fencing or removal of gates.
1. Fastenings, hardware, and all other connections, which have been peened or welded, shall be covered with a heated re-galvanizing alloy.
- P. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.
1. Fasten fabric to tension wires with 11-gage hog rings of same material and finish as fabric wire.
 2. Leave approximately 2 inches between finish surface and bottom of selvage.
- Q. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- R. Install bottom tension wire stretched taut between terminal posts.
- S. Do not attach the hinged side of gate to building wall; provide gate posts.
- T. Install hardware and gate with fabric to match fence.
- U. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.
- V. Perform three random field inspections confirming proper installation.

3.05 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From True Position: 1 inch.

3.06 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.
- C. Post Settings: Randomly inspect three locations against design for:
 1. Hole diameter.
 2. Hole depth.
 3. Hole spacing.
- D. Fence Height: Randomly measure fence height at three locations or at areas that appear out of conformance against design.
- E. Gates: Inspect for level, plumb, and alignment.
- F. Workmanship: Verify neat installation free of defects. See CLFMI CLF-FIG0111 for field inspection guidance.

END OF SECTION

SECTION 33 01 10.58
DISINFECTING OF SITE WATER DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Disinfection of site domestic water lines specified in Section 33 14 16.
- B. Disinfection of building domestic water piping specified in Division 22.
- C. Testing and reporting results.

1.02 RELATED REQUIREMENTS

- A. Section 33 14 16 - Site Water Distribution Piping.

1.03 REFERENCE STANDARDS

- A. AWWA B300 - Hypochlorites; 2011.
- B. AWWA B301 - Liquid Chlorine; 2010.
- C. AWWA B302 - Ammonium Sulfate; 2010.
- D. AWWA B303 - Sodium Chlorite; 2010.
- E. AWWA C651 - Disinfecting Water Mains; 2014.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Test Reports: Indicate results comparative to specified requirements.
- C. Certificate: From authority having jurisdiction indicating approval of water system.
- D. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.
- E. Disinfection report:
 - 1. Type and form of disinfectant used.
 - 2. Date and time of disinfectant injection start and time of completion.
 - 3. Test locations.
 - 4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
 - 5. Date and time of flushing start and completion.
 - 6. Disinfectant residual after flushing in ppm for each outlet tested.
- F. Bacteriological report:
 - 1. Date issued, project name, and testing laboratory name, address, and telephone number.
 - 2. Time and date of water sample collection.
 - 3. Name of person collecting samples.
 - 4. Test locations.

5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Certification that water conforms, or fails to conform, to bacterial standards of County of Riverside.

1.05 QUALITY ASSURANCE

- A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three years documented experience.
- B. Testing Firm: Company specializing in testing potable water systems, certified by governing authorities of California.
- C. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS

2.01 DISINFECTION CHEMICALS

- A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping system and water well has been cleaned, inspected, and pressure tested.
- B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.02 DISINFECTION

- A. Use method prescribed by the applicable state or local codes, or health authority or water purveyor having jurisdiction, or in the absence of any of these follow AWWA C651.
- B. Provide and attach equipment required to perform the work.
- C. Inject treatment disinfectant into piping system.
- D. Maintain disinfectant in system for 24 hours.
- E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.
- F. Replace permanent system devices removed for disinfection.
- G. Pressure test system to 120 psi. Repair leaks and re-test.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01 40 00.
- B. Test samples in accordance with AWWA C651.

END OF SECTION

SECTION 33 14 16
SITE WATER DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe and fittings for site water lines including domestic water lines.
 - 1. Site water lines up to approximately 5 feet from the building perimeter. See individual building systems for continuation.

1.02 RELATED REQUIREMENTS

- A. Section 31 23 16 - Excavation: Excavating of trenches.
- B. Section 31 23 23 - Fill: Bedding and backfilling.
- C. Section 33 01 10.58 - Disinfecting of Site Water Distribution Piping: Disinfection of site service utility water piping.

1.03 REFERENCE STANDARDS

- A. ASTM A197 - Standard Specification for Cupola Malleable Iron; 2000 (Reapproved 2015).
- B. ASTM A506 - Standard Specification for Alloy and Structural Alloy Steel, Sheet and Strip, Hot-Rolled and Cold-Rolled; 2016.
- C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).
- D. ASTM A575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades; 1996 (Reapproved 2013)e1.
- E. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2016a.
- F. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.
- G. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2015.
- H. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2015.
- I. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2015.
- J. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 1998 (Reapproved 2011).
- K. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.
- L. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2017.
- M. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service; 2009.
- N. AWWA C504 - Rubber-Seated Butterfly Valves 3 In. (75 mm) Through 72 In. (1,800 mm); 2010.
- O. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances; 2010.

- P. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution; 2016.
- Q. SSPWC - Greenbook: Standard Specifications for Public Works Construction; latest adopted edition.

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.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, joints, couplings, valves and accessories.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
 - 1. Submit a certificate stating that the meters have been tested and that the accuracy and capacity meet the requirements of AWWA C700 when tested in accordance with AWWA Standards according to type installed.
- D. Shop Drawings: Submit shop drawings for potable water system, showing piping materials, size, locations, and elevations. Include details of underground structures, connections, thrust blocks, and anchors. Show interface and spatial relationship between piping and proximate structures.
- E. Project Record Documents:
 - 1. Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.
 - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
 - 3. On a set of Contractor Drawings, kept at the site during construction, mark construction that is installed differently from that indicated.
 - a. Locate materials installed underground by dimensions from fixed identifiable points whether installed as indicated or not.
- F. Maintenance Data:
 - 1. Submit maintenance data and parts list for potable water system materials and products.
 - 2. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Section 01 78 00 - Closeout Submittals.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with utility company requirements.
- B. Manufacturer's Qualification: Firms regularly engaged in manufacture of potable water system materials and products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

- C. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with potable water piping work similar to that required for project.

1.07 REGULATORY REQUIREMENTS

- A. Materials and installation shall be in accordance with the following documents hereinafter referred to as the "SSPWC".

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers with labeling in place.
- B. Do not store materials directly on the ground. Support the pipe uniformly during shipping and storage.
 - 1. Do not stack higher than 4 feet nor stack with weight on bells.
 - 2. Cover plastic pipe to protect it from sunlight.
 - 3. Keep inside of pipe and fittings free of dirt and debris.
 - 4. Avoid scratching the pipe surface.
- C. Do not install pipe that is cracked, broken, gouged, scratched or forming a clear depression. Remove damaged pipe from the site.
- D. Do not install pipe contaminated with a petroleum product or any other toxic material whether inside or outside of pipe.
- E. Take special care to avoid injury to coatings and linings on pipe and fittings; make satisfactory repairs if coatings or linings are damaged.
 - 1. Hoist pipe with mechanical equipment using a cloth belt sling or a continuous fiber rope which avoids scratching the pipe.
 - 2. Pipes may be lowered by rolling on two ropes controlled by snubbing.

PART 2 PRODUCTS

2.01 WATER PIPE

- A. General:
 - 1. Provide piping materials and factory-fabricated piping products of size, type, pressure ratings, and capacities as indicated.
 - 2. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements.
 - 3. Provide size and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in potable water systems.
 - 4. Where more than one type of materials or products are indicated, selection is Installer's option.
- B. Piping:
 - 1. Provide pipes of one of the following materials, of weight/class indicated.
 - 2. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.

- C. PVC Pipe: ASTM D 1785, Schedule 80 for sizes 1/2 inch through 3 inches.
 - 1. Fittings: ASTM D2466, PVC, socket type, solvent cement joints; or elastomeric gaskets joints.
 - 2. Joints: ASTM D2855, solvent weld.
- D. PVC Pipe: AWWA C900 FM approved, Class 235 (formerly 150): for sizes 4 inches through 12 inches; UL Listed.
 - 1. Dimension Ratio: DR 18.
 - 2. Fittings: AWWA C111/A21.11, ductile-iron, cement lined, with rubber gaskets.
 - 3. Joints: ASTM D3139 compression gasket ring, bell and spigot.
- E. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service" in large letters.

2.02 VALVES

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Gate Valves Up To 3 Inches:
 - 1. Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression ends, with control rod, post indicator, valve key, and extension box.
- C. Gate Valves 3 Inches and Over:
 - 1. AWWA C500, iron body, bronze trim, non-rising stem with square nut, single wedge, flanged ends, control rod, post indicator, valve key, and extension box.
- D. Ball Valves Up To 2 Inches:
 - 1. Brass body, Teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA inlet end, compression outlet with electrical ground connector, with control rod, valve key, and extension box.
- E. Butterfly Valves From 2 Inches to 24 Inches:
 - 1. AWWA C504, iron body, bronze disc, resilient replaceable seat, water or lug ends, ten position lever handle.
- F. Valve Ends: Provide flanged, threaded, hub or sleeve type mechanical joint ends designed to suit pipe or tapping sleeves connections.

2.03 BEDDING AND COVER MATERIALS

- A. Bedding: As specified in Section 31 23 23.
- B. Cover: As specified in Section 31 23 23.

2.04 ACCESSORIES

- A. Anchorages: Provide anchorages for tees, wyes, crosses, plugs, caps, bends, valves, and hydrants. After installation, apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of ferrous anchorages.
 - 1. Clamps, Straps, and Washers: Steel, ASTM A506.
 - 2. Rods: Steel, ASTM A575.
 - 3. Rod Couplings: Malleable-iron, ASTM A197.

4. Bolts: Steel, ASTM A307.
 5. Cast-Iron Washers: Gray-iron, ASTM A126.
- B. Concrete: Ready-mixed, complying with ASTM C94/C94M; normal Portland cement; 2,500 psi strength at 28 days, 3 inch slump; 3/4 inch nominal size aggregate.
- C. Identification
1. Underground-Type Plastic Line Marker: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6 inches wide x 4 mils thick. Provide blue tape with black printing reading "CAUTION WATER LINE BURIED BELOW".
 - a. Manufacturer: Subject to compliance with requirements, provide identification markers of one of the following:
 - 1) Allen Systems Inc.
 - 2) Seton Name Plate Corp.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
 2. Nonmetallic Piping Label: If nonmetallic piping is used for water service, provide engraved plastic laminate, label permanently affixed to main electrical meter panel stating "THIS STRUCTURE HAS A NONMETALLIC WATER SERVICE".
- D. Corrosivity Protection: All underground metallic pipe and fittings shall be protected against corrosive soil by wrapping with 8 mil minimum polyethylene sheet.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.
- B. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.

3.03 TRENCHING

- A. See the sections on excavation and fill for additional requirements.
- B. Hand trim excavation for accurate placement of pipe to elevations indicated.
- C. Form and place concrete for pipe (larger than 4 inches) thrust restraints at each change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide 4 sq ft thrust restraint bearing on subsoil.
- D. Do not backfill until installation has been approved and as-built drawings are up to date. Promptly install all piping after excavation or cutting for same has been done, so as to keep the excavations open as short a time as possible.

- E. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.04 INSTALLATION - PIPE

- A. General: During back-filling/topsoiling of underground potable water piping, install continuous underground-type plastic line markers located directly over buried lines at 6 to 8 inches below finished grade.
- B. Maintain separation of water main from sewer piping in accordance with plumbing code.
- C. Group piping with other site piping work whenever practical.
- D. Establish elevations of buried piping to ensure not less than 2 ft of cover.
- E. Install pipe to indicated elevation to within tolerance of 5/8 inches.
- F. Polyvinyl Chloride Pipe: Install in accordance with manufacturer's installation instructions.
 - 1. Pressure water lines (4 inch and larger): Install in accordance with pipe manufacturers recommendations, or as shown in J-M Installation Guide "Ring-Tite PVC Pipe". Provide thrust blocks as required by "J-M Installation Guide".
- G. Route pipe in straight line.
- H. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- I. Install access fittings to permit disinfection of water system performed under Section 33 01 10.58.
- J. Slope water pipe and position drains at low points.
- K. Install trace wire 6 inches above top of pipe; coordinate with Section 31 23 23.
- L. Provide and install 14 gauge copper "Tracer" wire, continuous for entire length, for all underground non-metallic piping. Secure to piping at alternate joints, at each fitting and at each valve. Locate "Tracer" wire along side pipe, but not under pipe.
- M. Installation of identification: During backfilling/top-soiling of underground water piping systems, install continuous underground-type plastic line marker, located directly over buried line at 6 to 8 inches below finished grade.

3.05 INSTALLATION - VALVES AND HYDRANTS

- A. Check operation of all valves before installing. Install valves true to line and grade. Install valves in accordance with AWWA C600 and manufacturer's written instructions. Wrap all buried, ferrous metal valves with polyethylene film in conformance with Section 5-4 of AWWA C105/A21.5.
- B. Set valves on solid bearing.
- C. Install valves as indicated with stems pointing up. Provide valve box over underground valves.
- D. Center and plumb valve box over valve. Set box cover flush with finished grade.

3.06 CORROSION PROTECTIVE COATING APPLICATION

- A. Comply with NACE SP0169.

3.07 IDENTIFICATION INSTALLATION

- A. During backfilling/top-soiling of underground water piping systems, install continuous underground-type plastic line marker, located directly over buried line at 6 to 9 inches below finished grade.
- B. Attach nonmetallic piping label permanently to main electrical meter panel.

3.08 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01 40 00.
- B. Test valves for leakage and alignment prior to backfilling.
- C. Conduct piping tests before joints are covered, and after thrust blocks have sufficiently hardened. Fill pipeline 24 hours prior to testing, and apply test pressure to stabilize system. Use only potable water.
- D. Pressure test water piping to 200 psi.
 - 1. PVC Water Pipelines: Test all water lines in accordance with manufacturers recommendations.
 - 2. Increase pressure in 50 psi increments and inspect each joint between increments. Hold at test pressure for one hour, decrease to 0 psi. Slowly increase again to test pressure and hold for one more hour.
 - 3. Test fails if leakage exceeds 2-qts per hour per 100 gaskets or joints, irrespective of pipe diameter.
- E. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to District.

3.09 CLEANING

- A. Clean and disinfect water-distribution piping as indicated in Section 33 01 10.58 - Disinfecting of Site Water Distribution Piping.

END OF SECTION

SECTION 33 31 13
SITE SANITARY SEWERAGE PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sanitary sewerage system piping and appurtenances from a point 5 feet outside the building to the point of disposal.
- B. Sanitary sewerage drainage piping, fittings, and accessories.
- C. Connection of building sanitary drainage system to existing on-site.
- D. Cleanout access.

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Supply of connection devices to building piping for placement by this Section.

1.03 RELATED REQUIREMENTS

- A. Section 31 23 16 - Excavation: Excavating of trenches.
- B. Section 31 23 23 - Fill: Bedding and backfilling.

1.04 DEFINITIONS

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.05 REFERENCE STANDARDS

- A. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012.
- B. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2014.
- C. ASTM C891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures; 2011.
- D. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2014.
- E. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.
- F. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2016.
- G. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals; 2007 (Reapproved 2013).
- H. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe; 2014.
- I. SSPWC - Greenbook: Standard Specifications for Public Works Construction; latest adopted edition.

- J. City requirements.

1.06 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of sewer line with size, location and installation of service utilities.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- C. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.07 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating pipe, pipe accessories.
- C. Shop Drawings:
 - 1. Coordination profile drawings showing sanitary sewerage system piping in elevation. Draw profiles at a horizontal scale of not less than 1 inch equals 50 feet and vertical scale of not less than 1 inch equals 5 feet. Indicate pipe and underground structures. Show types, sizes, materials, and elevations of other utilities crossing sewerage system piping.
- D. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- E. Project Record Documents:
 - 1. Submit documents under provisions of Section 01 78 00 - Closeout Submittals.
 - 2. Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.
 - 3. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.08 REGULATORY REQUIREMENTS

- A. Conform to applicable code for materials and installation of the Work of this section.
- B. Comply with requirements of Local Plumbing Code, Health Department, and Authorities having jurisdiction.
- C. Utility Compliance: Comply with local utility regulations and standards pertaining to sanitary sewerage systems.
- D. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to sanitary sewerage systems.
- E. Permits: Obtain all required permits in name of Owner.

1.09 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that storm sewerage system piping may be installed in compliance with original design and referenced standards.
 - 1. Locate existing sanitary sewerage system piping and structures that are to be abandoned and closed.

1.10 SEQUENCING AND SCHEDULING

- A. Coordinate connection to public sewer with utility company.
- B. Coordinate with interior building sanitary drainage piping.
- C. Coordinate with other utility work.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

- A. Provide products that comply with applicable code(s).
- B. General: Provide pipe and pipe fitting materials compatible with each other. Where more than one type of materials or products is indicated, selection is Installer's option.
- C. Plastic Pipe: ASTM D3034, Type SDR35, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter of 4 to 8 inches, bell and spigot style solvent sealed joint end.
 - 1. Solvent Cement: ASTM D2564.
 - 2. Gaskets: ASTM F477, elastomeric seal.
 - 3. Pipe Joints: ASTM D3212.
- D. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required wyes, bends, cleanouts, reducers, traps and other configurations required.

2.02 PIPE ACCESSORIES

- A. Cleanouts: Provide cast-iron ferrule and countersunk brass cleanout plug, with round cast-iron access frame and heavy-duty, secured, scoriated cast-iron cover.
 - 1. Acceptable Manufacturers:
 - a. Ancon, Inc.
 - b. Josam Co.
 - c. Smith (Jay R.) Mfg. Co.
 - d. Wade Div.; Tyler Pipe.
 - e. Zurn Industries, Inc.; Hydromechanics Div.
 - f. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Sewer Service" in large letters.
- C. Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid green in color with continuously printed caption in black letters "CAUTION - SEWER LINE BURIED BELOW."
 - 1. Allen Systems, Inc.; Reef Industries, Inc.
 - 2. Brady (W.H.) Co.; Signmark Div.
 - 3. Calpico, Inc.
 - 4. Carlton Industries, Inc.
 - 5. EMED Co., Inc.
 - 6. Seton Name Plate Co.

- D. Couplings: Rubber or elastomeric compression gasket, made to match pipe inside diameter or hub, and adjoining pipe outside diameter.
 - 1. Gaskets: ASTM C425, rubber for vitrified clay pipe; ASTM C443, rubber for concrete pipe; ASTM C564, rubber for cast-iron soil pipe; and ASTM F477, elastomeric seal for plastic pipe. Gaskets for dissimilar or other pipe materials shall be compatible with pipe materials being jointed.
- E. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required wyes, bends, cleanouts, reducers, traps and other configurations required.
- F. Corrosivity Protection: All underground metallic pipe and fittings shall be protected from corrosive soils by 8 mil minimum polyethylene sheet.

2.03 BEDDING AND COVER MATERIALS

- A. Pipe Bedding Material: As specified in Division 31 - Earthwork and applicable City or County Standards.
- B. Pipe Cover Material: As specified in Division 31 - Earthwork and applicable City or County Standards.

PART 3 EXECUTION

3.01 GENERAL

- A. Perform work in accordance with applicable code(s).

3.02 TRENCHING

- A. See Division 31 - Earthwork for additional requirements.
- B. Hand trim excavation for accurate placement of pipe to elevations indicated.
 - 1. Correct over excavation in accordance with the Section in Division 31.
 - 2. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.
- C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.
- D. If during the installation of pipe, the trench material, backfill material is found to be unsuitable, as determined by the Engineer, it shall be removed and replaced by crushed rock as defined by SSPWC 200-2.2 or 200-2.3 except that minimum sand equivalent value shall be 30. Any excess material that is generated by this process shall be disposed of by the Contractor at no additional cost to the District.
- E. Bedding:
 - 1. Excavate pipe trench in accordance with the Section in Division 31 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
 - 2. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth, compact to 95 percent.
 - 3. Maintain optimum moisture content of bedding material to attain required compaction density.

3.03 EXAMINATION

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Inspect piping before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.
- C. Unless specified otherwise, all buried piping shall have coverage of at least three feet between top of pipe and finished grade.

3.04 CLOSING ABANDONED SANITARY SEWERAGE SYSTEM

- A. Abandoned Piping: Close open ends of abandoned underground piping that is indicated to remain in place. Provide sufficiently strong closures to withstand hydrostatic or earth pressure that may result after ends of abandoned utilities have been closed.
 - 1. Close open ends of concrete or masonry utilities with not less than 8-inch-thick brick masonry bulkheads.
 - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Wood plugs are not acceptable.
- B. Abandoned Structures: Remove structure and close open ends of the remaining piping, or remove top of structure down to not less than 3 feet below final grade; fill structure with stone, rubble, gravel, or compacted dirt, to within 1 foot of top of structure remaining and fill concrete.

3.05 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground sanitary sewerage system piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical.
- B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements.
- C. Use fittings for branch connections, except where direct tap into existing sewer or manhole is indicated.
- D. Use proper size increasers and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.
- E. Install piping pitched down in direction of flow, at minimum slope of 2 percent, except where indicated otherwise.
 - 1. Place bell ends of piping facing upstream.
- F. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, jacking, or a combination of both.
- G. No pipe shall be laid in water and all costs for drainage and/or dewatering trenches during construction shall be borne by the Contractor.

3.06 INSTALLATION - PIPE

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Pipe Applications For Underground Sanitary Sewers
 - 1. Pipe Sizes 15 inches and Smaller: PVC gasket joint sewer pipe and fittings.
 - 2. Pipe Sizes 1-1/2 to 10 Inches: Hubless cast-iron soil pipe and fittings.
- C. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
 - 1. Plastic Pipe: Also comply with ASTM D2321.
 - 2. Pipe shall be assembled by hand or by use of a bar and block or by lever puller. No swinging or stabbing shall be permitted. The "popping-on" of joints is expressly forbidden. All bell and spigot type connection shall be marked on the spigot end to indicate full insertion.
- D. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- E. Connect to building sanitary sewer outlet and municipal sewer system, through installed sleeves.
- F. Install trace wire 6 inches above top of pipe; coordinate with the Section in Division 31 - Earthwork.

3.07 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. Join and install hubless cast iron soil pipe and fittings, with "Best" or "MG" cast-iron couplings with neoprene gaskets. Stainless steel couplings not acceptable below grade.
- B. Join and install PVC pipe as follows:
 - 1. Pipe and gasketed fittings, joining with elastomeric seals.
 - 2. Installation in accordance with ASTM D2321.
- C. Join different types of pipe with standard manufactured couplings and fittings intended for that purpose.

3.08 INSTALLATION MANHOLES

- A. Install manholes complete with accessories as indicated. Form continuous concrete or split pipe section channels and benches between inlets and outlet. Set tops of frames and covers flush with finish surface where manholes occur in pavements. Elsewhere, set tops 3 inches above finish surface, unless otherwise indicated.
- B. Place pre-cast concrete manhole sections as indicated, and install in accordance with ASTM C891.
- C. Provide rubber joint gasket complying with ASTM C443 at joints of sections.
- D. Apply bituminous mastic coating at joints of sections.

3.09 INSTALLATION - CLEANOUTS

- A. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated. Set cleanout frame and cover in concrete block 18 by 18 by 12 inches deep, except where location is in concrete paving. Set top of cleanout 1 inch above surrounding earth grade or flush with grade when installing in paving.
 - 1. Provide as shown on plans or as required by Plumbing Code.
- B. Form bottom of excavation clean and smooth to correct elevation.
- C. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.
- D. Establish elevations and pipe inverts for inlets and outlets as indicated.
- E. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.10 TAP CONNECTIONS

- A. Make connections to existing piping and underground structures so that finished work will conform as nearly as practicable to the requirements specified for new work.
- B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap, with not less than 6 inches of 3000 psi 28-day compressive-strength concrete.
- C. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris, concrete, or other extraneous material that may accumulate.

3.11 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01 40 00.
- B. Perform testing of completed piping in accordance with local authorities having jurisdiction.
- C. Request inspection prior to and immediately after placing bedding.
- D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to District.
- E. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.
 - 1. Make inspections after pipe between manholes and manhole locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.
 - 2. All sewer mains constructed and to become part of the public sewer system shall be digitally recorded by the City prior to acceptance of the sewer system for maintenance by the City.
 - 3. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects correct such defects, and reinspect.
 - 4. If requested by local utility, provide video recording of visual interior inspection.
 - 5. Reinspect after any corrections.

3.12 CLEANING

- A. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.
 - 1. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
 - 2. Flush piping between manholes, if required by local authority, to remove collected debris.

3.13 PROTECTION

- A. Protect finished installation under provisions of Section 01 50 00 - Temporary Facilities and Controls.
- B. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION