

Glendale Unified School District  
**Verdugo Woodlands Elementary School**  
**Pedestrian Bridge**

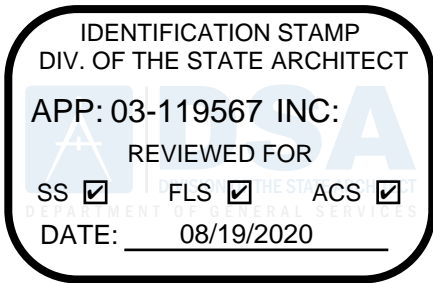
1751 North Verdugo Road  
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**100% CD**  
**TECHNICAL SPECIFICATIONS**

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Architect's Job No.  
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November 26, 2018



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## SECTION 01000

### ABBREVIATIONS, SYMBOLS AND ACRONYMS

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. List of abbreviations, symbols, and acronyms of societies, institutes, and associations generally appearing in the Contract Documents.

##### 1.02.1 RELATED SECTIONS

- A. Division 01: General Requirements

#### PART 2 - PRODUCTS

#### PART 3 - EXECUTION

##### 3.01 ABBREVIATIONS

ac	Alternating current
amp	ampere
BTU	British thermal unit
cfh	Cubic feet per hour
cfm	Cubic feet per minute
cm	Centimeter
Co.	Company
COP	Coefficient of performance
Corp.	Corporation
d	Penny
db.	Decibel
DB	Dry bulb
dc	Direct current
EER	Energy efficiency ratio
F	Degrees Fahrenheit
fpm	Feet per minute
ft	Foot or feet
gph	Gallons per hour
gpm	Gallons per minute
HP	Horsepower
HVAC	Heating, ventilating and air conditioning
Hz	Hertz
Inc.	Incorporated
KHz	Kilohertz
Kip	thousand pounds
Ksf	Thousand pounds per square foot
Ksi	Thousand pounds per square inch
Kv	Kilovolt
KVA	Kilovolt amperes
KW	Kilowatt

KWH	Kilowatt hour
LF	Linear foot
lb	Pound
LED	Light emitting diode
MBH	1000 BTUs per hour
MHz	Mega hertz
mil	Thousandth of an inch
mm	Millimeter
mph	Miles per hour
oz.	Ounce
PCF	Pounds per cubic foot
pH	Acidity-alkalinity balance
psf	Pounds per square foot
psi	Pounds per square inch
psig	Pounds per square inch, gage
RF	Radio frequency
rpm	Revolutions per minute
SF	Square foot
SY	Square yard
V	Volt
WB	Wet bulb

### 3.02 SYMBOLS

#	Number or pound
'	Foot or feet
"	Inch(es)
%	Percent

### 3.03 ACRONYMS

AA	The Aluminum Association, Inc
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ABMA	American Boiler Manufacturers Association
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
AGA	American Gas Association
AGCIH	American Conference of Governmental Industrial Hygienists
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association, Inc.
ANSI	American National Standards Institute
APA	APA – The Engineered Wood Association

ARI Air-Conditioning and Refrigeration Institute  
 ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers  
 ASME American Society of Mechanical Engineers  
 ASTM American Society for Testing and Materials  
 ATBCB Architectural & Transportation Barriers Compliance Board  
 AWI Architectural Woodwork Institute  
 AWPA American Wood Preservers Association  
 AWPI American Wood Preservers Institute  
 AWS American Welding Society  
 AWWA American Water Works Association

BHMA Builders Hardware Manufacturers Association  
 BIA Brick Institute of America

CAL/OSHA California Occupational Safety and Health Administration  
 CBC California Building Code  
 CCR California Code of Regulations  
 CEC California Electrical Code  
 CFR Code of Federal Regulations  
 CISPI Cast Iron Soil Pipe Institute  
 CLFMI Chain Link Fence Manufacturers Institute  
 CMC California Mechanical Code  
 CQC California Quality Control (CMA Standards)  
 CPC California Plumbing Code  
 CRA California Redwood Association  
 CRI Carpet and Rug Institute  
 CRSI Concrete Reinforcing Steel Institute  
 CS Commercial Standards, U.S. Department of Commerce  
 CSFM California State Fire Marshal  
 CSI Construction Specifications Institute  
 CTIOA Ceramic Tile Institute of America  
 CTI Cooling Tower Institute

DHI Door and Hardware Institute  
 DSA Division of the State Architect

EPA Environmental Protection Agency  
 ETL ETL Testing Laboratories  
 FCC Federal Communication Commission

FM Factory Mutual  
 FS Federal Specifications

GA Gypsum Association  
 GANA Glass Association of North America

HMMA Hollow Metal Manufacturer's Association  
 HPVA Hardwood Plywood & Veneer Association

IACS International Annealed Copper Standards  
 IAMPO International Association of Plumbing and Mechanical Officials

ICBO	International Conference of Building Officials
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical & Electronic Engineers, Inc.
IES	Illuminating Engineering Society
IMI	International Masonry Institute
IRI	Industrial Risk Insurers
ISO	International Organization for Standardization
MLSFA	Metal Lath/Steel Framing Association
MSS	Manufacturers Standardization Society of the Valve & Fittings Industry.
NAAMM	National Association of Architectural Metal Manufacturers
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NEBB	National Environmental Balancing Bureau
NEMA	National Electrical Manufacturers Association
NEC	National Electrical Code
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NOFMA	National Oak Flooring Manufacturers Association
NPCA	National Paint and Coatings Association
NPDES	National Pollutant Discharge Elimination System
NRCA	National Roofing Contractors Association
NSF	National Sanitation Foundation
NTMA	National Terrazzo & Mosaic Association
NUSIG	National Uniform Seismic Installation Guidelines
NWMA	National Woodwork Manufacturers Association
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PDI	Plumbing and Drainage Institute
PEI	Porcelain Enamel Institute
PS	Product Standard, U.S. Department of Commerce
RIS	Redwood Inspection Service
RFCI	Resilient Floor Covering Institute
SCAQMD	South Coast Air Quality Management District
SDEI	Steel Deck Institute
SDI	Steel Door Institute
SFM	State Fire Marshal
SFPA	Southern Forest Products Association
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Steel Structures Painting Council
SWI	Steel Window Institute



TCA	Tile Council of America
UBPPA	Uni-Bell PVC Pipe Association
UCI	Uniform Construction Index
UFAS	Uniform Federal Accessibility Standards
UL	Underwriters' Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WDMA	Window and Door Manufacturers Association
WIC	Woodwork Institute of California
WWPA	Western Wood Products Association

END OF SECTION

## SECTION 01005

### SUMMARY OF THE WORK

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. The furnishing of all labor, materials, equipment, services, and incidentals necessary for Work to be performed. Work includes but is not limited to demolition of existing asphalt and concrete paving in preparation for a new aluminum panel clad steel pratt truss bridge with concrete ramps, steps and landings. New bridge and site lighting and closure of existing non accessible bridge.

##### 1.02 RELATED SECTIONS

- A. Section 01010: Phasing of the Work
- B. Section 01100: Coordination
- C. Section 01500: Construction Facilities and Temporary Controls

#### PART 2 - PRODUCTS

#### PART 3 - EXECUTION

##### 3.01 USE OF PREMISES

- A. CONTRACTOR shall coordinate the Work of all trades, with OWNER and/or Separate Work Contract. CONTRACTOR shall sequence, coordinate, and perform the Work to impose minimum hardship on the operation and use of the existing facilities and/or Project site. CONTRACTOR shall install all necessary protection for existing improvements, Project site, property, and new Work against dust, dirt, weather, damage, vandalism, and maintain and relocate all protection to accommodate progression of the Work.
- B. CONTRACTOR shall confine entrance and exiting to the Project site and/or facilities to routes designated by the OAR
- C. Within existing facilities, OWNER will remove portable equipment, furniture, and supplies from Work areas prior to the start of Work. CONTRACTOR shall cover and protect remaining items in areas of the Work
- D. CONTRACTOR is advised school may be in session during performance of the Work. CONTRACTOR shall utilize all available means to prevent generation of unnecessary noise and maintain noise levels to a minimum. When required by the OAR,, CONTRACTOR shall immediately discontinue noise-generating activities and/or provide alternative methods to minimize noise generation. CONTRACTOR shall install and maintain air compressors, vehicles, and other internal combustion engine

equipment with mufflers, including unloading cycle of compressors. CONTRACTOR shall discontinue operation of equipment producing objectionable noise as required by the OAR.

- E. CONTRACTOR shall furnish, install, and maintain adequate supports, shoring, and bracing to preserve structural integrity and prevent collapse of existing improvements and/or Work modified and/or altered as part of the Work.
- F. CONTRACTOR shall secure building entrances, exits, and Work areas with locking devices as required by the OAR.
- G. CONTRACTOR assumes custody and control of OWNER property, both fixed and portable, remaining in existing facilities vacated during the Work.
- H. CONTRACTOR shall cover and protect surfaces of rooms and spaces in existing facilities turned over for the Work, including OWNER property remaining within as required to prevent soiling or damage from dust, dirt, water, and/or fumes. CONTRACTOR shall protect areas adjacent to the Work in a similar manner. Prior to OWNER occupancy, CONTRACTOR shall clean all surfaces including OWNER property.
- I. CONTRACTOR shall not use or allow anyone other than OWNER employees to use facility telephones and/or other equipment, except in an emergency. CONTRACTOR shall reimburse OWNER for telephone toll charges originating from the facility except those arising from emergencies or use by OWNER employees.
- J. CONTRACTOR shall protect all surfaces, coverings, materials, and finished Work from damage. Mobile equipment shall be provided with pneumatic tires.
- K. CONTRACTOR is advised OWNER will award Separate Work Contracts at this Project site.
- L. CONTRACTOR shall not permit the use of portable and/or fixed radio's or other types of sound producing devices including walkmans and similar devices.

### 3.02 PROPERTY INVENTORY

- A. Property, OWNER intends to remove, will be removed by OWNER before a room or space is vacated for the Work. Before performing Work in each room or space, OAR and CONTRACTOR shall prepare a detailed initial written inventory of OWNER property remaining within, including equipment and telephone instruments and the condition thereof. OAR and CONTRACTOR shall retain a signed copy of the inventory dated and signed by both parties. Prior to subsequent OWNER occupancy of each such room or space, OAR and CONTRACTOR shall perform a final inventory of OWNER property and all discrepancies between the initial inventory and final inventory shall be the responsibility of CONTRACTOR.

### 3.03 FURNITURE, FIXTURES, AND EQUIPMENT

- A. If designated in the Contract Documents to be OWNER furnished CONTRACTOR installed (OFCD), CONTRACTOR shall unload, store, uncrate, assemble, install, and connect OWNER supplied furniture, fixtures, and equipment.
- B. Ninety (90) days prior to Substantial Completion, CONTRACTOR shall notify OAR of the scheduled date for installation of furniture, fixtures, and equipment. Upon delivery to the Project site, CONTRACTOR shall store furniture, fixtures, and equipment inside rooms and/or protected spaces. OAR will sign receipt or bill of lading as applicable.
- C. CONTRACTOR shall, within ten (10) days after delivery, uncrate and/or unpack furniture, fixtures, and equipment in presence of IOR who shall inspect the delivered items. IOR shall prepare an inspection report listing damaged or missing parts and accessories. IOR shall transmit one copy of the report to OAR and CONTRACTOR. OWNER will procure and/or replace missing and or damaged furniture, fixtures, and equipment.
- D. CONTRACTOR shall install furniture, fixtures, and equipment in the locations and orientation. CONTRACTOR shall verify exact locations with OAR prior to final installation of furniture, fixtures, and equipment.
- E. If required, OAR will furnish setting and or placement drawings for furniture, fixtures, and equipment.
- F. CONTRACTOR shall install furniture, fixtures, and equipment by proper means and methods to ensure an installation as recommended by the manufacturer. CONTRACTOR shall furnish and install all necessary fasteners and required blocking to properly install furniture, fixtures, and equipment.
- G. CONTRACTOR shall install furniture, fixtures, and equipment with manufacturer recommended fasteners for the type of construction the furniture, fixtures, and equipment is being fastened and/or anchored to.
- H. CONTRACTOR shall provide final connections of any electrical, signal, gas, water, waste, venting and/or similar items to furniture, fixtures, and equipment. CONTRACTOR shall, prior to final connection, verify the operating characteristics of furniture, fixtures, and equipment are consistent with the designated supply.

END OF SECTION

SECTION 01010

PHASING OF THE WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements for phasing of the Work include logistics, phasing, and completion of designated phases prior to commencement of subsequent phases.

1.02 RELATED SECTIONS

- A. Section 01005: Summary of the Work
- B. Section 01010: Phasing of the Work
- C. Section 01100: Coordination
- D. Section 01300: Submittals
- E. Section 01365: Construction Schedule
- F. Section 01500: Construction Facilities and Temporary Controls
- G. Section 01700: Contract Closeout

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.01 SUBMITTALS

- A. CONTRACTOR shall submit a Project site logistics plans in accordance with and as required by this Section.

3.02 LOGISTICS

- A. Prior to commencement of the Work, CONTRACTOR shall prepare and submit to OAR, a detailed Project site logistic plan, in the same size and scale of the Drawings, setting forth CONTRACTOR plan of the Work relative to the following, but not limited to, items:

1. In accordance with local ordinances a truck access route to and from the Project site.
2. The identification of any overhead wire restrictions for power, street lighting, signal, and/or cable.
3. Local sidewalk access and street closure requirements.
4. Protection of sidewalk pedestrians and vehicular traffic.
5. Project site fencing and access gate locations.

6. Construction parking.
  7. Material staging and/or delivery areas.
  8. Material storage areas.
  9. Temporary trailer locations.
  10. Temporary service location and proposed routing of all temporary utilities.
  11. Location of temporary and/or accessible fire protection
  12. Trash removal and location of dumpsters.
  13. Concrete pumping locations.
  14. Location of portable sanitary facilities.
  15. Mixer truck wash out locations.
  16. Traffic control signage.
  17. Perimeter and site lighting.
  18. Storm Water Pollution Prevention Plan – SWPPP
  19. Stockpile and/or lay down areas.
- B. A revised Project site logistic plan may be required by the OAR for separately identified phases of the Work as set forth in this Section.
- C. Unless specifically required elsewhere in the Contract Documents, CONTRACTOR is responsible for securing and/or obtaining all approvals of authorities having jurisdiction relative to logistic plan activities.

### 3.03 PHASING OF THE WORK

- A. Project will be constructed in separate Milestone increments, as identified or as described in this Section and/or the Contract Documents. Phasing will also delineate Work to be completed in each designated phase. Each phase may be required to be completed according to the approved Construction Schedule prior to the commencement of the next subsequent phase. CONTRACTOR shall incorporate and coordinate the Work of Separate Work Contracts relative to this Project.
- B. CONTRACTOR shall install all necessary Work for, but not limited to, power, lighting, signal, HVAC, drainage, and plumbing systems in phased Work before completion of the designated phase. All valves, pull boxes, stub outs, temporary capping, and other Work necessary for phased completion and operation of all necessary systems shall be provided whether or not such Work is specifically identified in the Contract Documents.

### 3.04 PHASING OF THE WORK – GENERAL

- A. CONTRACTOR shall prepare the Construction Schedule in order to complete the Work and related activities in accordance with the phasing plan. CONTRACTOR shall include all costs to complete all Work within the Milestones and/or Contract Time.

- B. OWNER will be seriously damaged by not having all Work completed within the Milestones and/or Contract Time. It is mandatory the Work be complete within the Milestones and/or Contract Time.

3.05 PHASING OF THE WORK – SPECIFIC

- A. CONTRACTOR shall prepare the Construction Schedule, and shall complete the following, but not limited too Milestones, within the designated phases in accordance with the schedule provided by the Owner.
- B. The Contract Time shall be a total of 270 calendar days from the date of commencement of the Contract Time.

END OF SECTION

SECTION 01050  
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Procedure for submission of a certified Schedule of Values for review and approval by the OAR.

1.02 RELATED SECTIONS

- A. Section 01080: Application for Payment
- B. Section 01300: Submittals
- C. Section 01365: Construction Schedule

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.01 PREPARATION

- A. Upon receipt of the Notice of Intent to Award, CONTRACTOR shall commence preparation of a certified Schedule of Values.
- B. CONTRACTOR shall coordinate the preparation of a certified Schedule of Values with preparation of the Construction Schedule as set forth in Section 01365.
- C. CONTRACTOR shall follow the table of contents as a Project specific guide to establish the format for a certified Schedule of Values. Provide at least one (1) line item for each Division and/or Specification Section item. Provide separate line items for labor and material when required by the OAR.
- D. Include the following Project school(s) identification on each certified Schedule of Values:
  - 1. Project name and location
  - 2. Project Number
  - 3. ARCHITECT name
  - 4. CONTRACTOR name
  - 5. Date of Submittal
- E. Round amounts to the nearest whole dollar; the total shall equal the Contract Amount.
- F. An approved certified Schedule of Values shall serve as the basis for the monthly certified Application for Payment.

3.02 90 DAY INTERIM SCHEDULE OF VALUES

PEDESTRIAN BRIDGE  
VERDUGO WOODLANDS ELEMENTARY SCHOOL  
GLENDALE UNIFIED SCHOOL DISTRICT

11/26/2018  
SCHEDULE OF VALUES  
01050-1



- A. CONTRACTOR may prepare and submit, in accordance with sub-section 3.03, a 90 day interim Schedule of Values denoting Work to be completed during the first 90 days following the date established in the Notice to Proceed.
- B. CONTRACTOR shall coordinate the preparation of the 90 day interim Schedule of Values with preparation of the Construction Schedule as set forth in Section 01360.
- C. The 90 day interim Schedule of Values is subject to the same terms and conditions as set forth in sub-section 3.03.
- D. The 90 day interim Schedule of Values shall be incorporated into a final Schedule of Values.
- E. The OAR has the right to require subsequent revisions to an approved 90 day interim and/or a final Schedule of Values.

3.03 SUBMITTAL

- A. Within ten (10) days after the date established in the Notice to Proceed, CONTRACTOR shall submit five (5) certified copies of an interim and/or final Schedule of Values for review and approval by the OAR.
- B. OAR will review and if necessary, return the submitted Schedule of Values with summary comments noting items not in compliance with the requirements of the Contract Documents. CONTRACTOR shall revise the submitted Schedule of Values and return five (5) copies within three (3) days of receipt of summary comments.
- C. Signature by OAR shall constitute acceptance of the submitted Schedule of Values.
- D. A copy of the approved Schedule of Values will be transmitted to CONTRACTOR, IOR, and ARCHITECT.
- E. CONTRACTOR shall obtain OAR approval of a 90 day interim Schedule of Values prior to submittal of the first certified Application for Payment.
- F. CONTRACTOR shall obtain OAR approval of the final Schedule of Values prior to submittal of the fourth certified Application for Payment.

END OF SECTION

## SECTION 01080

### APPLICATION FOR PAYMENT

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES:

- A. This Section specifies administrative and procedural requirements relative to a certified Application for Payment.
  - 1. Coordinate the certified Schedule of Values and certified Application for Payment with, but not limited to, the Construction Schedule, submittal log, and list of Subcontractors.

##### 1.02 RELATED SECTIONS:

- 1. Section 01050: Schedule of Values
- 2. Section 01365: Construction Schedule
- 3. Section 01700: Contract Closeout

#### PART 2 - PRODUCTS

#### PART 3 - EXECUTION

##### 3.01 APPLICATION FOR PAYMENT

- A. Each certified Application for Payment shall be consistent with previous applications and payments as reviewed by ARCHITECT and/or OAR, paid for by OWNER, and:
  - 1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.
- B. Payment Application Times: The period of Work covered by each Application for Payment is the payment date for each progress payment as specified in the General Conditions. The period covered by each Application for Payment is the previous month.
- C. Payment Application Forms: Use OWNER provided forms for the Application for Payment.

- D. Application Preparation: Complete every entry on the form. Include execution by a person authorized to sign legal documents on behalf of CONTRACTOR. ARCHITECT will return incomplete applications without action.
- E. Transmittal: Submit a minimum of four (4) signed and original copies of each certified Application for Payment to the ARCHITECT. All copies shall be complete, including releases and similar attachments.
  - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to ARCHITECT.
- F. Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal for the first certified Application for Payment include, but are not limited to, the following:
  - 1. Certified Schedule of Values
  - 2. Performance and payment bonds. List of principal suppliers and fabricators.
  - 3. Worker Compensation certificates, if applicable.
  - 4. Auto Insurance, if applicable.
  - 5. Hazardous Material Insurance Certificates, if applicable.
  - 6. Construction Schedule
  - 7. Submittal Schedule
  - 8. Emergency Contact List
  - 9. Copies of authorizations and licenses from governing authorities for performance of the Work
- G. Application for Payment at Substantial Completion: Following OAR issuance of the certificate of Substantial Completion, submit an Application for Payment:
  - 1. Administrative actions, submittals and/or Work that shall precede or coincide with this application include:
    - a. Occupancy permits and similar approvals by authorities having legal jurisdiction over the Work.
    - b. Removal of temporary facilities and services.
    - c. Testing, adjusting and balance records.
    - d. Removal of surplus materials, rubbish, and similar elements.
    - e. Meter readings.
    - f. Start-up performance reports.
    - g. OWNER training and orientations.
    - h. Change over information related to OWNER occupancy, use, operation, and maintenance.
    - i. Final cleaning.
    - j. Ensure that incomplete Work is not accepted and will be completed without undue delay.

- k. Advice on shifting insurance coverage.
  - l. List of defective Work, recognized as exceptions to certificate of Substantial Completion.
  - m. Change of door locks to OWNER system.
- H. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include, but are not limited to, the following:
- 1. Completion of Contract Closeout requirements.
  - 2. Project record documents.
  - 3. Completion of final punch list items.
  - 4. Delivery of extra materials, products and or stock.
  - 5. Identification of unsettled claims.
  - 6. Proof that taxes, fees, and similar obligations are paid.
  - 7. Operating and maintenance instruction manuals.
  - 8. Consent of surety to final payment.
  - 9. Waivers and releases.
  - 10. Warranties, guarantees and maintenance agreements.

END OF SECTION

## SECTION 01100

### COORDINATION

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. This Section specifies administrative and procedural requirements necessary for coordinating Work operations including, but not limited to, the following:
  - 1. General coordination procedures.
  - 2. Coordination drawings.

#### PART 2 - PRODUCTS

#### PART 3 - EXECUTION

##### 3.01 COORDINATION

- A. CONTRACTOR shall coordinate operations included in various sections of the Contract Documents to assure efficient and orderly installation of each part of the Work. Coordinate Work operations included under related sections of the Contract Documents that depend on each other for proper installation, connection, and operation of the Work, including but not limited to:
  - 1. Schedule construction operations in the sequence required where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
  - 3. Provide provisions to accommodate items scheduled for later installation.
  - 4. Prepare and administer provisions for coordination drawings.
- B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required in notices, reports, attendance at meetings, and:
  - 1. Prepare similar memoranda for OAR and Separate Work Contract where coordination of their Work is required.

- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of schedules.
  - 2. Installation, relocation, and removal of temporary facilities.
  - 3. Delivery and processing of submittals.
  - 4. Progress meetings.
  - 5. Project closeout activities.
  
- D. Conservation: Coordinate Work operations to assure operations are carried out with consideration given to conservation of energy, water, materials, and:
  - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into the Work.

### 3.02 SUBMITTALS

- A. Coordination Drawings: CONTRACTOR shall prepare coordination drawings for coordination of installation of products and materials fabricated by separate entities. Prepare coordination drawings for those areas where limited space availability necessitates maximum utilization of space for efficient installation of different components.
  
- B. Prepare coordination drawings in the following manner:
  - 1. Mechanical, electrical, and plumbing Subcontractors are to first submit their respective Shop Drawings for review in order to make any necessary changes prior to going through the coordination process.
  
  - 2. Plumbing Subcontractor is to locate the plumbing lines on the plans in blue lines. Fire sprinkler Subcontractor is to locate all piping on the plans in red lines and forward drawing to electrical Subcontractor.
  
  - 3. Electrical Subcontractor to indicate service and feeder conduit runs in green lines and forward to CONTRACTOR.
  
  - 4. CONTRACTOR will perform the last coordination review. As each coordination drawing is completed, CONTRACTOR will meet with ARCHITECT and OAR to review and resolve all conflicts on the coordination drawings.
  
  - 5. All coordination meetings will be held in the Project field office of CONTRACTOR. CONTRACTOR is required to distribute Shop Drawings, cut sheets and submittals to Subcontractors where appropriate.

Reviewed coordination drawings will be maintained in the Project field office of CONTRACTOR.

END OF SECTION

## SECTION 01120

### CUTTING AND PATCHING

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. This Section specifies administrative and procedural requirements for cutting and patching.

##### 1.02 RELATED SECTIONS

- A. Section 01100: Coordination
- B. Section 01300: Submittals
- C. Section 01740: Warranties

#### PART 2 - PRODUCTS

#### PART 3 - EXECUTION

##### 3.01 SUBMITTALS

- A. The word “cutting” as used in the Contract Documents includes, but is not limited to, cutting, drilling, chopping, and other similar operations and the word “patching” includes, but is not limited to, patching, rebuilding, reinforcing, repairing, refurbishing, restoring, replacing, or other similar operations.
- B. Cutting and Patching Proposal: CONTRACTOR shall submit a proposal describing procedures well in advance of the time cutting and patching will be performed if the Contract Documents requires approval of these procedures before proceeding. Include the following information, as applicable, in the proposal:
  - 1. Describe the extent of cutting and patching required. Denote how it will be performed and indicate why it cannot be avoided.
  - 2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building’s appearance or other significant visual elements.
  - 3. List products to be used and firms or entities that will perform this Work.
  - 4. Indicate dates when cutting and patching will be performed.



5. Utilities: List utilities that cutting and patching operations will disturb or affect. List utilities to be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
7. Review by ARCHITECT and DSA prior to proceeding with cutting and patching does not waive ARCHITECT right to later require complete removal and replacement of defective Work.

### 3.02 QUALITY ASSURANCE

- A. Requirements for structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.
  1. Obtain approval from ARCHITECT and DSA of the cutting and patching proposal before cutting and patching the following structural elements:
    - a. Foundation construction
    - b. Bearing walls
    - c. Structural concrete
    - d. Structural steel
    - e. Lintels
    - f. Timber and primary wood framing
    - g. Structural decking
    - h. Miscellaneous structural metals
    - i. Equipment supports
    - j. Piping, ductwork, vessels, and equipment
- B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.
  1. Obtain review of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
    - a. Primary operational systems and equipment
    - b. Water, moisture, or vapor barriers
    - c. Membranes and flashings
    - d. Fire protection systems
    - e. Noise and vibration control elements and systems
    - f. Control systems
    - g. Communication and/or data systems

h. Electrical wiring systems

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the opinion of ARCHITECT, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

1. If possible, retain the original installer or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original installer or fabricator, engage another recognized experienced and specialized firm.
  - a. Firestopping
  - b. Acoustical ceilings
  - c. Acoustical panels
  - d. Carpeting
  - e. Ceramic tile
  - f. Gypsum board
  - g. Masonry (exterior and interior where exposed)
  - h. Tack boards
  - i. Casework
  - j. Finish carpentry

3.03 WARRANTY

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

3.04 INSPECTION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

1. Before proceeding, meet at the Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.05 PREPARATION

A. Temporary support: Provide adequate temporary support of existing improvements or Work to be cut.

- B. Protection: Protect existing improvements and Work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of existing improvements or Work that might be exposed during cutting and patching operations.
- C. Avoid interference with operation of adjoining areas or interruption of free passage to adjoining areas.
- D. Where the Work requires sandblasting of existing surfaces in order to receive new materials secured by cementitious, adhesive or chemical bond, completely remove existing finishes, stains, oil, grease, bitumen, mastic and adhesives or other substances deleterious to the new bonding and/or fastening of new Work. Utilize wet sand blasting for interior surfaces and for exterior surfaces where necessary to prevent objectionable production of dust.

### 3.06 PERFORMANCE

- A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay. Carefully remove existing Work to be salvaged and/or reinstalled. Protect and store for reuse into the Work. Verify compatibility and suitability of existing substrates before starting the Work.
- B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining Work. Where possible, review proposed procedures with the original installer; comply with the original installer's recommendations.
  - 1. In general, where cutting, provide hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Cut through concrete and masonry using a cutting machine, such as a carborundum saw or a diamond-core drill. Saw cut reinforcing bars and paint ends with bituminous paint except where bonded into new concrete or masonry.
  - 4. Comply with requirements of applicable Division 2 Sections where cutting and patching requires excavating, backfill, or re-compaction.
  - 5. Woodwork: Cut and or remove to a panel or joint line.

6. Sheet Metal: Remove back to joint, lap, or connection. Secure loose or unfastened ends or edges and seal watertight.
  7. Glass: Remove cracked, broken, or damaged glass and clean rebates and stops of setting materials.
  8. Plaster: Cut back to sound plaster on straight lines, and back bevel edges of remaining plaster. Trim existing lath and prepare for new lath.
  9. Gypsum Wallboard: Cut back on straight lines to undamaged surfaces with at least two opposite cut edges centered on supports.
  10. Acoustical ceilings: Remove hanger wires and related appurtenances where ceilings are not scheduled to be installed.
  11. Tile: Cut back to sound tile and backing on joint lines.
  12. Flooring: Completely remove flooring and clean backing of prior adhesive. Carefully remove wood flooring for patching and repairing of existing wood flooring scheduled to remain.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with required tolerances.
1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation. Verify conditions of existing substrates prior to executing Work.
  2. Restore exposed finishes of patched areas and extend finish restoration into retaining adjoining construction in a manner that will eliminate all evidence of patching and refinishing.
  3. Concrete: Maintain cut edges in a moist condition for twenty four (24) hours prior to the placement of new concrete. In lieu of this an epoxy adhesive may be provided. Finish placed concrete to match existing unless noted otherwise. Concrete shall provide a compressive strength 3,000 psi where installed to repair and/or match existing improvements, unless noted otherwise.
  4. Metal Fabrications: Items to remain exposed shall have their edges cut and ground smooth and rounded.
  5. Sheet Metal: Replace removed and/or damaged sheet metal items as required for new Work.

6. Lath and Plaster: Install new lath materials to match existing and fasten to supports at 6”centers. Provide a 6” lap where new lath to adjoins existing lath. Fasten new lath as required for new Work. Restore paper backings as required. Apply a bonding agent on cut edges of existing plaster. Apply three coat plaster of the type, thickness, finish, texture, and color to match existing.
7. Gypsum Wallboard: Fasten cut edges of wallboard. Install patches with at least two opposite edges centered on supports and secure at 6” centers. Tape and finish joints and fastener heads. Patching shall be non-apparent when painted and/or finished.
8. Acoustical Ceilings: Comply with the requirements for new Work specified in related sections of the Contract Documents.
9. Resilient Flooring: Completely remove flooring and prepare substrate for new material.
10. Painting: Prepare areas to be patched, patch and paint as specified under related sections of the Contract Documents.

3.07 CLEANING

- A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged coverings to their original condition.

END OF SECTION

SECTION 01160

REQUEST FOR CLARIFICATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Procedure for requesting clarification of the intent of the Contract Documents.

1.02 RELATED SECTIONS

- A. Section 01005: Summary of the Work
- B. Section 01100: Coordination
- C. Section 01365: Construction Schedule
- D. Section 01700: Contract Closeout

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.01 PROCEDURE

- A. ARCHITECT response is a clarification of the intent of the Contract Documents and does not authorize changes in the Contract Amount, Milestones and/or Contract Time.
- B. A Request for Clarification may be returned with a stamp or notation "Not Reviewed," if:
  - 1. The requested clarification is ambiguous or unclear;
  - 2. The requested clarification is equally available to the requesting party by researching and/or examining the Contract Documents;
  - 3. CONTRACTOR has not reviewed the Request for Clarification prior to submittal.
- C. Allow a minimum of nine (9) days for review and response time, after receipt by ARCHITECT and OAR. CONTRACTOR shall verify and is responsible in verifying ARCHITECT and OAR receipt of a Request for Clarification.
- D. Changes or alterations to the approved drawings or specifications shall be made by means of addenda or change orders as per section 4-338 of the California Building Standards Administrative Code.

END OF SECTION

## SECTION 01200

### PROJECT MEETINGS

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. This Section specifies administrative and procedural requirements for Project meetings, including but not limited to, the following:
  - 1. Job start meeting.
  - 2. Pre-installation conferences.
  - 3. Progress meetings.
  - 4. Meetings as required by the OAR.

##### 1.02 RELATED SECTIONS

- A. Section 01010: Phasing of the Work
- B. Section 01100: Coordination
- C. Section 01300: Submittals
- D. Section 01365: Construction Schedule

#### PART 2 – PRODUCTS

#### PART 3 - EXECUTION

##### 3.01 JOB START MEETING

- A. In accordance with General Condition Article 2.6, OAR will schedule a job start meeting before starting the Work, at a time and date determined by OAR. Meeting shall be held at the Project site or another location as determined by OAR. Meeting will be held in order to review responsibilities, procedures, and other administrative requirements contained within the Contract Documents.
- B. Authorized representatives of OWNER, IOR, ARCHITECT, CONTRACTOR and other parties shall attend the meeting. All participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work.
- C. Agenda items shall include significant items which could affect progress of the Work, including, but not limited to the following:
  - 1. Preliminary Construction Schedule
  - 2. Critical work sequencing

3. Designation of responsible personnel
4. Identification of OAR
5. Procedures for processing field decisions
6. Request for Proposal
7. Construction Directive and Change Order
8. Procedures for processing Applications for Payment
9. Prevailing wages
10. Submittal of Shop Drawings, Product Data, material lists, and Samples
11. Preparation of project record documents
12. Use of the Project site and/or premises
13. Parking availability
14. Office, work, and storage areas
15. Equipment deliveries and priorities
16. Safety procedures
17. First Aid
18. Security
19. Housekeeping
20. Working hours
21. Contract Compliance Officer
22. Insurance Services including OCIP
23. Environmental Health & Safety

- D. OAR shall prepare and issue meeting minutes to attendees and interested parties no later than five (5) calendar days after the meeting date.

### 3.02 PRE-INSTALLATION CONFERENCES

- A. CONTRACTOR shall coordinate and conduct pre-installation conferences at the Project site as required by related Sections of the Contract Documents.
- B. CONTRACTOR, manufacturers, and fabricators involved in or affected by the installation and its coordination or integration with other pre-ceding and/or subsequent installations of Work shall attend the meeting. CONTRACTOR shall advise OAR, IOR, and ARCHITECT of scheduled meeting dates in order to secure their attendance.
1. CONTRACTOR shall review the progress of construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for the following:
    - a. Contract Documents
    - b. Options
    - c. Related Construction Directives and Change Orders
    - d. Purchases
    - e. Deliveries
    - f. Shop Drawings, Product Data, and quality-control samples



- g. Review of mockups
- h. Possible conflicts
- i. Compatibility problems
- j. Time schedules
- k. Weather limitations
- l. Manufacturer's recommendations
- m. Warranty requirements
- n. Compatibility of materials
- o. Acceptability of substrates
- p. Temporary facilities
- q. Space and access limitations
- r. Governing regulations
- s. Safety
- t. Inspecting and testing requirements
- u. Required performance results
- v. Recording requirements
- w. Protection

- 2. CONTRACTOR shall record significant discussions and directives received from each conference. CONTRACTOR shall, within three (3) calendar days after the meeting date, distribute the minutes of the meeting to all concerned parties, including but not limited to, OAR, IOR, and ARCHITECT.

### 3.03 PROGRESS MEETINGS

- A. Progress meetings will be held at the Project site at regular intervals, typically weekly, as determined by the OAR.
- B. In addition to representatives of CONTRACTOR, OWNER, and ARCHITECT, each Subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of the Work shall, if requested by OAR, be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude all matters relating to the Work.
- C. Failure of the CONTRACTOR to be so represented at any progress meeting which is held at a mutually agreed time or for which a written notice is given, shall not relieve CONTRACTOR from abiding by any and all OAR or ARCHITECT determinations or directives issued at such meeting.
- D. OAR will review and correct or approve minutes of the previous progress meeting and will review other significant items affecting progress. Topics for discussion as appropriate to the status of the Project include but are not limited to:
  - 1. Interface requirements

2. Construction Schedule
3. Sequence and coordination
4. Status of submittals / RFC's
5. Deliveries
6. Off-site fabrication
7. Access
8. Site utilization
9. Temporary Construction Facilities and Controls
10. Hours of work
11. Hazards and risks
12. Housekeeping
13. Quality and workmanship
14. Unforeseen conditions
15. Testing and Inspection
16. defective Work
17. Construction Directive
18. Request for Proposal
19. Change Order Proposals and Change Orders
20. Documentation of information for payment requests
21. Application for Payment
22. Other items as required or as brought forth.

E. No later than three (3) calendar days after each progress meeting, OAR will prepare and distribute minutes of the meeting to each present and absent party. Include a brief summary, in narrative form, of progress, decisions, directives, actions taken, and all other issues since the previous meeting and report.

1. Schedule Updating: If required, CONTRACTOR shall revise the Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the next scheduled progress meeting.

#### 3.04 ADDITIONAL MEETINGS

A. OAR, upon giving notice to the intended parties and without further obligation, may require additional meetings to discuss Work and/or Project related activities.

END OF SECTION

## SECTION 01300

### SUBMITTALS

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Administrative and procedural requirements for submittals required for the Work, including but not limited to; Shop Drawings, Product Data, Samples, material lists, and quality control items as required by the Contract Documents.
- B. Wherever possible, throughout the Contract Documents, the minimum acceptable quality of workmanship and products has been defined by the name and catalog number of a manufacturer and by reference of recognized industry standards.
- C. To ensure that specified products are furnished and installed in accordance with the design intent, procedures have been established for submittal of design data and for its review by ARCHITECT, OAR and/or others.

##### 1.02 RELATED SECTIONS

- A. Section 01100: Coordination
- B. Section 01120: Cutting and Patching
- C. Section 01365: Construction Schedule
- D. Section 01640: Substitutions
- E. Section 01700: Contract Closeout
- F. Section 01740: Warranties

#### PART 2 – PRODUCTS

#### PART 3 - EXECUTION

##### 3.01 PROCEDURES

- A. CONTRACTOR shall package each submittal appropriately for transmittal and handling. CONTRACTOR shall transmit each submittal to ARCHITECT with concurrent copy of the transmittal to the OAR. ARCHITECT and/or OAR will not accept submittals received from sources other than from CONTRACTOR.
- B. After ARCHITECT review, ARCHITECT will transmit submittals to OAR and OAR shall further distribute to CONTRACTOR, IOR and/or others as required. Work shall not commence, unless otherwise approved by OAR, until approved submittals are transmitted to CONTRACTOR.

- C. CONTRACTOR shall clearly identify any deviations from the Contract Documents on each submittal. Any deviation not so noted even though stamped reviewed is not acceptable.
- D. CONTRACTOR shall coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities requiring sequential activity.
- E. Timing of Submittals:
  - 1. In accordance with General Conditions, CONTRACTOR shall submit to ARCHITECT, with copy of transmittal to the OAR, those Shop Drawings, Product Data, diagrams, materials lists, Samples and other submittals required by the Contract Documents.
  - 2. The schedule of submittals shall provide adequate time between submittals in order to allow for proper review without negative impact to the Construction Schedule.
  - 3. Schedule of submittals shall be related to Work progress, and shall be so organized as to allow sufficient time for transmitting, reviewing, corrections, resubmission, and re-reviewing.
  - 4. CONTRACTOR shall coordinate submittal of related items and ARCHITECT reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received by ARCHITECT.
  - 5. CONTRACTOR shall revise, update and submit submittal schedule to ARCHITECT and OAR on the first of each month, or as required by OAR.
  - 6. CONTRACTOR shall allow in the Construction Schedule, at least sixteen (16) days for ARCHITECT review following ARCHITECT receipt of submittal. For mechanical, plumbing, electrical, and other submittals requiring joint review with OAR, CONTRACTOR shall allow a minimum of eighteen (18) days following ARCHITECT receipt of submittal.
  - 7. No adjustments to the Contract Time and/or Milestones will be authorized because of a failure to transmit submittals to ARCHITECT sufficiently in advance of the Work to permit review and processing.
  - 8. In case of product substitution, Shop Drawing preparation shall not commence until such time ARCHITECT and OAR reviews said submittal relative to the General Conditions.

- G. If required, resubmit submittals in a timely manner. Resubmit as specified for initial submittal but identify as such. Review times for re-submitted items shall be as per the time frames for initial submittal review.
- H. Shop Drawing preparation shall not commence until such time as CONTRACTOR receives Product Data approval.
- I. ARCHITECT, or authorized agent, will stamp each submittal with a uniform, action stamp. ARCHITECT, or authorized agent, will mark the stamp appropriately to indicate the action taken, as follows:
  - 1. Final Unrestricted Release: When ARCHITECT, or authorized agent, marks a submittal “ Reviewed, “ the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
  - 2. Final-But-Restricted Release: When ARCHITECT, or authorized agent, marks a submittal “ Reviewed as Noted,“ the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
  - 3. Returned for Re-submittal: When ARCHITECT, or authorized agent, marks a submittal “ Rejected, Revise and Resubmit,“ do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat as necessary to obtain different action mark. In case of multiple submittals covering same items of Work, CONTRACTOR is responsible for any time delays, schedule disruptions, out of sequence Work, or additional costs due to multiple submissions of the same submittal item. Do not use, or allow others to use, submittals marked “Rejected, Revise and Resubmit” at the Project site or elsewhere where Work is in progress.
  - 4. Other Action: Where a submittal is for information or record purposes or special processing or other activity, the ARCHITECT, or authorized agent, will return the submittal marked “Action Not Required “.

### 3.02 SHOP DRAWINGS

- A. Shop Drawings are original drawings prepared by CONTRACTOR, Subcontractor, supplier, or distributor illustrating some portion of Work by showing fabrication, layout, setting, or erection details. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings.

- B. Produce Shop Drawings to an accurate scale that is large enough to indicate all pertinent features and methods. Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 x 11 inches but no larger than 24 x 36 inches.
- C. Shop Drawings shall include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:
  - 1. Dimensions
  - 2. Identification of products and materials included by sheet and detail number.
  - 3. Compliance with specified standards.
  - 4. Notation of coordination requirements.
  - 5. Notation of dimensions established by field measurement.
- D. Provide a space of approximately 4 by 5 inches on the label or beside the title block on Shop Drawings to record CONTRACTOR and ARCHITECT review, and the action taken. Include the following information on the label for processing and recording action taken:
  - 1. Project name.
  - 2. Date.
  - 3. Name and address of ARCHITECT.
  - 4. Name and address of CONTRACTOR.
  - 5. Name and address of Subcontractor.
  - 6. Name and address of supplier.
  - 7. Name and address of manufacturer.
  - 8. Name and title of appropriate Specification section.
  - 9. Drawing number and detail references, as appropriate.
- E. Unless otherwise agreed to or indicated in individual Specification sections, submit a sufficient number to allow for adequate CONTRACTOR, Subcontractor, supplier, manufacturer and fabricators distribution plus two sets to be retained by ARCHITECT, one set to IOR and one set to OAR. .

### 3.03 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of Work or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, wiring diagrams, schedules, illustrations, or performance curves.
  - 1. Mark each copy to show or delineate pertinent materials, products, models, applicable choices, or options. Where Product Data includes information

on several products that are not required, clearly mark copies to indicate the applicable information. Include the following information:

- a. Manufacturer's printed recommendations.
- b. Compliance with trade association standards.
- c. Compliance with recognized testing agency standards.
- d. Application of testing agency labels and seals.
- e. Notation of dimensions verified by field measurement.
- f. Notation of coordination requirements.
- g. Notation of dimensions and required clearances.
- h. Indicate performance characteristics and capacities.
- i. Indicate wiring diagrams and controls.

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

C. Required Copies and Distribution: Same as denoted in sub - section 3.02, E.

### 3.04 SAMPLES

A. Procedure:

1. Submit Samples of sufficient size, quantity, cured and finished and physically identical to the proposed product or material. Samples include partial or full sections or range of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches denoting color, texture, and/or pattern.
  - a. Mount or display Samples in the manner to facilitate review of qualities indicated. Include the following:
    1. Specification section number and reference.
    2. Generic description of the Sample.
    3. Sampling source.
    4. Product name or name of manufacturer.
    5. Compliance with recognized standards.
    6. Availability and delivery time.
2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
  - a. Where variations in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three

- (3) multiple units that show the approximate limits of the variations.
  - b. Refer to other Specification sections for requirements for Samples that illustrate workmanship, fabrication techniques, assembly details, connections, operation, and similar construction characteristics.
  - c. Refer to other sections for Samples to be returned to CONTRACTOR for incorporation into the Work. Such Samples must be undamaged at time of installation. On the transmittal indicate special requests regarding disposition of Sample submittals.
  - d. Samples not incorporated into the Work, or otherwise not designated as OWNER property, remain the property of CONTRACTOR and shall be removed from the Project site prior to Substantial Completion.
- 3. Color and Pattern: Whenever a choice of color or pattern is available in a specified product, submit accurate color chips and pattern charts to OAR for review and selection.
- 4. Number Required: Submit 5 of each. Two will be returned to CONTRACTOR with one to ARCHITECT, OAR, and IOR.
- B. When specified, erect field Samples and mock-ups at the Project site to illustrate products, materials, or workmanship and to establish standards by which completed Work shall be judged.
- C. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of the Work. Sample sets may be used to obtain final acceptance of the Work associated with each set.

### 3.05 QUALITY CONTROL SUBMITTALS

- A. Submit quality control submittals, including design data, certifications, manufacturer's field reports, and other quality control submittals as required under other sections of the Contract Documents.
- B. When other sections of the Contract Documents require manufacturer's certification of a product, material, and/or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.



- C. Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the represented company.
- D. Requirements for submittal of inspection and test reports are specified in other sections of the Contract Documents.

END OF SECTION

## SECTION 01340

### CONSTRUCTION & DEMOLITION WASTE MANAGEMENT

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Section Includes:

1. Preparation and implementation, including reporting and documentation, of a Waste Management Plan for reusing, recycling, salvage or disposal of non-hazardous waste materials generated during demolition and/or new construction (Construction & Demolition (C&D) Waste), to foster material recovery and reuse and to minimize disposal in land fills.

###### B. Related Sections

1. Section 01300: Submittals
2. Section 01500: Construction Facilities and Temporary Controls
3. Section 01700: Contract Closeout

##### 1.02 REFERENCES

- A. California Integrated Waste Management Act of 1989 (AB 939)
- B. California Code of Regulations Title 14, Section 18700 et seq.

##### 1.03 SYSTEM DESCRIPTION

- A. Collection and separation of all C&D waste materials generated on-site, reuse or recycling on-site, transportation to approved recyclers or reuse organizations, or transportation to legally designated landfills, for the purpose of recycling salvaging and/or reusing a minimum of 75% of the C&D waste generated.

##### 1.04 SUBMITTALS

- A. C&D Waste Management Plan (Exhibit 1): Within 10 calendar days after the Notice to Proceed and prior to any waste removal, submit the following to the OAR for review and approval. Update quarterly. Include:
  1. Materials to be recycled, reused, or salvaged, either onsite or offsite.
  2. Estimates of C&D waste quantity (in tons) by type of material. (If waste is measured by volume, give factors for conversion to weight in tons.)
  3. Procedures for recycling/ reuse program.
  4. Permit or license and location of Project waste-disposal areas.
  5. Site plan for placement of waste containers.

- B. C&D Waste Management Monthly Progress Report (Exhibit 2): Summary of waste generated by Project, monthly with Application for Payment. Include:
  - 1. Firms accepting the recovered or waste materials.
  - 2. Type and location of accepting facilities (landfill, recovery facility, used materials yard, etc.). If materials are reused or recycled on the Project site, location should be designated as “on-site reuse / recycling”.
  - 3. Type of materials and net weight (tons) of each.
  - 4. Value of the materials or disposal fee paid.
  - 5. Attach weigh bills and other documentation confirming amount and disposal location of waste materials.
- C. C&D Waste Management Final Compliance Report: Final update of Waste Management Plan to provide summary of total waste generated by Project.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.01 IMPLEMENTATION

- A. Implement approved Waste Management Plan including collecting, segregating, storing, transporting and documenting each type of waste material generated, recycled or reused, or disposed in landfills.
- B. Designate an on-site person to be responsible for instructing workers and overseeing the sorting and recording of waste/ recyclable materials.
- C. Include waste management and recycling in worker orientation and as an agenda item for regular Project meetings.
- D. Recyclable and waste bin areas shall be limited to areas approved on the Waste Management Plan. Keep recycling and waste bins neat and clearly marked to avoid contamination of materials.

3.02 ATTACHMENTS

- A. Exhibit 1: Waste Management Plan
- B. Exhibit 2: Waste Management Monthly Progress Report.

# EXHIBIT 1

## WASTE MANAGEMENT PLAN CONSTRUCTION/ MAINTENANCE/ALTERATION & DEMOLITION PROJECTS

**PROJECT NAME:** NEW RELOCATABLE CLASSROOMS, NEW RESTROOM BUILDING AND NEW CHILD CARE CENTER  
**PROJECT NO:** «Project Number»  
**NAME OF COMPANY:** \_\_\_\_\_  
**CONTACT PERSON:** \_\_\_\_\_  
**TELEPHONE:** \_\_\_\_\_  
**PROJECT SITE LOCATION:** \_\_\_\_\_  
**PROJECT TYPE:**       NEW CONSTRUCTION       DEMOLITION  
                                   MAINTENANCE/ALTERATION PROJECTS  
**PROJECT SIZE (SQ. FT.):** \_\_\_\_\_  
**DATE & ESTIMATED PERIOD** \_\_\_\_\_

(1) Material Type	(2) Tons Estimated Recycle	(3) Tons Estimated Reuse	(4) Tons Estimated Salvage	(5) Tons Estimated Landfill	(6) Proposed Disposal or Recycling Facility (e.g., Onsite, Name of Facility)
<b>Total</b>					
<b>Diversion Rate: Columns [(2)+(3)+(4)] / [(2)+(3)+(4)+(5)]</b>					=

Signature	Title	Date
-----------	-------	------

- Column 1      "Material Types" – Enter type of materials targeted for recycling, reuse, and/or salvage, either on- or off-site, and include a category for waste materials requiring disposal.
- Columns 2 thru 4      "Estimated Generation" - Enter estimated quantities (tons) of recyclable, reusable, or salvageable waste materials anticipated to be generated and state number of salvageable items.
- Column 5      "Estimated Landfill" - Enter quantities (tons) of materials to be disposed in landfill.
- Column 4      "Disposal Location" - Enter end-destination of recycled, salvaged, and disposed materials.
- General :      (1) Attach proposed Recycling & Waste Bin Location Plan.

(2) Attach name and contact data for each recycling or disposal destination to be used.

## EXHIBIT 2

### WASTE MANAGEMENT PROGRESS REPORT CONSTRUCTION/ MAINTENANCE/ALTERATION & DEMOLITION PROJECTS

PROJECT NAME: «PROJECTTITLE» «CONTRACTTITLE»  
 PROJECT NO: «Project Number»  
 NAME OF COMPANY: \_\_\_\_\_  
 CONTACT PERSON: \_\_\_\_\_  
 TELEPHONE: \_\_\_\_\_  
 PROJECT SITE LOCATION: \_\_\_\_\_  
 PROJECT TYPE:  NEW CONSTRUCTION     DEMOLITION  
                            MAINTENANCE/ALTERATION PROJECTS  
 PROJECT SIZE (SQ. FT.): \_\_\_\_\_  
 PERIOD \_\_\_\_\_ to \_\_\_\_\_

(1) Material Type	(2) Tons Actual Recycle	(3) Tons Actual Reuse	(4) Tons Actual Salvage	(5) Tons Actual Landfill	(6) Disposal or Recycling Facility (e.g., Onsite, Name of Facility)
<b>Total</b>					
<b>Diversion Rate: Columns [(2)+(3)+(4)] / [(2)+(3)+(4)+(5)]</b>					<b>=</b>

Signature	Title	Date
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- Column 1 "Material Types" – Enter type of materials targeted for recycling, reuse, and/or salvage, either on- or off-site, and include a category for waste materials requiring disposal.
- Columns 2 thru 4 "Estimated Generation" - Enter estimated quantities (tons) of recyclable, reusable, or salvageable waste materials anticipated to be generated and state number of salvageable items.
- Column 5 "Estimated Landfill" - Enter quantities (tons) of materials disposed.
- Column 4 "Disposal Location" - Enter end-destination of recycled, salvaged, and disposed materials.
- General :
- (1) Attach proposed Recycling & Waste Bin Location Plan.
  - (2) Attach name and contact data for each recycling or disposal destination to be used.

END OF SECTION

## SECTION 01365

### CONSTRUCTION SCHEDULE

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Construction Schedule procedures, preparation, submittal, updates, and revisions.

##### 1.02 RELATED SECTIONS

- A. Section 01005: Summary of the Work
- B. Section 01300: Submittals.
- C. Section 01700: Contract Closeout.

##### 1.03 PROCEDURES

- A. Within 7 calendar days after date of Notice to Proceed, CONTRACTOR shall submit to OWNER for review, a detailed Construction Schedule setting forth all requirements for complete execution of the Work.
- B. Seven (7) calendar days after receipt of the OWNER'S review comments, submit a final Construction Schedule acceptable to OWNER.
- C. If a Construction Schedule is considered by OWNER to not be in compliance with any requirement of the Contract, CONTRACTOR will be notified to review and revise the Construction Schedule and bring it into compliance. Failure of CONTRACTOR to submit a Construction Schedule in full compliance with the Contract Documents will result in a delay in progress payment processing. The Construction Schedule is to be used in evaluating progress for payment approval.
- D. Subsequently with each Progress Payment Request, CONTRACTOR shall deliver to OWNER an updated Construction Schedule reflecting Work progress to the end of the Progress Payment Request period. Each such Construction Schedule shall indicate actual progress to date in execution of the Work, together with a projected schedule for completion of all the Work.
- E. All schedule submittals are subject to review and acceptance by OWNER. OWNER retains the right to withhold progress payments until CONTRACTOR submits a Construction Schedule acceptable to OWNER.

- F. Concurrent with OWNER'S acceptance of CONTRACTOR'S submitted Construction Schedule, shall be CONTRACTOR'S signature of acceptance.

1.04 SCHEDULE SUBMITTAL PREPARATION GUIDELINES

- A. The Contract Work shall be scheduled and progress monitored using a Critical Path Method (CPM) network type scheduling system. Schedule shall be broken into sub-activities which shall, as a minimum, include major suppliers, all submittal approvals, all major trades, plumbing, mechanical, electrical, security, fire, and elevators/escalators. Scheduling system shall indicate all inter-relationships between trades and suppliers.
- B. Construction Schedule shall represent a practical plan to complete the Work within the Contract time requirement.
  - 1. A schedule extending beyond Contract time or less than Contract time will not be acceptable.
  - 2. A schedule found unacceptable by OWNER shall be revised by CONTRACTOR and resubmitted.
- C. Construction schedule shall clearly indicate sequence of construction activities, grouped by applicable phase and sorted by areas, buildings, or facilities within phase, and shall specifically indicate:
  - 1. Start and completion of all Work items, their major components, and interim milestone completion dates, as determined by CONTRACTOR and OWNER.
  - 2. Activities for procurement, delivery, installation of equipment, materials, and other supplies, including:
    - a. Time for submittals, resubmittals, and reviews. Include decision dates for selection of finishes.
    - b. Time for manufactured products for the Work fabrication and delivery.
    - c. Interdependence of procurement and construction activities.
    - d. As applicable, dates for testing, balancing equipment, and final inspection.



- D. Schedule shall be in sufficient detail to assure adequate planning and execution of the Work.
1. Each task activity shall range in duration from a 1 workday minimum to a 15 workday maximum and shall be total of actual days required for completion. The activity duration shall not include consideration of weather impact on completion of that activity.
  2. Schedule shall be suitable, in judgment of OWNER, to allow monitoring and evaluation of progress in performance of the Work; it shall be calendar time-scaled.
  3. Activities shall include:
    - a. Description; what is to be accomplished and where.
    - b. Workday duration.
    - c. Scheduled activities shall indicate continuous flow, from left to right.
  4. CONTRACTOR shall setup up the schedule calendar to identify workdays per week and shifts per day worked, non-work days, weekends and holidays.
- E. Failure to include any element of Work required for performance of this Contract shall not excuse CONTRACTOR from completing Work required to comply with the Contract Documents, notwithstanding acceptance of Construction Schedule.
- F. Submittal of Construction Schedule shall be understood to be CONTRACTOR'S confirmation that the schedule meets requirements of the Contract Documents, and that the Work will be executed in sequence indicated in schedule.

1.05 REVIEWS, UPDATES, AND REVISIONS

- A. OWNER will review and return the initial submittal of CONTRACTOR'S Construction Schedule, with summary comments, within 7 calendar days. If revisions are required, CONTRACTOR shall resubmit Schedule within 7 calendar days following receipt of OWNER'S comments.
- B. CONTRACTOR shall analyze and update the Project Construction Schedule:
1. As part of monthly payment application, CONTRACTOR shall submit to and participate with OWNER in a schedule review to include:
    - a. Actual start dates for Work items started during report period.

- b. The percent (%) complete on activities that have actual start dates.
  - c. Actual completion dates for Work items completed during report period.
  - d. Estimated remaining duration for Work items in progress, which will not exceed original duration for activity.
  - e. Estimated start dates for Work items scheduled to start during month following report period, if applicable.
  - f. Changes in duration of Work items.
2. In case of a change to CONTRACTOR'S planned sequence of Work, CONTRACTOR shall include a narrative report with updated progress schedule which shall include, but not be limited to, a description of problem areas, current and anticipated delaying factors, and any proposed revisions for a recovery plan.
  3. All Change Orders affecting the schedule shall be clearly identified as separate and new activities integrated into the schedule at the appropriate time and in the appropriate sequence as reviewed and approved by OWNER.
  4. The Project Construction Schedule Review will not relieve CONTRACTOR of responsibility for accomplishing all Work in accordance with the Contract Documents.
- D. Updates: CONTRACTOR shall submit to OWNER, with each payment application, an up-to-date Project Construction Schedule to include following:
1. Work Item Report: Detailing Work items and dependencies as indicated on the Schedule.
  2. Separate listing of activities completed during reporting period.
  3. Separate listing of activities which are currently in progress, indicating their remaining duration and percentages completed.
  4. Separate listing of activities which are causing delay in Work progress.
- E. Scheduling of change or extra Work orders is responsibility of CONTRACTOR.
1. CONTRACTOR shall revise the Project Construction Schedule to incorporate all activities involved in completing change orders or extra Work orders and submit it to OWNER for review.

- F. If OWNER finds CONTRACTOR is entitled to extension of any completion date, under provisions of the Contract, OWNER'S determination of total number of days of extension will be based upon an analysis of the current Project Construction Schedule, and upon data relevant to the extension.
- G. CONTRACTOR acknowledges and agrees that delays to non-critical activities will not be considered a basis for a time extension unless activities become critical. Non-critical activities are those activities which, when delayed, do not affect an interim or Substantial Completion date.
- H. Any claim for extension of time shall be made in writing to OWNER not more than 7 days after commencement of delay; otherwise, it shall be deemed waived for all purposes. CONTRACTOR shall provide an estimate of the probable effect of such a delay on progress of Work as part of claim.

1.06 CONTRACTOR'S RESPONSIBILITY

- A. Nothing in these requirements shall be deemed to be an usurpation of CONTRACTOR'S authority and responsibility to plan and schedule Work as CONTRACTOR sees fit, subject to all other requirements of Contract Documents.
- B. CONTRACTOR shall provide at all times sufficient competent labor, materials, and equipment to properly carry on Work and to insure completion of each part in accordance with Construction Schedule and within time agreed.
- C. CONTRACTOR shall be responsible for ensuring that all submittals to the OWNER are accurate and consistent. Damage, including extra time and cost, caused by inaccuracies from CONTRACTOR will be compensated by CONTRACTOR.

1.07 SUSPENSION OF PAYMENTS

- A. Initial Submittal: If CONTRACTOR fails to comply with the specified requirements, OWNER reserves the right to engage an independent scheduling consultant to fulfill these requirements. Upon additional notice to CONTRACTOR, OWNER shall retain against CONTRACTOR all incurred costs for additional services.
- B. Update Submittals: OWNER has the right to withhold progress payments if CONTRACTOR fails to update and submit the Project Construction Schedule and reports as required by OWNER.

1.08 RECORD COPY

- A. Prior to the Contract Completion, CONTRACTOR shall submit the Project Construction Schedule showing the as-built sequence. The as-built schedule shall have all activities with actual start and end dates.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01420

TESTING AND INSPECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Testing and inspection services to meet requirements of the California Building Code (CBC), Title 24, Parts 1 and 2, as indicated on the Drawings.
- B. One or more DSA certified inspectors employed by the OWNER in accordance with the requirements of California Building Standards Administrative Code will be assigned to the Work with their duties as specifically defined in Section 4-333(b).
- C. Tests of materials are required by a DSA certified testing agency as set forth in Section 4-335 of the California Building Standards Administrative Code.

1.02 RELATED SECTIONS

- A. Section 01120: Cutting and Patching
- B. Section 01300: Submittals
- C. Section 01365: Construction Schedule
- E. Section 01600: Materials and Equipment
- F. Section 01700: Contract Closeout
- G. Section 01740: Warranties

PART 2 – PRODUCTS (Not applicable)

PART 3 – EXECUTION

3.01 TESTS

- A. OWNER will select an independent testing agency to conduct tests, sampling, and testing of materials. Selection of material to be tested shall be by the agency and not by CONTRACTOR.
- B. Any material shipped from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from IOR such testing and inspection is not required shall not be incorporated into the Work.
- C. OWNER will select and directly reimburse testing agency the costs for all DSA and/or DSA required tests and inspections, but may be reimbursed by

CONTRACTOR for such costs as noted in related sections of the Contract Documents.

- D. The independent testing agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work. The agency shall not perform any duties of CONTRACTOR.

### 3.02 TEST REPORTS

- A. Test reports shall include all tests performed, regardless of whether such tests indicate the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Records of special sampling operations as required shall also be reported. Reports shall indicate the material or materials were sampled and tested in accordance with requirements of CBC, Title 24, Parts 1 and 2, as indicated on the Drawings. Test reports shall indicate specified design strength. They shall also definitely state whether or not material or materials tested comply with the specified requirements.

### 3.03 VERIFICATION OF TEST REPORTS

- A. Each testing agency shall submit to the Division of the State Architect a verified report in duplicate covering tests which are required to be performed by that agency during progress of the Work. Such report shall be furnished each time construction on the Work is suspended, covering tests up to that time, and prior to Final Completion of the Work, covering all tests.

### 3.04 INSPECTION BY OWNER

- A. OWNER and its representatives shall at all times have access, for purpose of inspection, to all parts of the Work and to shops wherein the Work is in preparation, and CONTRACTOR shall at all times maintain proper facilities and provide safe access for such inspection.
- B. OAR shall have the right to reject materials and/or workmanship deemed defective Work, and to require correction. Defective workmanship shall be corrected in a satisfactory manner and defective materials shall be removed from the premises and legally disposed of, all without charge to OWNER. If CONTRACTOR does not correct such defective Work within a reasonable time, fixed by written notice and in accordance with the terms and conditions of the Contract Documents, OWNER may correct such defective Work and proceed in accordance with related Articles of the Contract Documents.
- C. CONTRACTOR is responsible for compliance to all applicable local, state, and federal regulations regarding codes, regulations, ordinances, restrictions, and requirements.

3.05 INSPECTOR OF RECORD

- A. Inspector of Record is employed by OWNER in accordance with requirements of Title 24 of the California Code of Regulations with their duties specifically defined therein.
- B. Inspection of Work shall not relieve CONTRACTOR from any obligation to fulfill all of the terms and conditions of the Contract Documents.
- C. CONTRACTOR shall be responsible for scheduling times of inspection, tests, sample taking, and similar activities of the Work.

3.06 TESTS AND INSPECTIONS

The following tests and inspections do not limit inspection of the Work but are required by DSA, other agencies, or are required in related Sections of the Contract Documents.

- A. Concrete - CBC, Chapter 19A:
  - 3. Inspection:
    - a. Project Site Inspection 1905A.1
    - b. Post-installed anchors in concrete 1916A.7
- B. Wood - CBC, Chapter 23A:
  - 1. Materials:
    - a. Lumber and Plywood Grading 2303.1, 2304

END OF SECTION

## SECTION 01500

### CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Temporary utilities, construction facilities and controls to be provided, maintained, relocated, and removed by the CONTRACTOR

##### 1.02 RELATED SECTIONS

- A. Section 01005: Summary of the Work
- B. Section 01010: Phasing of the Work
- C. Section 01050: Schedule of Values
- D. Section 01365: Construction Schedule
- E. Section 01700: Contract Closeout

#### PART 2 - PRODUCTS

#### PART 3 - EXECUTION

##### 3.01 QUALITY ASSURANCE

- A. CONTRACTOR shall comply with industry standards and with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
  - 1. Building Code requirements
  - 2. Division of State Architect – Comply with 2013 CFC Chapter 33.
  - 3. Health and safety regulations
  - 4. Utility company regulations
  - 5. Police, fire department and rescue squad requirements
  - 6. Environmental protection regulations

- B. CONTRACTOR shall arrange for the inspection and testing of each temporary utility prior to use. Obtain required certifications and permits and transmit to OAR.

##### 3.02 TEMPORARY UTILITIES

- A. CONTRACTOR shall submit to OAR reports of tests, inspections, meter readings and similar procedures performed on temporary utilities.



B. CONTRACTOR shall coordinate with the appropriate utility company to install temporary services. Where the utility company provides only partial service, CONTRACTOR shall provide and install the remainder with matching compatible materials and equipment.

C. Temporary Water:

1. CONTRACTOR when required shall furnish, install and pay for all necessary permits, inspections, move ins/out, temporary water lines, connections & fees, extensions and distribution, metering devices and use charges, deliveries/pick ups, rentals, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other miscellaneous items for the temporary water system, and upon Substantial Completion of the Work, removal of all such temporary water system devices and appurtenances.
2. CONTRACTOR when required shall provide and maintain temporary water service, including water distribution piping and outlet devices of the size and required flow rates in order to provide service to all areas of the Project site.
3. CONTRACTOR when required shall provide and pay for all potable water needed for construction and all other uses associated with the Work.
4. CONTRACTOR shall at their expense and without limitation, remove, extend and/or relocate temporary water systems as rapidly as required in order to provide for progress of the Work.

D. Temporary Electric:

1. CONTRACTOR when required shall furnish, install, maintain and pay for all necessary permits, inspections, temporary wiring, metering devices and use charges, move ins/outs, connections & fees, service, extension and distribution, deliveries/pickups, rentals, storage, transportation, taxes, labor, insurance, bonds, materials, equipment and all other required miscellaneous items for the temporary electric systems and upon Substantial Completion of Work, removal of all such temporary electric systems and appurtenances.
2. CONTRACTOR when required shall furnish, install, maintain, extend and distribute temporary electric area distribution boxes, so located that individual trades can obtain adequate power and artificial lighting, at all points required for the Work, for inspection and for safety.
3. CONTRACTOR when required shall provide temporary electric for construction, temporary facilities, and connections for construction

equipment requiring power or lighting, at all points required for the Work, for inspection and safety.

4. CONTRACTOR when required shall provide 20 foot candles minimum lighting levels inside building(s) and 5 foot candles outside for safety and security.
5. CONTRACTOR when required shall ensure welding equipment is supplied by electrical generators.
6. CONTRACTOR when required shall at their expense and without limitation remove, extend and/or relocate temporary electric systems as rapidly as required in order to provide for progress of the Work.

E. Temporary Heating, Ventilation and Air Conditioning:

1. CONTRACTOR shall furnish, install, maintain, and pay for all necessary permits, inspections, move ins/out, extensions and distribution, connections and fees, use charges, metering devices and use charges, equipment, rentals, deliveries/pick ups, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other required miscellaneous items for temporary heat and ventilation needed for proper installation of the Work and to protect materials and finishes from damage due to weather. Upon Substantial Completion of the Work, CONTRACTOR shall remove all such temporary heating and ventilating system devices and appurtenances.
2. CONTRACTOR shall provide, maintain and pay for all temporary ventilation of enclosed Work areas to cure materials, disperse humidity, remove fumes, and to prevent accumulation of dust, irritants, or gases.
3. CONTRACTOR shall maintain manufacturer required levels of room and/or space temperature, humidity and ventilation necessary to install products, materials and/or systems of the Work.
4. CONTRACTOR shall at their expense and without limitation, remove, extend and/or relocate temporary heating and ventilating systems as rapidly as required in order to provide for progress of the Work.

G. Temporary Telephone and Data:

1. CONTRACTOR shall furnish, install, maintain and pay for all necessary permits, inspections, move ins/outs, extensions and distribution, devices, connections and fees, use charges, rentals, deliveries/pickups, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other required miscellaneous items for temporary phone, data service and

distribution to Project site temporary offices as required by this Section and Section 01500, 3.03.

2. CONTRACTOR shall at their expense and without limitation, remove, extend and/or relocate temporary phone service and distribution as rapidly as required in order to provide for progress of the Work.
3. Upon Substantial Completion of the Work, CONTRACTOR shall remove all such temporary phone service, distribution, devices and appurtenances.

### 3.03 CONTRACTOR PROVIDED FACILITIES

- A. CONTRACTOR shall provide temporary offices, utilities, storage units, fencing, barricades, chutes, hoists, scaffolds, railings and other facilities or services as required. CONTRACTOR shall be responsible for providing, installation, maintenance, supplying, and all use charges for the items provided under Section 01500.
- B. At CONTRACTOR expense and without limitation remove and/or relocate temporary office(s) and related facilities as rapidly as required in order to provide for progress of the Work.
- C. Temporary Storage Units:
  1. CONTRACTOR shall provide secure and waterproof storage units for the temporary storage of furniture, equipment and other items requiring protection.
  2. Walls, roof and doors shall be a minimum of 16-gage steel with floors of 1" tongue and groove hardwood or 3/4" minimum exterior type plywood. The undercarriage shall be designed to accommodate forklift blades 42" to 60" long. There shall be doublewide swing out lockable doors at one end equipped with waterproof gaskets.
  3. CONTRACTOR shall be responsible for all delivery charges and will install the storage unit in an appropriate area.
  4. CONTRACTOR shall remove the storage unit from the Project site when the storage unit is no longer required for the Work or upon Substantial Completion of the Work.
  5. CONTRACTOR shall at their expense and without limitation remove and/or relocate storage units as rapidly as required in order to provide for progress of the Work.

D. Temporary Sanitary Facilities:

1. CONTRACTOR shall provide portable chemical toilet facilities. Quantity of portable chemical toilet facilities shall be based on total number of workers and shall be in accordance with CAL/OSHA standards.
2. Portable chemical toilet facilities shall be maintained with adequate supplies and in a clean and sanitary condition and shall be removed from the Project site upon Substantial Completion of the Work.
3. CONTRACTOR employees shall not use school toilet facilities.
4. At CONTRACTOR expense and without limitation remove and/or relocate portable chemical toilet facilities as rapidly as required in order to provide for progress of the Work.
5. CONTRACTOR will contain their breaks and lunch periods to the areas designated by OAR or any public area outside the Project site. CONTRACTOR shall provide a suitable container within the break/lunch area for the placement of trash. Areas used for break/lunch must be maintained clean and orderly. Once finish flooring has been installed in a particular area, no food or beverages will be permitted in that area.

E. Temporary Security Fence/Barricade:

1. CONTRACTOR shall install temporary Project site security barricade(s) as directed and coordinated with OAR as required for safety and as specified herein. New or used material may be furnished. Security of Project site and contents is a continuous obligation of CONTRACTOR.
2. Unless otherwise indicated or specified, security fence shall be constructed of 8'-0" high chain link fencing with a 8'-0" high windscreen. Space posts not to exceed 10'-0" on centers. Posts shall be of following nominal pipe dimensions: terminal, corner, and gatepost 2-1/2", line posts 2". Chain link fence shall be not less than #13 gage, 2" mesh, and in one width. Posts, fence and accessories shall be galvanized and as follows:
  - a. Shall be set in the earth a depth of 30" with soil firmly compacted around post, unless required otherwise in writing by OAR.
  - b. Fence fabric shall be attached to posts with #14 gage tie wire at 16" on centers. A #6 gage steel tension wire with turnbuckles shall be installed at top and bottom of barricade fencing. Wire tie fabric to tension wires at 18" centers.

- c. Windscreen shall be attached to fence fabric and steel tension wires at 18" centers with a minimum of #14 gage tie wire. Windscreen shall be maintained and all rips, tears, missing sections shall be corrected upon notification by OAR.
- d. Chain link fencing shall be free from barbs, icicles or other projections resulting from galvanizing process. Fence having such defects will be replaced even if it has been installed.
- e. Gates shall be fabricated of steel pipe with welded corners, and bracing as required. Fence and fabric to be attached to frame at 12" centers. Provide all gate hardware of a strength and quality to perform satisfactorily until barricade is removed upon Substantial Completion of the Work. Each gate shall have a chain and padlock. Provide two (2) gate keys to OAR. At Substantial Completion of the Work, remove barricade from Project site, backfill and compact fence footing holes. Existing surface paving that is cut into or removed shall be patched and sealed to match surrounding areas.
- f. At CONTRACTOR expense and without limitation remove and/or relocate fencing, fabric and barricades or other security and protection facilities as rapidly as required in order to provide for progress of the Work.

F. Other Temporary Enclosures & Barricades:

- 1. Provide lockable, temporary weather-tight enclosures at openings in exterior walls to create acceptable working conditions, to allow for temporary heating and for security.
- 2. Provide protective barriers around trees, plants and other improvements designated to remain.
- 3. Temporary partitions shall be installed at all openings where additions connect to existing buildings, and where to protect areas, spaces, property, personnel, students and faculty and to separate and control dust, debris, noise, access, sight, fire areas, safety and security. Temporary partitions shall be directed and coordinated by OAR. At CONTRACTOR expense and without limitation remove and/or relocate enclosures, barriers and temporary partitions as rapidly as required in order to provide for progress of the Work.
- 4. Since the Work of this Project may be immediately adjacent to existing occupied structures and vehicular and pedestrian right of ways, CONTRACTOR shall, in his sole judgment and in accordance with applicable safety standards, provide all temporary facilities, additional

barricades, protection and care to protect existing structures, occupants, property, pedestrians and vehicular traffic. CONTRACTOR is responsible for any damage, which may occur to the property and occupants of the property of OWNER or adjacent private or public properties which in any way results from the acts or neglect of CONTRACTOR.

G. Temporary Storage Yards:

1. CONTRACTOR shall fence and maintain storage yards in an orderly manner.
2. Provide storage units for materials that cannot be stored outside.
3. At CONTRACTOR expense and without limitation remove and/or relocate storage yards and units as rapidly as required in order to provide for progress of the Work.

H. Temporary De-watering Facilities & Drainage:

1. For temporary drainage and de-watering facilities and operations not directly associated with construction activities included under individual sections, comply with de-watering requirements of applicable Division 01 sections. CONTRACTOR shall maintain the Work, Project site and related areas free of water.
2. For temporary drainage and de-watering facilities and operations directly associated with new buildings, additions or other construction activities, comply with Division 01 & 02 Sections. CONTRACTOR shall be responsible for, but not limited to, de-watering of excavations, trenches & below grade areas of buildings, structures, the Project site and related areas.

F. Temporary Protection Facilities Installation:

1. CONTRACTOR shall not change over from using temporary facilities and controls to permanent facilities until Substantial Completion, except as permitted by OAR
2. Until permanent fire protection needs are supplied and approved by authorities having jurisdiction, CONTRACTOR shall provide, install and maintain temporary fire protection facilities of the types needed in order to adequately protect against fire loss. CONTRACTOR shall adequately supervise welding operations, combustion type temporary heating and similar sources of fire ignition.
3. CONTRACTOR shall provide, install and maintain substantial temporary enclosures of partially completed areas of construction. Provide locking

entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security. Where materials, tools and equipment are stored within the Work area, CONTRACTOR shall provide secure lock up to protect against vandalism, theft and similar violations of security. OWNER accepts no financial responsibility for loss, damage, vandalism or theft.

4. CONTRACTOR operations shall not block, hinder, impede or otherwise inhibit the use of required exits and/or emergency exits to the public way, except as approved by the OAR. CONTRACTOR shall maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities and other access routes for fire fighting equipment and/or personnel.
5. With approval of OAR and at the earliest feasible date in each area of the Work, complete installation of the permanent fire protection facilities including connected services and place into operation and use.
6. In the event of an emergency drill or an actual emergency, designated by the sounding of the fire alarm and/or other sounding device, all construction activities must cease. CONTRACTOR shall evacuate the Work area and remain outside the Work area until permitted to return. No Work shall be conducted during the evacuation of a building or during an emergency.

J. Temporary Security and Safety Measures:

1. During performance of the Work in existing facilities CONTRACTOR shall provide, install and maintain substantial temporary barriers and/or partitions separating all Work areas from areas occupied by students, faculty and/or administrative staff.
2. During performance of the Work in existing facilities and/or on a Project site occupied by students and where temporary barriers and/or partitions are not physically feasible, CONTRACTOR shall provide an employee meeting the requirements of Education Code Section 45125.2.(2) to continually supervise and monitor all employees of the CONTRACTOR and Subcontractor. For the purposes of this Section, CONTRACTOR employee shall be someone whom the Department of Justice has ascertained has not been convicted of a violent or serious felony as listed in Penal Code Section 667.5(c) and/or Penal Code Section 1192.7(c). To comply with this Section, CONTRACTOR shall have his employee submit his or her fingerprints to the Department of Justice pursuant to Education Code Section 45125.1(a).
3. Penal Code Sections 290 and 290.4 commonly known as “Megan’s Law”, require, among other things, individuals convicted of

sexually oriented crimes, to register with the chief of police where the convicted individual resides or with a county sheriff or other law enforcement officials. The CONTRACTOR shall check it's own employees and require each Subcontractor to check it's employees and report to the CONTRACTOR if any such employees are registered sex offenders. The CONTRACTOR shall check monthly during the life of the Contract to ascertain this information and report same to OAR. Before starting the Work, and monthly thereafter during the life of Contract, CONTRACTOR shall notify the OWNER in writing if any of it's employees and/or if any Subcontractor's employees is a registered sex offender. If so, CONTRACTOR shall proceed in accordance with Section 3.03 M.2 above.

K. Temporary Access Roads and Staging Areas:

1. Due to the limited amount of on and off Project site space for the parking of staff and school visitor's vehicles there will be no parking of CONTRACTOR vehicles in areas designated for school use only. CONTRACTOR shall provide legal access to and maintain CONTRACTOR designated areas for the legal parking, loading, off-loading & delivery of all vehicles associated with the Work. CONTRACTOR shall be solely responsible for providing and maintaining these requirements whether on or off the Project site.
2. Temporary access roads are to be installed and maintained by CONTRACTOR to all areas of the Project site.
3. CONTRACTOR will be permitted to utilize existing facility campus roads as designated by OAR. CONTRACTOR shall only utilize those entrances and exits as designated by OAR and CONTRACTOR shall observe all traffic regulations of OWNER.
4. CONTRACTOR shall maintain roads and walkways in a clean condition including removal of debris and/or other deleterious material on a daily basis.

3.04 PROJECT SIGNAGE

- A. Until Substantial Completion of the Work, CONTRACTOR shall remove, as required, all graffiti from buildings, equipment, fences and all other temporary and/or permanent improvements on the Project site.
- B. CONTRACTOR shall provide and install signage to provide directional, identification, and contact information to construction personnel and visitors as follows and as reviewed by OAR.



1. For construction traffic control/flow at entrances/exits, and as designated by OAR.
2. To direct visitors.
3. For construction parking.
4. To direct deliveries.
5. For Warning Signs as required.
6. Per CAL/OSHA standards as necessary.
7. For trailer identification and Project site address.
8. For "No Smoking" safe work site at designated locations.
9. Emergency contact information and phone number of CONTRACTOR.
10. Emergency contact information and phone number of local police, fire, and emergency personnel.

### 3.05 TRENCHES

- A. Open trenches for installation of utility lines (water, gas, electrical and similar utilities) and open pits outside barricaded working areas shall be barricaded at all times in a legal manner determined by CONTRACTOR. Trenches shall be backfilled and patch-paved within twenty-four (24) hours after approval of installation by authorities having jurisdiction or shall have "trench plates" installed. Required access to buildings shall be provided and maintained. CONTRACTOR shall comply with all applicable statutes, codes & regulations regarding trenching and trenching operations. Open trenches deeper than 3'-6", and not located within a public street access, shall be enclosed within an 8'-0" high chain-link fence.

### 3.06 DUST CONTROL

- A. CONTRACTOR is responsible for dust control on and off the Project site. When Work operations produce dust the Project site and/or streets shall be sprinkled with water to minimize the generation of dust. CONTRACTOR shall clean all soils and debris from construction vehicles and cover both earth and debris loads prior to leaving the Project site. CONTRACTOR shall, on a daily basis, clean all streets and/or public improvements within the right of way of any and all debris, dirt, mud and/or other materials attributable to operations of CONTRACTOR.

### 3.07 WASH OUT

- A. CONTRACTOR shall provide and maintain a minimum of four (4) wash out boxes of sufficient size and strength to provide for concrete mixer wash out. CONTRACTOR shall locate and relocate both the wash out boxes and wash out areas in order to accommodate the progression of the Work. The wash out area shall be located as to minimize the amount of potential run off onto adjacent private and/or public property. CONTRACTOR shall legally dispose of the contents of the wash out boxes and area on an as needed basis or as required by OAR.

3.08 WASTE DISPOSAL

- A. CONTRACTOR shall provide and maintain trash bins on the Project site. Trash bins shall be serviced on an as needed basis and CONTRACTOR is responsible for the transportation of and the legal disposal of all contents.

3.09 ADVERSE WEATHER CONDITIONS

- A. Should warnings of adverse weather conditions such as heavy rain and/or high winds be forecasted, CONTRACTOR shall provide every practical precaution to prevent damage to the Work, Project site and adjacent property. CONTRACTOR precautions shall include, but not be limited to, enclosing all openings, removing and/or securing loose materials, tools, equipment and scaffolding.
- B. CONTRACTOR shall provide and maintain drainage away from buildings and structures.
- C. CONTRACTOR shall implement all required storm water mitigation measures as required under related Division 01 Sections.

3.10 DAILY REPORTS

- A. CONTRACTOR shall provide and maintain in the Project site office of CONTRACTOR, a daily sign in sheet for use by all employees of CONTRACTOR and all Subcontractors at whatever tier. At the beginning of each work day, the foreman, project manager, superintendent of CONTRACTOR and/or Subcontractors shall visit the site office of the CONTRACTOR and shall enter onto the daily sign in sheet: all employee names; trade classification; and represented company. The completed sign in sheet shall serve as the basis of and shall be submitted with the daily construction report as set forth in Section 3.10 B.
- B. By the end of each workday, CONTRACTOR shall submit to OAR and IOR a daily construction report denoting the daily manpower counts and a brief description/location of the workday activities. Manpower shall be broken down by trade classification such as foreman, journeyman or apprentice. The report shall also note the date, day of the week, weather conditions, deliveries, equipment on the Project site whether active and/or idle, visitors, inspections, accidents and unusual events, meetings, stoppages, losses, delays, shortages,

strikes, orders and requests of governing agencies, Construction Directive and/or Change Orders received and implemented, services disconnected and/or connected, equipment start up or tests and partial use and/or occupancies. CONTRACTOR shall also include on the daily construction report the above information for all Subcontractors at whatever tier.

### 3.11 FIELD OFFICE SUPPLIES

- A. CONTRACTOR shall provide the initial supply of field office supplies to the OAR in the quantities listed as set forth below in Table A. CONTRACTOR shall provide additional supplies as required by the OAR.
- B. CONTRACTOR may utilize different suppliers as the specified information is only to establish the required quantities and levels of quality.

Table A

ITEM	DESCRIPTION	UNIT	QUANTITY	SUPPLIER/ITEM NUMBER
Three Ring Binders – 3”	N/A	Each	{ SPECIFY }	Staples / 823526-54
Three Ring Binders – 2”	N/A	Each	{ SPECIFY }	Staples / 816199-54
Three Hole Punch	N/A	Each	{ SPECIFY }	Staples / 104695-54
Two Hole Punch	N/A	Each	{ SPECIFY }	Staples / 506261-54
File Organizer	N/A	Each	{ SPECIFY }	Staples / 120162-54
Calculator	MS80TE	Each	{ SPECIFY }	Staples / 425912-54
Computer Diskettes	3-1/2 DS-HD	25/Lot	{ SPECIFY }	Staples / 384385-64
Wastebasket	N/A	Each	{ SPECIFY }	Staples / 125039-54
Digital Camera	SONY MVC-100	Each	1	Staples / 479265-64
Cordless Phone with Answering Machine	ATT - 2255	Each	1	Staples / 475028-54
Surge Suppressors	N/A	Each	{ SPECIFY }	Staples / 481841-64
Flashlight	N/A	Each	{ SPECIFY }	Staples / 391655-54
Batteries	N/A	4/Lot	{ SPECIFY }	Staples / 318956-54
Clipboard	N/A	3/Lot	{ SPECIFY }	Staples / 450422-54
8” Cast Iron Shears	N/A	Each	{ SPECIFY }	Staples / 421040-54
First Aid Kit	N/A	Each	1	Staples / 503979-54
Journal	N/A	Each	{ SPECIFY }	Staples / 217695-54
Pens	N/A	12/Lot	{ SPECIFY }	Staples / 441884-64
Pencils	N/A	48/Lot	{ SPECIFY }	Staples / 711382-54
Pencil Sharpener	1900	1	{ SPECIFY }	Staples / 330250-54
Mouse Pad	N/A	Each	{ SPECIFY }	Staples / 382955-64
Date Received Stamp	N/A	Each	1	Staples / 920274-54
Colored Pencils	N/A	12/Lot	{ SPECIFY }	Staples / 317297-54
Markers	N/A	12/Lot	{ SPECIFY }	Staples / 479159-54
Telephone Message Book	N/A	Each	{ SPECIFY }	Staples / 256347-54
Wall Calendar	PM233-28	Each	{ SPECIFY }	Staples / 527861-54
Steno Pad	N/A	12/Lot	{ SPECIFY }	Staples / 163485-64
Legal Pad	N/A	12/Lot	{ SPECIFY }	Staples / 163865-64
Post Its	N/A	12/Lot	{ SPECIFY }	Staples / 130005-64
File Folders – 8-1/2x11	N/A	50/Lot	{ SPECIFY }	Staples / 831099-54
File Folders – 8-1/2x14	N/A	50/Lot	{ SPECIFY }	Staples / 831057-54
Tape / Dispenser	N/A	Each	{ SPECIFY }	Staples / 211540-54
Highlighters	N/A	12/Lot	{ SPECIFY }	Staples / 479156-54
Rubber Bands	N/A	Each	{ SPECIFY }	Staples / 363150-54

Push Pins	N/A	Each	{ SPECIFY }	Staples / 480118-54
Dry Erase Board	S537	Each	{ SPECIFY }	Staples / 518928-54
Binder Clip – Medium	N/A	24/Lot	{ SPECIFY }	Staples / 831602-54
Binder Clip - Large	N/A	12/Lot	{ SPECIFY }	Staples / 831610-54
Stapler	818	Each	{ SPECIFY }	Staples / 395059-54
3 Pocket Wall File	N/A	Each	{ SPECIFY }	Staples / 730523-54
Heavy Duty Stapler	415	Each	1	Staples / 386312-54
Heavy Duty Staples	SW1-35312	Each	1	Staples / 504191-54
Hanging File Folder	8-1/2 x 11	25/Lot	{ SPECIFY }	Staples / 116806-54
Hanging File Folder	8-1/2x14	25/Lot	{ SPECIFY }	Staples / 163352-54
File Folder Labels	5266	750/Lot	{ SPECIFY }	Staples / 287292-54
Fax Notes	N/A	12/Lot	{ SPECIFY }	Staples / 210625-64
Paper Clips	N/A	Each	{ SPECIFY }	Staples / 480108-54
Paper Clips	N/A	Each	{ SPECIFY }	Staples / 480109-54
Poster Kit - State	CA	Each	1	Staples / 378965-54
Poster Kit - Federal	US	Each	1	Staples / 935983-54
Broom	N/A	Each	1	Staples / 428881-54
Fire Extinguisher	First Alert	Each	{ SPECIFY }	Staples / 238774-54
Copy Paper	8-1/2 x 11	5000/Case	{ SPECIFY }	Staples / 122374-69
Copy Paper	8-1/2 x 14	500/Ream	{ SPECIFY }	Staples / 122598-69
Copy Paper	11 x 17	500/Ream	{ SPECIFY }	Staples / 238105-69

END OF SECTION

## SECTION 01600

### MATERIALS AND EQUIPMENT

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. This Section includes administrative and procedural requirements governing selection of products for incorporation into the Work.

##### 1.2 RELATED SECTIONS

- A. Section 01100: Coordination
- B. Section 01300: Submittals
- C. Section 01640: Substitutions
- D. Section 01740: Warranties

##### 1.3 DEFINITIONS

- A. Definitions used in this Section are not intended to change the meaning of other terms used in the Contract Documents, such as “specialties,” “systems,” “structure,” “finishes,” “accessories,” and other similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.
  - 1. “Products” are items purchased for incorporation into the Work, whether purchased for the Work or taken from previously purchased stock. The term “product” includes the terms “material” and “equipment” and terms of similar intent.
    - a. “Named Products,” are items identified by the manufacturer’s product name, including make, model number or other designation, shown or listed in the manufacturer’s published product literature, current as of the date of the Contract.
    - b. “Foreign Products,” as distinguished from “domestic products,” are items substantially manufactured (50 percent or more of value) outside the United States and its possessions. Products produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens of, nor living within, the United States and its possessions are also considered to be foreign products.

2. “Materials,” are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
3. “Equipment,” is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

#### 1.4 SUBMITTALS

- A. Material list: Prepare a list in tabular form acceptable to ARCHITECT and/or OAR showing proposed products. Include generic names. Include the manufacturer’s name and proprietary names for each item listed.
  1. Coordinate material list with the Construction Schedule and the submittal schedule.
  2. Form: Prepare material list with information on each item tabulated under the following column headings.
    - a. Related Specification Section number
    - b. Generic name used in Contract Documents
    - c. Proprietary name, model number, and similar designations
    - d. Manufacturer’s name and address
    - e. Supplier’s name and address
    - f. Installer’s name and address
    - g. Projected delivery date or time span of delivery period
  3. Initial Submittal: Within ten (10) days after execution of each subcontract agreement, as set forth in General Condition Article 6.25, submit three (3) copies of an initial material list to the ARCHITECT with a copy to the OAR. Provide a written explanation for omissions of data and for known variations from the Contract Documents.
  4. ARCHITECT Action: ARCHITECT will respond in writing to OAR within fourteen (14) days and OAR will forward response to CONTRACTOR within sixteen (16) days of receipt of the completed material list. No response outside this period constitutes no objection to listed items but does not constitute a waiver of the requirement that selected items comply with the Contract Documents. ARCHITECT response will include a list of unacceptable item selections, containing a brief explanation of reasons for this action.

#### 1.5 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.
  - 1. CONTRACTOR is to verify necessary lead times for all materials; however, when specified products are available only from sources that do not, or cannot, produce a quality adequate to complete Work in a timely manner, consult with the ARCHITECT to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing these qualities, to the fullest extent possible.
- B. Compatibility of Options: When the CONTRACTOR is given the option of selecting between two or more products for use in the Work, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
- C. Foreign Product Limitations: Except under one or more of the following conditions, provide domestic products, not foreign products, for inclusion into the Work:
  - 1. No available domestic product complies with the Contract Documents.
  - 2. Domestic products that comply with the Contract Documents are available only at prices or terms substantially higher than foreign products that comply with the Contract Documents.
- D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed in view in occupied spaces or on the exterior.
  - 1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
  - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
    - a. Name of product and manufacturer
    - b. Model and serial number
    - c. Capacity

- d. Speed
- e. Ratings

## 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
  - 1. Schedule delivery to minimize long-term storage at the Project site and to prevent overcrowding of Work spaces.
  - 2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  - 3. Deliver products to the Project site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  - 4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
  - 5. Store products at the Project site in a manner that will facilitate inspection and measurement of quantity or counting of units.
  - 6. Store heavy materials away from structures in a manner that will not endanger the structure's supporting construction.
  - 7. Store products subject to damage by the elements above ground, under cover in a weather-tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

## PART 2 - PRODUCTS

### 2.1 MATERIAL SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.



1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
  2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other Projects.
- B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:
1. Proprietary Specification Requirements: Where Specifications name only a single material or manufacturer, provide the product indicated. No substitutions will be permitted.
  2. Semi-proprietary Specification Requirements: Where Specifications name two or more products or manufacturers, provide one of the products indicated. No substitutions will be permitted.
    - a. Where Specifications specify products or manufacturers by name, accompanied by the term “or equal” comply with General Condition Article 6.14 to obtain approval for use of an unnamed product.
  3. Descriptive Specification Requirements: Where Specifications describe a product or assembly, list exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with the Contract Documents.
  4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.
    - a. Manufacturer’s recommendations may be contained in published material literature or by the manufacturer’s certification of performance.
  5. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes, or regulations specified.

6. Visual Matching: Where Specifications require matching an established Sample, decision of the ARCHITECT will be final on whether a proposed product matches satisfactorily.
7. Visual Selection: Where specified product requirements include the phrase "... as selected from manufacturer's standard or premium colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The ARCHITECT will select the color, pattern, and texture from the product line selected.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located, and aligned with other Work.
  1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration until Substantial Completion.

END OF SECTION

## SECTION 01640

### SUBSTITUTIONS

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. This Section includes administrative and procedural requirements for handling requests for substitutions submitted eleven (11) days or more after the date established in the Notice to Proceed.

##### 1.2 RELATED SECTIONS

- A. Section 01300: Submittals
- B. Section 01600: Materials and Equipment

#### PART 2 - PRODUCTS

#### PART 3 - EXECUTION

##### 3.1 APPLICATION

- A. CONTRACTOR proposed changes in products or materials required by the Contract Documents eleven (11) days or more after the date established in the Notice to Proceed, are considered to be requests for substitutions. OAR will consider requests for substitution if a product is no longer manufactured and/or cannot be acquired from existing inventories. The following are not considered to be valid requests for substitutions:
  - 1. Revisions to the Contract Documents requested by OAR or ARCHITECT.
  - 2. Specified options of products included in the Contract Documents.
  - 3. Substitutions requested on a “or equal” basis.

##### 3.2 SUBMITTALS

- A. Transmit submittals as described in related Sections for each request for substitution.
  - 1. Identify the product to be replaced in each request. Include related Specification Section and Drawing number.

2. Provide complete documentation denoting compliance with the requirements for substitutions, and the following information, as appropriate.
  - a. A detailed comparison of significant qualities of the proposed substitution with those specified in the Contract Documents. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.
  - b. Product Data, including Drawings, descriptions of products, fabrication, and installation procedures.
  - c. Samples, where applicable or requested.
  - d. CONTRACTOR certification the proposed substitution conforms to requirements of the Contract Documents in every respect and is appropriate for the applications indicated.
  - e. CONTRACTOR waiver of rights to an increase in the Contract Amount, Milestones and/or Contract Time that may subsequently become necessary because of the failure of the substitution to adequately perform.
3. If required, ARCHITECT will request additional information or documentation for evaluation. OAR will notify CONTRACTOR of acceptance or rejection of the substitution.
4. ARCHITECT will review and consider request for substitution and provide a recommendation to OAR
5. Where a proposed substitution involves and/or effects more than one Subcontractor, CONTRACTOR shall ensure each Subcontractor cooperates with the other Subcontractor involved to coordinate the Work, provide uniformity and consistency, and assure compatibility of all products.
6. CONTRACTOR submittal and ARCHITECT review of Shop Drawings, Product Data, material lists or Samples do not constitute an acceptable or valid request for substitution.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section includes administrative and procedural requirements for Contract Closeout, including but not limited to, the following:
  - 1. Inspection procedures.
  - 2. Project record documents submittal.
  - 3. Operation and maintenance manual submittal.
  - 4. OWNER orientation and instruction.
  - 5. Final cleaning.
- B. Closeout requirements for specific Work activities are included in the appropriate Sections in Divisions 01 through 16.

1.02 RELATED SECTIONS

- A. Section 01080: Application for Payment
- B. Section 01300: Submittals
- C. Section 01365: Construction Schedule
- E. Section 01500: Construction Facilities and Temporary Controls
- F. Section 01740: Warranties

PART 2 – PRODUCTS

PART 3 - EXECUTION

3.01 SUBSTANTIAL COMPLETION

- A. Inspection Procedures: On receipt of a request for a certificate of Substantial Completion, OAR will either authorize commencement of inspection or advise CONTRACTOR of unfilled requirements. IOR, OAR, CONTRACTOR and ARCHITECT will inspect the Work and IOR shall prepare a comprehensive punch list of items to be completed.
  - 1. IOR will repeat inspection when requested and assure the Work is complete.
  - 2. Results of the completed inspection will form a partial basis of the requirements for Final Completion.

- B. Re-inspection Procedures: IOR, OAR, CONTRACTOR and ARCHITECT will inspect the Work upon notice the Work, including final inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to OAR.
1. Upon completion of inspection, OAR will recommend Final Completion. If the Work is incomplete, OAR will advise CONTRACTOR of Work that is incomplete or of obligations that have not been fulfilled but are required for Final Completion.
  2. If necessary, re-inspection will be repeated, but may be assessed against CONTRACTOR if OWNER is subject to additional professional service and or additional costs of inspection.

### 3.02 PROJECT RECORD DOCUMENT SUBMITTAL

- A. General: Do not use project record documents for construction purposes. Protect record documents from deterioration and loss. Provide access to record documents for ARCHITECT, IOR and OAR reference during normal working hours. Project record document shall be updated on a weekly basis. Prior to submitting each application for payment, secure IOR and ARCHITECT approval of project record documents.
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line white prints of Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which Drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Drawings. Provide detailed and accurate field dimensions for concealed elements that would be difficult to measure and record at a later date.
1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Date and number entries in the same format as submitted. Call attention to entry by a “cloud” around the affected areas.
  2. Mark new information important to OWNER but was not shown on Drawings or Shop Drawings.
  3. Utility location and depth below finished grade and/or above ceilings and attic spaces shall be fully dimensioned and indicated on record drawings. Dimensions shall be measured from building lines or permanent landmarks and shall be triangulated to those features.

4. Note related Change Order or Construction Directive numbers where applicable. RFC submissions shall be referenced on each affected sheet, Drawing and/or Shop Drawing.
  5. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
  6. Prior to Final Completion of the Work, and review of the project record drawings by ARCHITECT, prepare a final set of project record drawings incorporating all mark ups and information noted. Provide a hardline drawing set of record drawings printed on reproducible white bond paper. Submit final set of Record Drawings to ARCHITECT.
- C. Record Specifications: Maintain two complete copies of the Specifications, including Addenda. Include with the Specifications two copies of other written Contract Documents, such as Change Orders and/or Construction Directives issued during construction.
1. Mark these record documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
  2. Give particular attention to substitutions and selection of options and information on concealed Work that cannot otherwise be readily discerned later by direct observation.
  3. Note related record document information with Product Data.
  4. Prior to Final Completion of the Work, submit record Specifications to ARCHITECT for OWNER records.
- D. Record Product Data: Maintain two copies of each Product Data submittal. Note related Change Orders and Construction Directives and mark-up of record drawings and Specifications.
1. Mark these documents to illustrate significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Project site and from the manufacturer's installation instructions and recommendations.
  2. Provide detailed and accurate information regarding concealed products and portions of Work that cannot otherwise be readily discerned later by direct observation.

3. Prior to Final Completion of the Work, submit complete set of record Product Data to the ARCHITECT for OWNER records.
- E. Record Samples: Immediately prior to Substantial Completion, CONTRACTOR shall meet with ARCHITECT and OAR at the Project site to determine which Samples are to be transmitted to OWNER for record purposes. Comply with OAR instructions regarding delivery to OWNER storage area.
- F. Miscellaneous Records: Refer to other Specification sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date of Final Completion, complete and compile miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to ARCHITECT for OWNER records.
- G. Maintenance Manuals: Prior to Substantial Completion, organize operation and maintenance data into suitable two sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-3", 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Submit to OAR for ARCHITECT and for OWNER records. Include the following types of information.
  1. Emergency instructions
  2. Spare parts list
  3. Copies of warranties
  4. Wiring diagrams
  5. Recommended "turn-around" cycles
  6. Inspection procedures
  7. Shop Drawings and Product Data
  8. Fixture lamping schedule
- H. Verified Reports: Construction progress of the Work shall be reported to DSA via a duly verified report as per Sections 4-336 and 4-343 of the California Building Standards Administrative Code.

### 3.03 CLOSEOUT PROCEDURES:

- A. Operation and Maintenance Instructions: Prior to Substantial Completion, arrange for each installer of equipment that requires regular operation and maintenance to meet with designated OWNER personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
  1. Maintenance manuals
  2. Record documents



3. Spare parts and materials
  4. Tools
  5. Lubricants
  6. Fuels
  7. Identification systems
  8. Control sequences
  9. Hazards
  10. Cleaning
  11. Warranties and bonds
  12. Maintenance agreements and similar continuing commitments
- B. As part of instruction for operating equipment, demonstrate the following procedures:
1. Start-up
  2. Shutdown
  3. Emergency operations
  4. Noise and vibration adjustments
  5. Safety procedures
  6. Economy and efficiency adjustments
  7. Effective energy utilization

#### 3.04 FINAL CLEANING

- A. General: Related sections of the Contract Documents specify general cleaning during performance of the Work. General cleaning is included in Division 01 Section "Construction Facilities and Temporary Controls".
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
1. Complete the following cleaning operations before requesting inspection for a certificate of Substantial Completion.
    - a. Remove labels that are not permanent labels.
    - b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
    - c. Clean exposed exterior and interior hard-surfaced finished to a dust-free condition, free of stains, films, and similar foreign

substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.

- d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
- e. Clean the Project site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

## END OF SECTION PART 1 - GENERAL

### 1.03 SECTION INCLUDES

- C. This Section includes administrative and procedural requirements for Contract Closeout, including but not limited to, the following:
  - 6. Inspection procedures.
  - 7. Project record documents submittal.
  - 8. Operation and maintenance manual submittal.
  - 9. OWNER orientation and instruction.
  - 10. Final cleaning.
- D. Closeout requirements for specific Work activities are included in the appropriate Sections in Divisions 01 through 16.

### 1.04 RELATED SECTIONS

- A. Section 01080: Application for Payment
- B. Section 01300: Submittals
- C. Section 01360: Construction Schedule
- D. Section 01450: Test and Balance
- E. Section 01500: Construction Facilities and Temporary Controls
- F. Section 01740: Warranties

## PART 2 – PRODUCTS

## PART 3 - EXECUTION

### 3.01 SUBSTANTIAL COMPLETION

- C. Inspection Procedures: On receipt of a request for a certificate of Substantial Completion, OAR will either authorize commencement of inspection or advise CONTRACTOR of unfilled requirements. IOR, OAR, CONTRACTOR and ARCHITECT will inspect the Work and IOR shall prepare a comprehensive punch list of items to be completed.
  - 3. IOR will repeat inspection when requested and assure the Work is complete.
  - 4. Results of the completed inspection will form a partial basis of the requirements for Final Completion.
  
- D. Re-inspection Procedures: IOR, OAR, CONTRACTOR and ARCHITECT will inspect the Work upon notice the Work, including final inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to OAR.
  - 3. Upon completion of inspection, OAR will recommend Final Completion. If the Work is incomplete, OAR will advise CONTRACTOR of Work that is incomplete or of obligations that have not been fulfilled but are required for Final Completion.
  - 4. If necessary, re-inspection will be repeated, but may be assessed against CONTRACTOR if OWNER is subject to additional professional service and or additional costs of inspection.

### 3.02 PROJECT RECORD DOCUMENT SUBMITTAL

- H. General: Do not use project record documents for construction purposes. Protect record documents from deterioration and loss. Provide access to record documents for ARCHITECT, IOR and OAR reference during normal working hours. Project record document shall be updated on a weekly basis. Prior to submitting each application for payment, secure IOR and ARCHITECT approval of project record documents.
  
- I. Record Drawings: Maintain a clean, undamaged set of blue or black line white prints of Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which Drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Drawings. Provide detailed and accurate field dimensions for concealed elements that would be difficult to measure and record at a later date.
  - 7. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Date and number

entries in the same format as submitted. Call attention to entry by a “cloud” around the affected areas.

8. Mark new information important to OWNER but was not shown on Drawings or Shop Drawings.
  9. Utility location and depth below finished grade and/or above ceilings and attic spaces shall be fully dimensioned and indicated on record drawings. Dimensions shall be measured from building lines or permanent landmarks and shall be triangulated to those features.
  10. Note related Change Order or Construction Directive numbers where applicable. RFC submissions shall be referenced on each affected sheet, Drawing and/or Shop Drawing.
  11. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
  12. Prior to Final Completion of the Work, and review of the project record drawings by ARCHITECT, prepare a final set of project record drawings incorporating all mark ups and information noted. Provide a hardline drawing set of record drawings printed on reproducible white bond paper. Submit final set of Record Drawings to ARCHITECT.
- J. Record Specifications: Maintain two complete copies of the Specifications, including Addenda. Include with the Specifications two copies of other written Contract Documents, such as Change Orders and/or Construction Directives issued during construction.
5. Mark these record documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
  6. Give particular attention to substitutions and selection of options and information on concealed Work that cannot otherwise be readily discerned later by direct observation.
  7. Note related record document information with Product Data.
  8. Prior to Final Completion of the Work, submit record Specifications to ARCHITECT for OWNER records.
- K. Record Product Data: Maintain two copies of each Product Data submittal. Note related Change Orders and Construction Directives and mark-up of record drawings and Specifications.

4. Mark these documents to illustrate significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Project site and from the manufacturer's installation instructions and recommendations.
  5. Provide detailed and accurate information regarding concealed products and portions of Work that cannot otherwise be readily discerned later by direct observation.
  6. Prior to Final Completion of the Work, submit complete set of record Product Data to the ARCHITECT for OWNER records.
- L. Record Samples: Immediately prior to Substantial Completion, CONTRACTOR shall meet with ARCHITECT and OAR at the Project site to determine which Samples are to be transmitted to OWNER for record purposes. Comply with OAR instructions regarding delivery to OWNER storage area.
- M. Miscellaneous Records: Refer to other Specification sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date of Final Completion, complete and compile miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to ARCHITECT for OWNER records.
- N. Maintenance Manuals: Prior to Substantial Completion, organize operation and maintenance data into suitable two sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-3", 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Submit to OAR for ARCHITECT and for OWNER records. Include the following types of information.
9. Emergency instructions
  10. Spare parts list
  11. Copies of warranties
  12. Wiring diagrams
  13. Recommended "turn-around" cycles
  14. Inspection procedures
  15. Shop Drawings and Product Data
  16. Fixture lamping schedule
- H. Verified Reports: Construction progress of the Work shall be reported to DSA via a duly verified report as per Sections 4-336 and 4-343 of the California Building Standards Administrative Code.

### 3.03 CLOSEOUT PROCEDURES:

- C. Operation and Maintenance Instructions: Prior to Substantial Completion, arrange for each installer of equipment that requires regular operation and maintenance to meet with designated OWNER personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
13. Maintenance manuals
  14. Record documents
  15. Spare parts and materials
  16. Tools
  17. Lubricants
  18. Fuels
  19. Identification systems
  20. Control sequences
  21. Hazards
  22. Cleaning
  23. Warranties and bonds
  24. Maintenance agreements and similar continuing commitments
- D. As part of instruction for operating equipment, demonstrate the following procedures:
8. Start-up
  9. Shutdown
  10. Emergency operations
  11. Noise and vibration adjustments
  12. Safety procedures
  13. Economy and efficiency adjustments
  14. Effective energy utilization

#### 3.04 FINAL CLEANING

- C. General: Related sections of the Contract Documents specify general cleaning during performance of the Work. General cleaning is included in Division 01 Section "Construction Facilities and Temporary Controls".
- D. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
2. Complete the following cleaning operations before requesting inspection for a certificate of Substantial Completion.

- f. Remove labels that are not permanent labels.
- g. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
- h. Clean exposed exterior and interior hard-surfaced finished to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
- i. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
- j. Clean the Project site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

END OF SECTION

## SECTION 01740

### WARRANTIES

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers and/or installer's standard warranties on products and special product warranties.
  - 1. Refer to the General Conditions for terms of the guarantee period for the Work.

##### 1.2 RELATED SECTIONS

- A. Section 01600: Materials and Equipment
- B. Section 01700: Contract Closeout
- C. All Necessary work related sections division 2-16

#### PART 2 - PRODUCTS

#### PART 3 - EXECUTION

##### 3.1 WARRANTY REQUIREMENTS

- A. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties shall not relieve CONTACTOR of the warranty of the Work incorporating such materials, products, and/or equipment. Manufacturer's disclaimers and limitations on warranties do not relieve suppliers, manufacturers, installers, and Subcontractors of the requirement to countersign special warranties with CONTRACTOR.
- B. Standard warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to OWNER.
- C. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for OWNER.
- D. Related Damages and Losses: When correcting failed or defective warranted Work, remove and replace Work that has been damaged as a result of such failure



or which must be removed and replaced to provide access for correction of warranted Work.

- E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement with the reinstated warranty equal to the original warranty.
- F. Replacement Cost: Upon determination the Work covered by a warranty has failed and/or is defective, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. CONTRACTOR is responsible for the cost of replacing or rebuilding defective Work regardless of whether OWNER has benefited from use of the Work through a portion of its anticipated useful service life.
- G. OWNER Recourse: Expressed warranties made to OWNER are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which OWNER can enforce such other duties, obligations, rights, or remedies.
- H. Rejection of Warranties: OAR reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- I. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, OAR reserves the right to refuse to accept the Work until CONTRACTOR presents evidence the entities required to countersign such commitments have done so.

### 3.2 SUBMITTALS

- A. Submit written warranties to ARCHITECT prior to Final Completion of the Work. If the certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, submit written warranties as set forth in the certificate of Substantial Completion.
  - 1. When a designated portion of the Work is partially used and/or occupied by OWNER, submit properly executed warranties to ARCHITECT within fifteen (15) days of the Partial Use or Occupancy of the designated portion of the Work.
- B. When the Contract Documents require CONTRACTOR, or CONTRACTOR and a Subcontractor, installer, supplier or manufacturer to execute a special warranty, prepare a written document containing appropriate terms and identification, ready for execution by the required parties. Submit a draft to OAR, through the ARCHITECT, for approval prior to final execution.

1. Refer to Divisions 02 through 16 for specific content requirements and particular requirements for submitting special warranties.
- C. Form of Submittal: Prior to Final Completion of the Work, compile two copies of each required warranty properly executed by CONTRACTOR, or by CONTRACTOR and Subcontractor, installer, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the Specifications.
- D. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8½ by 11” (115 by 280 mm) paper.
1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the item or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the installer.
  2. Identify each binder on the front and spine with the typed or printed title “WARRANTIES,” Project title and/or name, and name of CONTRACTOR.
  3. When warranted Work requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

END OF SECTION

## SECTION 024113

### SELECTIVE DEMOLITION

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Demolition and removal of site improvements and all other related contiguous improvements as required. Refer to Demolition Plans for locations.
  - 2. Demolition, dismantling, cutting and alterations as indicated, specified, and required for completion of the Contract; for new construction, modernization and rehabilitation projects, as applicable. Includes items such as the following:
    - 1. Protecting existing work to remain.
    - 2. Salvageable items to be retained.
    - 3. Cleaning soiled materials that are to remain.
    - 4. Disconnecting and capping utilities.
    - 5. Removing debris and equipment.
    - 6. Removal of items indicated on drawings.
- B. Demolition of Existing Building Foundations
  - 1. Demolition and removal of all existing building foundations, footings, slabs, retaining walls, etc. shall be carried in a careful and orderly manner, and according to all applicable codes and regulations for demolition of structures, safety of adjacent structures, dust control and disposal of materials.
  - 2. Sprinkle Work with water to minimize dust. Provide hoses and water connections for that purpose.
- C. Demolition and Removal of Pavements
  - 1. Markup all existing utilities on site.
  - 2. Sawcut all Concrete Pavements, as indicated on Drawings.
  - 3. Remove all indicated pavements, walkways, curb and gutter, concrete ditches, landscape areas, etc.
  - 4. Protect all manhole and valve covers, lids, vaults and other site fixtures, marked to remain.

- D. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 31 for "Site Clearing" and "Earthwork" as applicable.

### 1.3 DEFINITIONS

- A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the District's property.
- B. Asbestos-Containing Materials (ACMs) and other hazardous materials: As identified in the Report, remove asbestos-containing materials (ASMs) and other identified hazardous materials.
- C. Remove and Salvage: Items indicated to be removed and salvaged remain the District's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to District's designated storage area.
- D. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in locations indicated.
- E. Existing to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during demolition and then cleaned and reinstalled in their original locations.

### 1.4 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the District's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.
- B. Historical items indicated remain the District's property. Carefully remove and salvage each item in a manner to prevent damage and deliver promptly to the District.
- C. Historical items, archeological or paleontological findings, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, commemorative benches, antiques, and other items of interest or value to the District, which may be encountered during demolition, remain the District's property. If such items are encountered, all project operations shall cease in the area of discovery immediately. The District shall secure the services of an archeological consultant to assess the resources, and determine a course of action.
  - 1. Cooperate with District's archaeological consultant or historical adviser. [Refer to the Initial Study/Mitigated Negative Declaration (MND) for related requirements.]
- D. Human Remains: In the event that human remains are discovered, there shall be no disposition of such human remains, other than in accordance with the procedures and requirements set forth in the California Health and Safety Code and Public Resources

Code. All project operations shall cease in the area of discovery immediately. In conjunction with the District, the Code provisions require immediate notification of the County Coroner and the Native American Heritage Commission.

1. Cooperate with the County Coroner, the Native American Heritage Commission representative and other related officials. [Refer to the Initial Study/Mitigated Negative Declaration (MND) for related requirements.]

## 1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.
- B. Proposed dust-control measures.
- C. Proposed noise-control measures.
- D. Schedule of demolition activities indicating the following:
  1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
  2. Dates for shutoff, capping, and continuation of utility services.
- E. Inventory of items to be removed and salvaged.
- F. Inventory of items to be removed by District.
- G. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by demolition operations.
- H. Record drawings at Project closeout according to Division 1 Section "Project Record Documents".
  1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.
- I. Landfill records for record purposes indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

## 1.6 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed demolition Work similar to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA & SCAQMD notification regulations before starting demolition. Observe applicable Best Practices and implementation of the Storm Water Pollution Prevention Plan (SWPPP). Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Pre-demolition Conference: Conduct conference at Project site to comply with pre-installation conference requirements of Division 1 Section "Project Meetings."

## 1.7 PROJECT CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by District as far as practical. Bidders shall make themselves fully aware of the existing conditions within the site scope limits scheduled for demolition and items/areas to remain protected in supplement to the Bid Drawings and Documents.
- B. If conditions are encountered that vary from those indicated on plan, notify the Inspector of Record for instructions prior to proceeding.
- C. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
  - 1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
  - 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from owner.

## 1.8 SCHEDULING

- A. Arrange demolition schedule so as not to interfere with District's on-site operations.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- A. Requirements for satisfactory soil materials are specified in Division 31 Section "Earthwork". Refer to the Geotechnical Investigation Report dated prepared by Converse Consultants, for site soil requirements
  - 1. Obtain approved borrow soil materials off-site when sufficient satisfactory soil materials are not available on-site.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped. Test lines as required.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.

- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. Survey existing conditions of the improvements such as light standards and trees to determine the best method(s) for removal so as not to cause potential damage to persons and property during the course of removal.
- E. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

### 3.2 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
  - 1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by District and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to District and to governing authorities.
    - a. Provide not less than 72 hours' notice to District if shutdown of service is required during changeover.
- B. District will arrange for disconnecting and sealing indicated utilities serving structures to be demolished before start of demolition work, when requested by Contractor.
- C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving structures to be demolished.
  - 1. Arrange to shut off indicated utilities with utility companies.
- D. Utility Requirements: Refer to Division 21, 22, 23 and 33 Sections, as well as the Contract Drawings, for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

### 3.3 PREPARATION

- A. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.
- B. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from District and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

- C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.
- D. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
- E. Protect existing site improvements, appurtenances, and landscaping to remain.
  - 1. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

### 3.4 CUTTING EXISTING CONCRETE

- A. Cutting of existing concrete shall be done by experienced workers familiar with the requirements and space necessary for placing concrete. Perform concrete cutting with concrete cutting wheels and hand chisels. Take care not to damage concrete that is intended to remain.
- B. Extent of cutting of concrete shall be as indicated on drawings and in accordance with standard plans for public works construction plan no. 132-1. Replace concrete that is removed in excess of amount indicated or required.
- C. Prior to cutting or coring concrete, determine locations of hidden utilities and take necessary measures to protect them from damage.
- D. If an existing pavement joint or cracked area is within two feet outside of a designated sawcut line shown on the Drawings, removal and resurfacing shall be to that joint, and/or shall include the crack or cracked area, unless otherwise approved by Architect.

### 3.5 EXPLOSIVES

- A. Explosives: Use of explosives will not be permitted.

### 3.6 POLLUTION CONTROLS

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
  - 1. Do not create hazardous or objectionable conditions, such as ice, flooding, and pollution, when using water.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.



- C. Clean adjacent buildings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before start of demolition.

### 3.7 DEMOLITION

- A. Demolition: Demolish improvements completely and remove from the site. Use methods required to complete Work within limitations of governing regulations and as follows:
- B. Below-Grade Construction: Demolish foundation walls and other below-grade construction, as follows:
  - 1. Completely remove below-grade construction, including foundation walls and footings.
  - 2. Break up and remove below-grade concrete slabs, unless indicated to remain.
- C. Filling Below-Grade Areas: Completely fill below-grade areas and voids resulting from demolition of buildings and pavements with soil materials according to requirements specified in Division 31 Section "Earthwork."
- D. Damages: Promptly repair damages to adjacent facilities caused by demolition operations.

### 3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off District's property and legally dispose of them.

END OF SECTION

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## SECTION 03 10 00

### CONCRETE FORMS AND ACCESSORIES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes:
  - 1. Formwork for cast-in-place concrete as indicated.
  - 2. Installation of items to be embedded in concrete, such as anchor bolts, inserts, embeds, and sleeves.
- C. Related Sections:
  - 1. Section 01 42 00: Testing and Inspection.
  - 2. Section 03 20 00: Concrete Reinforcement.
  - 3. Section 03 30 00: Cast-In-Place Concrete.

##### 1.2 REFERENCES

- A. American Concrete Institute (ACI) Publication:
  - 1. ACI 318 – Building Code Requirements for Structural Concrete, Chapter 6, Formwork, Embedded Pipes, and Construction Joints.
  - 2. ACI 347 – Guide to Formwork for Concrete.
- B. American Plywood Association (APA):
  - 1. Form No. V345 - Concrete Forming Design/Construction Guide.
- C. National Institute of Standards and Technology (NIST):
  - 1. NIST Voluntary Product Standard PS 1.

##### 1.3 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating locations of forms, construction and expansion joints, embedded items, and accessories. Review and approval will not include form strength and adequacy.
- B. Product Data: Submit manufacturer's Product Data for form materials and accessories.
- C. Record Document: Keep an accurate record of the dates of removal of forms, form shores and reshores, and furnish copies to the Architect.

## 1.4 REGULATORY REQUIREMENTS

- A. California Building Code (CBC), Chapter 19A, and ACI 318-08.
- B. California Code of Regulations, Title 8, Division 1, Chapter 4, Subchapter 4, Construction Safety Orders, Article 6, Excavations, Sections 1713 and 1717.

## 1.5 DELIVERY, STORAGE AND HANDLING

- A. Storage shall prevent damage and permit access to materials for inspection and identification.
- B. Deliver materials for forms in timely manner to ensure uninterrupted progress.

## 1.6 QUALITY ASSURANCE

- A. Construction of Forms shall comply with the following as a minimum requirement:
  - 1. ACI 347, "Recommended Practice for Concrete Formwork"
  - 2. CBC Section 1906A.
  - 3. Tolerances shall conform to those as specified in ACI 301, "Specifications for Structural Concrete for Buildings", as applicable, unless exceeded by requirements of DSA or otherwise indicated or specified.
  - 4. Plywood: Conform to tables for form design and strength in APA Form V 345.
- B. Mock-ups: Provide mock-ups for all exposed finishes; 100 square feet minimum size. Locate as required by the Architect, for review and approval prior to installation.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Form materials may be reused during progress of the Work provided they are completely cleaned and reconditioned, recoated for each use, capable of producing formwork of required quality, and are structurally sound.
- B. Form Lumber: WCLIB Construction Grade or Better, WWPA No. 1 or Better.
- C. Plywood: NIST Voluntary Product Standard PS 1, Group 1, Exterior Grade B-B Plyform or better, minimum 5-ply and 3/4 inch thick for exposed locations and at least 5/8 inch thick for unexposed locations, grade marked, not mill oiled. Furnished plywood with medium or high density overlay is permitted.
- D. Coated Form Plywood: For exposed painted concrete, plastic overlaid plywood of grade specified above, factory coated with a form coating and release agent Nox-crete", or equal.

- E. Tube Forms: Sonoco "Seamless Sonotubes," or equal, of the type leaving no marks in concrete, one-piece lengths for required heights.
- F. Special Forms: For exposed integrally-colored concrete, plywood as above with high density overlay, plywood with integral structural hardboard facing or fibrous glass reinforced plastic facing, providing specified finish.
- G. For Exposed Concrete Finish:
  - 1. Plywood: New, waterproof, synthetic resin bonded, exterior type Douglas fir or Southern pine plywood manufactured especially for concrete formwork and conforming to NIST Voluntary Product Standard PS 1, Grade B-B grade, Class I.
  - 2. Glass-Fiber-Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surfaces.
  - 3. Steel: Minimum 16 gage sheet, well matched, tight fitting, stiffened to support weight of concrete, without deflection detrimental to tolerances and appearances of finished concrete surfaces.
  - 4. Plywood: "Finland Form," or "Combi Form" distributed by North American Plywood Corporation. The material shall be furnished with hard smooth birch face veneers with phenolic resin thermally fused onto panel sides. Edges shall be factory sealed.
- H. Form Ties: Prefabricated rod, flat band, wire, internally threaded disconnecting type, not leaving metal within 1-1/2 inch of concrete surface.
- I. Form Coating: Non-staining clear coating free from oil, silicone, wax, not grain-raising, "Formshield" by A.C. Horn, Inc., "Release" by Edoco/Dayton Superior ,or "Cast-Off" by Sonneborn/BASF Building Systems. Where form liners are furnished, provide form coatings recommended by form liner manufacturer.
- J. Form Liner: Rigid or resilient type by L.M. Scofield, Symons, or Greenstreak, types shown or directed, matching approved Sample.
- K. Void Forms: Manufactured by SureVoid Products, Inc., or equal. Forms shall be "WallVoid" for temporary support of concrete walls and grade beams spanning between supports, and "SlabVoid" for creating gaps between concrete slabs or steps and underlying soils. Void forms shall be fabricated of corrugated paper with moisture resistant exterior, and shall be capable of withstanding working load of 1,500 psf. Provide accessories as required.

PART 3 - EXECUTION

3.1 GENERAL

A. Forms shall be constructed so as to shape final concrete structure conforming to shape, lines and dimensions of members required by Drawings and Specifications, and shall be sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together to maintain position and shape with no sagging, displacement, or bulging between studs. Forms and their supports shall be designed so that previously placed structures will not be damaged. Use clean, sound, approved form material, coated with specified materials only, not oil. Provide backing on all plywood joints. Forms shall be true to line within tolerances as permitted under section 1.6 above.

3.2 TOLERANCES

A. Permitted abrupt or gradual irregularities in formed surfaces as measured within a 5 feet length with a straightedge shall per ACI 347, Table 3.1:

Class of Surface			
A	B	C	D
1/8 inch	1/4 inch	1/2 inch	1 inch

1. Class A: Use for concrete surfaces prominently exposed to public view.
2. Class B: Use for coarse-textured concrete-formed surfaces intended to receive plaster, stucco or wainscoting.
3. Class C: Use as a general standard for permanently exposed surfaces where other finishes are not specified.
4. Class D: Use for surfaces where roughness is not objectionable and will be permanently concealed.

B. Finish Lines: Position formwork to maintain hardened concrete finish lines within following permissible deviations.

1. Variation from Plumb:
  - a. In 10'-0"                                 1/4 inch
  - b. In any story or 20'-0"                 3/8 inch
  - c. In 40'-0" or more                     3/4 inch
2. Variation from Level or Grades Indicated:
  - a. In 10'-0"                                 1/4 inch
  - b. In any bay or 20'-0" maximum       3/8 inch
  - c. In 40'-0" or more                     3/4 inch
3. Cross-Sectional Dimensions:

- a. Minus 1/4 inch
  - b. Plus 1/2 inch
- C. Building Lines: Variation of linear building lines from established position in plan and related position of columns, walls and partitions:
- a. In any bay or 10'-0" maximum 1/2 inch
  - b. In 40'-0" or more 1 inch
- D. Slab Openings: Variations in size and location of sleeves and slab openings shall not exceed 1/4 inch.

### 3.3 ERECTION

- A. Conform to ACI 301 and ACI 347 except as exceeded by the requirements of code, regulatory agencies, or herein.
- B. Plywood shall be installed with horizontal joints level, vertical joints plumb and with joints tight. Back joints by studs or solid blocking, and fill where necessary for smoothness. Reused plywood shall be thoroughly cleaned, damaged edges or surfaces repaired and both sides and edges oiled with colorless form oil. Nail plywood along edges, and to intermediate supports, with common wire nails spaced as necessary to maintain alignment and prevent warping.
- C. Construction: Provide openings, offsets, keys, reglets, anchorages, recesses, moldings, chamfers, blocking, screeds, drips, bulkheads, and all other required features. Make forms easily removable without hammering or prying against concrete. Space forms apart with metal spreaders. Construct forms to accurate alignment, location and grades, and provide against sagging, leakage of concrete mortar, or displacement occurring during and after placing of concrete. Coordinate installation of inserts and anchors in forms according to Shop Drawings and requirements for work of other sections.
- D. Openings for Cleaning: Provide temporary openings at points in formwork to facilitate cleaning and inspection. At base of walls and wide piers, bottom form board on one face for entire length shall be omitted until form has been cleaned and inspected.
- E. Chamfers: Provide 3/4 inch by 3/4 inch chamfer strips for all exposed concrete corners and edges unless otherwise indicated.
- F. Reglets and Rebates: As specified in Section 03300: Cast-In-Place Concrete. Form required reglets and rebates to receive frames, flashing, and other equipment.
- G. Form Joints: Fill joints to produce smooth surfaces, intersections, and arises. Use polymer foam or equivalent fillers at joints and where forms abut or overlap existing concrete to prevent leakage of mortar.

H. Recesses, Drips, and Profiles: Provide smooth milled wood or pre-formed rubber or plastic shapes of types shown and required.

### 3.4 REMOVAL OF FORMS

- A. Forms shall not be removed until concrete has sufficiently hydrated to maintain its integrity and not be damaged by form removal operations. Unless noted otherwise and/or permitted by the Architect, wall forms shall not be removed in less than 5 days, floor slabs in less than 7 days, and ramp, landing, steps and floor slabs shall not be removed in less than 7 days. Shoring shall not be removed until member has acquired sufficient strength to support its weight, load upon it, and added load of construction. In no case shall forms be removed sooner than specified in ACI 347, paragraph 3.6.2.3, or CBC Section 1906A.2.
- B. Compressive strength of in-place concrete shall be determined by testing field-cured specimens representative of concrete location or members, as specified in Section 03300: Cast-In-Place Concrete.
- C. Reshore structural members as specified per ACI 347R-94. Maintain a form and shoring removal record. Contractor shall submit shoring/reshoring plans and calculations stamped and signed by a licensed civil or structural engineer for review and approval. Reshoring loads to lower floors shall be consistent with the design loads specified on the construction documents and with the acquired strength of the lower floors based on the time they have been allowed to cure before being loaded.
- D. Remove formwork progressively so unbalanced loads are not imposed on the structure.
- E. Avoid damage concrete surfaces during form removal.
- F. Store reusable forms for exposed architectural concrete to prevent damage to contact surfaces.
- G. Remove formwork in same sequence as concrete placement to achieve similar concrete surface coloration.

### 3.5 SURVEY AND ADJUSTMENT:

- A. Check forms before and during placement of concrete, using an instrument, and make corrections as work proceeds.

### 3.6 EMBEDDED PIPING AND ROUGH HARDWARE:

- A. Comply with CBC, Section 1906A.3. Where work of other sections require openings for passage of pipes, conduits, ducts, and other inserts in the concrete, obtain all dimensions and other information. All necessary pipe sleeves, anchors, or other required inserts shall be accurately installed as part of the work of other sections, according to following requirements.

- B. Conduits or Pipes: No pipe/conduit runs shall be embedded in structural concrete.
- C. Sleeves: Pipe sleeves may pass through slabs or walls if not exposed to rusting or other deterioration and are of uncoated or galvanized iron or steel. Provide sleeves of diameter large enough to pass any hub or coupling on pipe, including any insulation.

### 3.7 FIELD QUALITY CONTROL

- A. Inspection: Obtain inspection and approval of forms before placing structural concrete.

### 3.8 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

### 3.9 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION



## SECTION 03 2000

### CONCRETE REINFORCING

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Section Includes:

1. Concrete steel reinforcement.

###### B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 420 : Testing and Inspection.
3. Section 03 1000: Concrete Forming.
4. Section 03 3000: Cast-In-Place Concrete.

##### 1.02 REGULATORY REQUIREMENTS

- ###### A. Fabrication and placement of reinforcing shall be in accordance with requirements of CBC, Chapter 19A.

##### 1.03 REFERENCES

###### A. American Society for Testing and Materials (ASTM):

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM A184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
3. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
4. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
5. ASTM A497 - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.

6. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
7. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

B. American Concrete Institute (ACI) Publication:

1. ACI SP-66 – ACI Detailing Manual.
2. ACI 318 – Building Code Requirements for Structural Concrete, as modified by CBC.

C. American Welding Society (AWS):

1. AWS D1.4 – Structural Welding Code – Reinforcing Steel.

1.04 SUBMITTALS

- A. Shop Drawings: Submit steel reinforcement Shop Drawings in accordance with ACI 315. Include assembly diagrams, bending charts and slab plans. Indicate lengths and location of splices, size and lengths of reinforcing steel.
- B. Closeout Submittals: Record exact locations of reinforcing that vary from Shop Drawings.

1.05 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice.
2. American Welding Society (AWS).
3. American Concrete Institute (ACI).
4. CBC, Chapter 19A, Concrete.

B. Source Quality Control: Refer to Division 01 Sections for general requirements and to the following paragraphs for specific procedures. Testing laboratory retained by the OWNER shall select test Samples of bars, ties, and stirrups from the material at the Project Site or from the place of distribution, with each Sample consisting of not less than two 18 inch long pieces, and perform the following tests according to ASTM A615, or ASTM A706, as applicable:

1. Identified Bars: If Samples are obtained from bundles as delivered from the mill, identified as to heat number, accompanied by mill analyses and mill test

reports, and properly tagged with the identification certificate so as to be readily identified, perform one tensile and one bend test for each 10 tons or fraction thereof of each size of bars. Submit mill reports when Samples are selected.

2. Unidentified Bars: When positive identification of reinforcing bars cannot be performed and when random Samples are obtained; perform tests for each 2.5 tons or fraction thereof, one tensile and one bend test from each size of bars.
- C. Certification of Welders: Shop and Project site welding shall be performed by welding operators certified by AWS.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Avoid exposure to dirt, moisture or conditions harmful to reinforcing.
- B. Reinforcing steel bars, wire, and wire fabric shall be stored on the Project site to permit easy access for examination and identification of each shipment. Material of each shipment shall be separated for size and shape.

### PART 2 - PRODUCTS

#### 2.01 GENERAL

- A. Provide reinforcing of sizes, gages and lengths indicated, bent to indicated shapes.

#### 2.02 MATERIALS

- A. Steel Reinforcing Bars: ASTM A615, or ASTM A706 deformed grade 60 billet steel unless otherwise specified or indicated.
- B. Bars or Rod Mats: ASTM A184.
- C. Welded Wire Fabric for Reinforcement: ASTM A185.
- D. Tie Wire: ASTM A82, fully annealed, copper-bearing steel wire, 16 gage minimum.
- E. Chairs, Spacers, Supports, and Other Accessories: Standard manufacture conforming to ACI 315 fabricated from steel wire of required types and sizes. For reinforcement supported from grade, provide properly sized dense precast blocks of concrete.

#### 2.03 FABRICATION OF REINFORCING BARS

- A. Comply with CRSI Manual of Standard Practice for Reinforced Concrete Construction for fabrication of reinforcing steel.

- B. Bending and Forming: Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials. Do not heat reinforcement for bending. Bend bars No. 6 size and larger in the shop only. Bars with unscheduled kinks or bends are not permitted. Provide only tested and permitted bar materials.
- C. Welding: Provide only ASTM A706 steel where welding is indicated. Perform welding by the direct electric arc process in accordance with AWS D1.4 and specified low-hydrogen electrodes. Preheat 6 inches each side of joint. Protect joints from drafts during the cooling process; accelerated cooling is not permitted. Do not tack weld bars. Clean metal surfaces to be welded of loose scale and foreign material. Clean welds each time electrode is changed and chip burned edges before placing welds. When wire brushed, the completed welds must exhibit uniform section, smooth welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion and penetration into the base metal. Cut out welds or parts of welds deemed defective, using chisel, and replace with proper welding. Prequalification of welds shall be in accordance with CBC requirements.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Bars shall be bent cold. Bars partially embedded in concrete shall not be field bent except as indicated on reviewed Shop Drawings.
- B. Before installation and just prior to placing concrete, clean reinforcing of loose scale, rust, oil, dirt and any coating that could reduce bond.
- C. Accurately position, install, and secure reinforcing to prevent displacement during the placement of concrete.
- D. Provide metal chairs to hold reinforcement the required distance above form bottoms. In beams and slab construction, provide chairs under top slab reinforcement as well as under bottom reinforcement. Space chairs so that reinforcement will not be displaced during installation. Provide metal spacers to secure proper spacing. Stirrups shall be accurately and securely wired to bars at both top and bottom. At slabs, footings, and beams in contact with earth, provide concrete blocks to support reinforcement at required distance above grade.
- E. Install and secure reinforcement to maintain required clearance between parallel bars and between bars and forms. Lapped splices shall be installed wherever possible in a manner to provide required clearance between sets of bars. Stagger lapped splices. Dowels and bars extending through construction joints shall be secured in position against displacement before concrete is installed and subsequently cleaned of concrete encrustations while they are still soft.

F. Do not install reinforcing in supported slabs and beams until walls and columns have been installed to underside of slabs and beams or until construction joints have been thoroughly cleaned. Reinforcing shall be inspected before placement of concrete and cleaned as required.

G. Use deformed bars unless otherwise indicated, except for spiral reinforcement.

3.02 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.03 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

## SECTION 03 3000

### CAST-IN-PLACE CONCRETE PART 1 - GENERAL

#### 1.01 SUMMARY

##### A. Section Includes:

1. Cast-in-place normal weight and lightweight concrete, placement and finishing.

##### B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 4520 Testing and Inspection.
3. Section 03 1000: Concrete Forming and Accessories.
4. Section 03 2000: Concrete Reinforcing.
5. Section 32 1313: Site Concrete Work.

#### 1.02 REFERENCES

##### A. American Concrete Institute (ACI) Publication:

1. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 301 – Specifications for Structural Concrete.
3. ACI 302.1R – Guide for Concrete Floor and Slab Construction.
4. ACI 305R - Specification for Hot Weather Concreting.
5. ACI 306.1 – Standard Specification for Cold Weather Concreting.
6. ACI 308R – Guide to External Curing of Concrete.
7. ACI 318 - Building Code Requirements for Structural Concrete, as modified by CBC Sections 1903A and 1905A.

##### B. American Society for Testing and Materials (ASTM) Standards:

1. ASTM C31 – Standard Specification for Making and Curing Concrete Test Specimens in the Field.

2. ASTM C33 - Standard Specification for Concrete Aggregates.
3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
5. ASTM C88 - Standard Test Method for Soundness of Aggregates by use of Sodium Sulphate or Magnesium Sulphate.
6. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
7. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
8. ASTM C150 - Standard Specification for Portland Cement.
9. ASTM C156 – Standard Test Method for Water Loss (from a Mortar Specimen) Through Liquid membrane-Forming Curing Compounds for Concrete.
10. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
11. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.
12. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
13. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
14. ASTM C289 - Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).
15. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
16. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
17. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
18. ASTM C567 - Standard Test Method for Determining Density of Structural Lightweight Concrete.
19. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

20. ASTM C845 - Standard Specification for Expansive Hydraulic Cement
21. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
22. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
23. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
24. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
25. ASTM C1315 – Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
26. ASTM D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
27. ASTM C1567 - Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).
28. ASTM D1751 - Standard Test Method for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
29. ASTM D7234 – Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
30. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
31. ASTM E1155 - Standard Test Method for Determining  $F_F$  Floor Flatness and  $F_L$  Floor Levelness Numbers.
32. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.
33. ASTM E1745 - Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
34. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.



35. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
36. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes.
37. ASTM F3010 – Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use under Resilient Floor Coverings.

1.03 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating locations of cast-in-place concrete Work and accessory items such as vapor barriers. Include details and locations of reinforcing, embedded items, and interfacing with other Work.
- B. Mix Design Data: Submit concrete mix designs as specified herein and in Article 2.02.
  1. Submit name, address and telephone number of the concrete production facility which the contractor intends to engage to design the concrete mixes. Submit name and qualifications of the proposed concrete technologist.
  2. Mix Design: Submit a concrete mix design for each strength and type of concrete indicated in the drawings or specified. Include water/cement ratio, source, size and amount of coarse aggregate and admixtures. Predict minimum compressive strength, maximum slump and air content percentage. Clearly indicate locations where each mix design will be used.
    - a. Water/cement ration for concrete slabs on grade shall be 0.50 maximum.
  3. Test Reports: Submit copies of test reports showing that the proposed mixes produce concrete with the strengths and properties specified. Include tests for cement, aggregates and admixtures. Provide gradation analysis.
- C. Material Samples: Submit Samples illustrating concrete finishes and hardeners, minimum 12-inch by 12-inch.
- D. Certificates: Submit certification that each of the following conforms to the standards indicated:
  1. Portland cement: ASTM C150.
  2. Normal weight concrete aggregates: ASTM C33.
  3. Lightweight concrete aggregates: ASTM C330.

4. Aggregates: Submit evidence that the aggregate is not reactive in the presence of cement alkalis. In the absence of evidence, aggregate shall be tested by one of the methods in ASTM C33 Appendix XI, Methods for Evaluating Potential for Deleterious Expansion Due to Alkali Reactivity of an Aggregate. Aggregates deemed to be deleterious or potentially deleterious may be used with the addition of a material that has been shown to prevent harmful expansion in accordance with Appendix XI of ASTM C33, when approved by the building official, in accordance to CBC Section 1903A5A.
  5. Curing materials: ASTM C171.
- E. Admixtures: Submit product data for proposed concrete admixtures.

#### 1.04 QUALITY ASSURANCE

- A. Continuous inspection shall be provided at the batch plant and for transit-mixed concrete to run check sieve analysis of aggregate, check moisture content of fine aggregate, check design of mix, check cement being used with test reports, check loading of mixer trucks, and certify to quantities of materials placed in each mixer truck.
- B. Inspection shall be performed by a representative of a testing laboratory selected by the OWNER. OWNER will pay for inspection costs. Notify the laboratory 24 hours in advance of time concrete is to be mixed. Notify the laboratory of postponement or cancellation of mixing within at least 24 hours of scheduling time.
- C. CONTRACTOR shall assist the testing laboratory in obtaining and handling samples at the project site and at the source of materials.
- D. Continuous batch plant inspection requirement may be waived in accordance with CBC Section 1705A.3.3.1. Waiver shall be in writing, including DSA approval. When batch plant inspection is waived by DSA, the following requirements shall be met:
  1. Approved inspector of the testing laboratory shall check the first batching at the start of work and furnish mix proportions to the licensed weightmaster.
  2. Licensed weightmaster shall positively identify materials as to quantity and certify to each load by a ticket.
  3. Tickets shall be transmitted to the Inspector by a truck driver with load identified thereon. The Inspector will not accept the load without a load ticket identifying the mix and will keep a daily record of placements, identifying each truck, its load and time of receipt and approximate location of deposit in the structure and will transmit a copy of the daily record to DSA.

4. At the end of the project, the weightmaster shall furnish an affidavit to DSA certifying that all concrete furnished conforms in every particular to proportions established by mix designs.

E. Special Inspections and Tests shall be in accordance with CBC Chapter 17A, Reinforcement and Anchor testing per CBC Section 1910A and Specification Section 01 4523.

#### 1.05 DELIVERY, STORAGE AND HANDLING

A. Store cement and aggregate materials so as to prevent their deterioration or intrusion by foreign matter. Deteriorated or contaminated materials shall not be furnished.

B. Packaged materials shall bear the manufacturers and brand name label, and shall be stored in their original unbroken package in a weather tight place until ready for use in the work.

#### 1.06 PROJECT CONDITIONS

A. Cold Weather Requirements: Batching, mixing, delivering and placing of concrete in cold weather shall comply with the applicable requirements of ACI 306.1.

B. Hot Weather Requirements: Batching, mixing, delivering and placing of concrete in hot weather shall comply with the applicable requirements of ACI 305R.

C. Concrete temperature of freshly mixed concrete shall be determined per ASTM C1064.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

A. Cement: ASTM C150. Portland Cement.

B. Aggregates: Conform to the following standards:

1. Normal weight concrete: ASTM C33.

2. Lightweight concrete: ASTM C330, with fine aggregates per ASTM C33.

3. Aggregate shall be tested for Potential Alkali Reactivity of Cement-Aggregate Combinations per ASTM C289.

4. Nominal maximum size of coarse aggregate shall be no larger than:

a.  $1/5$  the narrowest dimension between sides of forms, nor

- b. 1/3 the depth of slabs, nor
  - c. 3/4 the clear spacing between individual reinforcing bars or wires, bundles of bars, individual tendons, or ducts.
  - d. CONTRACTOR may request the ARCHITECT and DSA waiver of the above limitations reported per ACI 318, provided that the workability and methods of consolidation are such that the concrete can be placed without honeycombs or voids.
- C. Water: Water for concrete mixes, curing and cleaning shall be potable and free from deleterious matter.
- D. Admixtures: Shall be shown capable of maintaining essentially the same composition and performance throughout the work as the product used in establishing concrete proportions in accordance with ACI 318, Section 3.6.
- 1. Admixtures containing chlorides or sulfides are not permitted.
  - 2. Air-entraining admixtures shall comply with ASTM C260. Air-entrained admixtures shall not be used for floor slabs to receive steel trowel finish.
  - 3. Admixtures for water reduction and setting time modification shall conform to ASTM C494.
  - 4. Admixtures for producing flowing concrete shall conform to ASTM C1017.
  - 5. Fly ash, pozzolan and ground granulated blast-furnace slag: Modify ACI 318 Sections 3.6.6 and 3.6.7 as follows:
    - a. Fly ash or other pozzolan used as a partial substitution for ASTM C150 Portland cement shall meet the following requirements:
      - 1) Shall conform to ASTM C618 for Class N or F materials (Class C is not permitted).
      - 2) 15 percent by weight of fly ash or other pozzolans shall substitute for ASTM C150 Portland cement provided the mix design is proportioned per ACI 318, Section 318 5.3.
      - 3) Fly ash shall not be used in concrete in metal decks.
    - b. Ground-granulated blast-furnace slag used as a partial substitution for ASTM C150 Portland cement shall meet the following requirements:
      - 1) Shall conform to ASTM C989.

- 2) 15 percent by weight of ground-granulated blast-furnace slag shall substitute for ASTM C150 Portland cement provided the mix design is proportioned per ACI 318, Section 5.3.
  - 3) Fly ash shall not be in concrete in metal decks.
6. Admixtures containing ASTM C845 expansive cements shall be compatible with the cement and produce no deleterious effects.
  7. Silica fumes used as an admixture shall conform to ASTM C1240.
- E. Reinforcement Fibers: Chop strands of alkali-resistant polypropylene or nylon fibers added to the concrete mix for protection against shrinkage cracks.
- F. Expansion Joint Fillers: Preformed strips, non-extruding and resilient bituminous type, of thickness indicated, conforming to ASTM D1751.
- G. Curing:
1. Curing Paper: Shall conform to ASTM C171 and consist of two sheets of kraft paper cemented together with a bituminous material in which are embedded cords or strands of fiber running in both directions. The paper shall be light in color, shall be free of visible defects, with uniform appearance.
  2. Elevated slabs and slabs on grade may be cured at CONTRACTOR's option with curing and proactive water vapor emission and alkalinity control system. Products shall be approved by OWNER's Office of Environmental Health and Safety.
    - a. VaporSeal 309, by Floor Seal Technology, Inc., or equal.
      - 1) ASTM C156: 0.39 kg/m<sup>2</sup>.
      - 2) ASTM C309: Exceeds requirements.
      - 3) ASTM C1315: Exceeds requirements.
      - 4) ACI 308R-01 Compliant.
    - b. Remedial Treatment: Water vapor emission and alkalinity control treatment, MES 100 by Floor Seal Technology, Inc. or equal.
      - 1) ASTM E96: <0.1 Perms.
      - 2) ASTM D1308: 14pH Resistant.
      - 3) ASTM D7234: 500+psi 100% concrete failure.

- 4) ASTM F2170: 100%RH resistant.
- 5) VOC Content: <100 g/L, meets SCAQMD Rule #1113.
- 6) ASTM F3010: Meets Requirements.

c. Self-leveling Compounds: Ardex Engineered Cements, K15, or V1200, Schonox ZM Rapid, US Self Leveler Armstrong, S-194, or equal.

H. Floor Hardener: Water soluble, inorganic, silicate-based curing, hardening, sealing and dustproofing compound. Aquaseal W20 by Monopole Inc., Kure-N-Harden by BASF, Chem Hard by L&M, Liqui-Hard by W. R. Meadows, or equal.

I. Underlayment: Two component latex underlayment for filling low spots in concrete for both interior and exterior applications, from featheredge to a maximum of 3/8 inch in thickness. Underlayment shall be non-shrink and suitable for repairing exposed concrete surfaces and for underlayment of carpet, resilient, tile and quarry floor coverings. La-O-Tex by TexRite, Underlay C, RS by Mer-Krete Systems, Underlayment 962 by C-Cure, or equal.

J. Stair Treads and Nosings: Two part stair tread and nosing with ribbed abrasive bars. Fabricated from 6063-T5 or 6063-T6 extruded aluminum, mill finish. Anti-slip abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Color shall extend uniformly throughout filler.

- 1. American Safety Tread: TP-311R.
- 2. Balco Inc.: DST-330.
- 3. Nystrom: STTB-P3.375E.
- 4. Wooster Products Inc.: WP-RN3SG.
- 5. Equal.

K. Grout: ASTM C1107, non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 5,000 psi at 7 days; of consistency suitable for application and a 30 minute working time.

## 2.02 CONCRETE MIX

A. Mix shall be signed and sealed by a Civil or Structural Engineer currently registered in the State of California.

- B. Strength of Concrete: Strengths and types of concretes shall be as indicated in the Drawings. Unless otherwise indicated or specified, concrete shall be provided with minimum 28-day strength of 3000 psi (f'c).
- C. Concrete mix shall meet the durability requirements of ACI 318, Chapter 4.
- D. Concrete proportioning shall be determined on the basis of field experience and/or trial mixtures in accordance with ACI 318, Section 5.3. Proportions of materials shall provide workability and consistency to permit concrete to be placed readily into forms and around reinforcement under conditions of placement to be employed, without segregation or excessive bleeding.
- E. Ready-Mixed Concrete: Mix and deliver in accordance with requirements of ASTM C94.

PART 3 - EXECUTION

3.01 GENERAL

- A. Surfaces to receive concrete shall be free of debris, standing water, and any other deleterious substances before start of concrete placing.
- B. Time of Placing: Do not place concrete until reinforcement, conduits, outlet boxes, anchors, hangers, sleeves, bolts, and other embedded materials are securely fastened in place. Contact the Inspector at least 24 hours before placing concrete; do not place concrete until inspected by the Project Inspector.
- C. Pouring Record: A record shall be kept on the Project site of time and date of placing concrete in each portion of structure. Such record shall be maintained on the Project site until Substantial Completion and shall be available for examination by the ARCHITECT and DSA.

3.02 TOLERANCES

- A. Concrete construction tolerances shall be as specified in ACI 117 and as modified herein.
- B. Floor Flatness ( $F_F$ ) and Floor Levelness ( $F_L$ ) shall be as indicated below:

	Specified Overall Value		Minimum Local Value	
	$F_F$	$F_L$	$F_F$	$F_L$

Slabs on ground: mechanical and electrical rooms, parking structures and mortar bed set tile and quarry flooring.	20	15	15	10
Slab on ground: carpet.	25	20	17	15
Slab on ground: thinset tile and resilient flooring.	35	25	24	17
Suspended slabs: mechanical and electrical rooms, parking structures and mortar bed set tile and quarry flooring.	20	15	N/A	N/A
Suspended slabs: carpet.	25	20	N/A	N/A
Suspended slabs: thinset tile and resilient flooring.	35	20	N/A	N/A

- C. Refer to ACI 302.1R, Tables 8.1 and 8.2 Slab on Ground and Suspended Flatness/Levelness Construction Guide, for recommended concrete placing and finishing methods.
- D. Floor Flatness and Floor Levelness shall be tested in accordance to ASTM E1155. Floor measurements shall be made within 48 hours after slab installation, and shall precede removal of shores and forms.

### 3.03 PREPARATION

- A. Reglets and Rebates:
1. Form reglets and rebates in concrete to receive flashing, frames and other equipment as detailed and required. Coordinate dimensions and locations required with other related Work.
  2. If concrete slabs on grade adjoin a wall or other perpendicular concrete surface, form a reglet in wall to receive and carry horizontal concrete Work. Reglet shall be full thickness of the slab and shall be 3/4 inch wide, unless otherwise indicated. Requirement does not apply to exterior walks, unless specifically indicated.
- B. Screeds: Install screeds accurately and maintain at required grade or slab elevations after steel reinforcement has been installed, but before starting to place concrete. Install screeds adjacent to walls and in parallel rows not to exceed 8 feet on centers.

### 3.04 INSTALLATION



A. Conveying and Placing:

1. Concrete shall be placed only under direct observation of the Project Inspector. Do not place concrete outside of regular working hours, unless the Inspector has been notified at least 48 hours in advance.
2. Concrete shall be conveyed from mixer to location of final placement by methods that will prevent separation or loss of materials.
3. Concrete shall be placed as nearly as practicable to its final position to avoid segregation due to re-handling or flowing. No concrete that has partially hydrated or has been contaminated by foreign materials shall be placed, nor shall re-tempered concrete or concrete which has been remixed after initial set be placed.
4. In placing concrete in columns, walls or thin sections, provide openings in forms, elephant trunks, tremies or other recognized devices, to prevent segregation and accumulation of partially hydrated concrete on forms or metal reinforcement above level of concrete being placed. Such devices shall be installed so that concrete will be dropped vertically. Unconfined vertical drop of concrete from end of such devices to final placement surface shall not exceed 6 feet.
5. Concrete shall be placed as a continuous operation until placing of panel or section is completed. Top surfaces of vertically formed lifts shall be level.
6. Concrete shall be thoroughly consolidated by suitable means during placement, and shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms.
7. Where conditions make consolidation difficult or where reinforcement is congested, batches of mortar containing same proportions of cement, sand, and water as provided in the concrete, shall first be deposited in the forms to a depth of at least one inch.

B. Cold Weather:

1. Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather. All ground with which concrete is to come in contact shall be free from frost. No frozen materials or materials containing ice shall be used.
2. The temperature of concrete at the time of placement shall not be below the minimum temperatures given in Table 3.1 of ACI 306.1.
3. Concrete shall be maintained at a temperature of at least 50° F. for not less than 72 hours after placing or until it has thoroughly hardened. Cover concrete and

provide sufficient heat as required. When necessary, aggregates shall be heated before mixing. Special precautions shall be taken for protection of transit-mixed concrete.

C. Hot Weather:

1. Concrete to be placed during hot weather shall comply with the requirements of ACI 318, Section 5.13.
2. Maintain concrete temperatures indicated in Table 2.1.5 of ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square feet of exposed concrete per hour.
3. Cool concrete using methods indicated in ACI 305R Appendix B.
4. Place and cure concrete as specified in ACI 305R Chapter 4.

D. Compaction and Screeding:

1. Tamp freshly placed concrete with a heavy tamper until at least 3/8 inch of mortar is brought to surface. Concrete shall then be tamped with a light tamper and screeded with a heavy straightedge until depressions and irregularities are eliminated, and surface is true to finish grades or elevations. Remove excess water and debris.
2. Where slabs are to receive separate cement finish or mortar setting bed, continued tamping to raise mortar to surface is not performed. Laitance shall be removed by brushing with a stiff brush or by light sandblasting to expose clean top surface of coarse aggregate.

E. Floating and Troweling:

1. When concrete has hydrated sufficiently, it shall be floated to a compact and smooth surface. After floating, wait until concrete has reached proper consistency before troweling. Top surfaces shall receive at least 2 troweling operations with steel hand trowel. Prior to and during final troweling, apply a fine mist of water frequently with an atomizing type fog sprayer. Omit troweling for slabs to receive a separate cement finish.
2. For interior finish slabs, final troweling shall provide a hard, impervious, and non-slip surfaces, free from defects and blemishes. Finished surface shall be within tolerances indicated in Article 3.02. Avoid burnishing. Do not add cement or sand to absorb excess moisture.
  - a. Floor of Walk-In Refrigerator: Finish as specified above, to a smooth finish.

- b. Floor of Gymnasium Locker Rooms: After floating, and while the surface is still plastic, provide a fine textured finish by drawing a fine fiber bristle broom uniformly over the surface in one direction only. Floors sloped for drainage should be brushed in the direction of flow.
3. Vertical concrete surfaces shall be finished smooth and free from marks or other surface defects.

### 3.05 CURING

- A. Length of time, temperature and moisture conditions for curing concrete shall be in accordance with ACI 318, Section 5.11.
- B. Forms containing concrete, top of concrete between forms, and exposed concrete surfaces after removal of forms shall be maintained in a thoroughly wet condition for at least 7 consecutive days after placing.
- C. If weather is hot or surface has dried out, spray surface of concrete slabs and paving with fine mist of water, starting not later than 2 hours after final troweling and continuing until sunset. Surface of finish shall be kept continuously wet until curing medium has been installed.
- D. Immediately after finishing, monolithic floor slabs shall be covered with curing paper. Paper shall be lapped 4 inches at joints and sealed with waterproof sealer. Edges shall be cemented to finish. Repair or replace paper damaged during construction operations.
- E. When curing slabs with proactive water vapor emission and alkalinity control system:
  1. Coordinate and schedule application of curing compound with concrete pour schedule, while conforming to manufacturer's application instructions.
  2. When the surface of the concrete has hardened sufficiently to sustain foot traffic pre-cure slabs with liquefied product application following manufacturer's written instructions. Application shall be by trained applicators.
  3. Monitor Environmental Conditions: Set up weather station 20 to 30 inches above freshly placed concrete. Record temperature, humidity and wind velocity measurements at 15 minute maximum intervals.
  4. Calculate Evaporation Rate: Use recorded weather information in combination with nomograph per ACI 308R, Figure 4.1, Guide to Curing Concrete, to evaluate relevant evaporation rate.
  5. When the bleed water rate of the concrete is approximately equal to the surface water evaporation rate, spray curing compound material throughout surface of

slabs and decks, following manufacturer's written instructions. Application shall be by trained applicators.

6. Perform the following tests at least 28 days after placement of concrete and prior to floor covering installation. Submit to OAR test results indicating locations that do not comply with scheduled flooring installation requirements.
  - a. Calcium chloride testing per ASTM F1869.
  - b. Relative humidity testing per ASTM F2170.
  - c. Alkalinity testing per ASTM F710.
  - d. Perform concrete bond layer humidity meter testing to determine substrate surface acceptability.
7. Areas emitting moisture and alkalinity at rates exceeding floor covering manufacturer's published ASTM F1869 limits, shall receive a corrective coating, at no cost to the OWNER, as follows:
  - a) Mask and protect adjacent walls and floor surfaces from effects of scarification and application of remedial treatment.
  - b) Scarify slab surface in area of application by shot blasting or other method acceptable to corrective coating manufacturer.
  - c) Prepare and fill cracks, control joints and cold joints.
  - d) Apply two-component modified epoxy penetrant and coating with roller and squeegee over required treatment area; saturate surfaces to ensure a through mechanical bond.
  - e) Clean and fill divots, chips, voids and other surface irregularities with one hundred percent Portland cement based patching compound or cementitious fill.
  - f) Apply cementitious surfacing over coating in areas to receive resilient and wood floor coverings to facilitate adhesion; apply to a thickness of 1/8 inch.

### 3.06 FILLING, LEVELING AND PATCHING

- A. Concrete slabs exhibiting high or low spots and indicated to receive resilient floor covering or soft floor covering, shall have surfaces repaired. High spots shall be honed, or ground with power-driven machines to required tolerances. Low spots shall be filled

with latex underlayment, installed in strict accordance with manufacturer's written recommendations.

- B. Holes resulting from form ties or sleeve nuts shall be solidly packed, through exterior walls, by pressure grouting with cement grout, as specified. Grouted holes on exposed surfaces shall be screeded flush and finished to match adjoining surfaces.
- C. Cement Base: Cement base shall be of the height, thickness, and shape detailed. Base shall be reinforced with one inch mesh, 18 gage, zinc-coated wire fabric. Base finish mixture shall be one part Portland cement, 2 parts of fine aggregate and one part pea gravel. Colored cement base shall include a chemically inert mineral oxide pigment in the mix.

### 3.07 FINISHING

- A. Soda and Acid Wash: Concrete surfaces to receive plaster, paint or other finish, and which have been formed by oil coated forms, shall be scrubbed with a solution of 1-1/2 pounds of caustic soda to one gallon of water. Surfaces where smooth wood or waste molds have been furnished shall be scrubbed with a solution of 20 percent muriatic acid. Wash with clean water after scrubbing.
- B. Sacking: Exposed concrete curbs, walls, and other surfaces shall be sacked by an application of Portland cement grout, floated, and rubbed. Sacking shall not be performed until patching and filling of holes has been completed. Entire sacking operation for any continuous area shall be started and completed within the same day.
  - 1. Mix one part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having consistency of thick paint. Wet surface of concrete sufficiently to prevent absorption of water from grout. Apply grout uniformly with a brush or spray gun, then immediately float surface with a cork or other suitable float, scouring wall vigorously.
  - 2. While grout is still plastic, finish surface with a sponge-rubber float, removing excess grout. Allow surface to dry thoroughly, then rub vigorously with dry burlap to completely remove dried grout. No visible film or grout shall remain after rubbing with burlap.
- C. Sandblasting: Exterior concrete surfaces to receive stucco dash coat finish, where plywood or other smooth forms have been furnished, shall be uniformly sand-blasted with sharp quartz sand under sufficient air pressure to remove dirt, form oil and other foreign materials, and roughen surface to provide a proper bond. Such surfaces shall be thoroughly washed with clean water after sandblasting.
- D. Abrasive: Concrete stair treads, landings, ramps and steps on interior and exterior of buildings, and interior exposed concrete floors in shop buildings shall receive an abrasive finish.

- E. Floor Hardener: Exposed interior concrete floors throughout shall be treated with floor hardener.
  - 1. Protect adjacent surfaces. Clean surfaces to receive treatment in accordance with manufacturer's instructions, ensuring that all stains, oil, grease, form release agents, laitance, dust and dirt are removed prior to application.
  - 2. Apply hardener in accordance with manufacturer's instructions as soon as concrete is firm enough to work on after final troweling.
- F. Cement Grout and Dry-Pack Concrete: Cement grout shall be mixed at the Project site and shall be composed of one volume of Portland cement and 2-1/2 volumes of fine aggregate. Materials shall be mixed dry with sufficient water added to make mixture flow under its own weight. When grout is used as a dry pack concrete, add sufficient water to provide a stiff mixture, which can be molded into a sphere.
- G. Broom Finish: Exterior stair treads and landings shall be provided with a non-slip broom finish in addition to abrasive finish specified.
- H. Abrasive Stair Nosing: Nosing shall be installed according to manufacturers written recommendations.

### 3.08 EXPANSION AND CONSTRUCTION JOINTS

- A. Construction Joints: Details and proposed location of construction joints shall be as indicated on the Drawings, located to least impair strength of structure, in accordance with the following:
  - 1. Thoroughly clean contact surface by sand blasting entire surface not earlier than 5 days after initial placement.
  - 2. A mix containing same proportion of sand and cement provided in concrete plus a maximum of 50 percent of coarse aggregate shall be placed to a depth of at least one inch on horizontal joints. Vertical joints shall be wetted and coated with a neat cement grout immediately before placing of new concrete.
  - 3. Should contact surface become coated with earth, sawdust, or deleterious material of any kind after being cleaned, entire surface shall be re-cleaned before applying mix.
- B. Expansion Joints: Provide expansion joints where indicated in walks and exterior slabs. Space approximately 20 feet apart, unless otherwise indicated. Joints shall extend entirely through slab with joint filler in one piece for width of walk or slab. Joint filler shall be 3/8 inch thick, unless otherwise indicated.
  - 1. Do not place expansion joints in concrete filled metal deck.

- C. Tooled Joints: Slabs, walks and paving shall be marked into areas as indicated with markings made with a V-grooving tool. Marks shall be round-edged, free from burrs or obstructions, with clean cut angles and shall be straight and true. Walks, if not indicated, shall be marked off into rectangles of not more than 12 square feet and shall have a center marking where more than 5 feet wide.

- 1. Do not place joints in concrete filled metal deck.

### 3.09 TESTING

- A. Molded Cylinder Tests:

- 2. Inspector or testing lab personnel will prepare cylinders and perform slump tests. Samples for concrete strength shall be taken in accordance to ASTM C172. Each cylinder shall be dated, given a number, point in structure from which sample was obtained, mix design number, mix design strength and result of accompanying slump test noted.
  - 3. Separate tests of molded concrete cylinders obtained at same place and time shall be made at age of three days, seven days, and 28 days. A strength test shall be the average of the compressive strength of two cylinders, obtained from the same sample of concrete and tested at 28 days or at test age designated for determination of  $f_c$ .
  - 4. Test cylinders shall be prepared at the Project site and stored in testing laboratory in accordance with ASTM C31, and tested in accordance with ASTM C39.

- B. Core Test: At request of the ARCHITECT, cores of hardened concrete shall be cut from portions of hydrated structures for testing, in accordance with CBC and ASTM C42.

- 1. Provide 4 inch diameter cores at representative places throughout the structure as designated by the ARCHITECT.
  - 2. In general, provide sufficient cores to represent concrete placed with at least one core for each 4,000 square feet of building area, and at least 3 cores total for each Project.
  - 3. Where cores have been removed, fill voids with drypack, and patch the finish to match the adjacent existing surfaces.

- C. Concrete Consistency: Measure consistency according to ASTM C143. Test twice each day or partial day's run of the mixer.

- D. Adjustment of Mix: If the strength of any grade of concrete for any portion of Work, as indicated by molded test cylinders, falls below minimum 28 days compressive strength

specified or indicated, adjust mix design for remaining portion of construction so that resulting concrete meets minimum strength requirements.

- E. Air Content Testing: Measure in accordance to ASTM C173 or ASTM C231, for each composite sample taken in accordance to ASTM C172.
- F. Defective Concrete:
  - 1. Should strength of any grade of concrete, for any portion of Work indicated by tests of molded cylinders and core tests, fall below minimum 28 days strength specified or indicated, concrete will be deemed defective Work and shall be replaced or adequately strengthened in a manner acceptable to the ARCHITECT and DSA.
  - 2. Concrete Work that is not formed as indicated, is not true within 1/250 of span, not true to intended alignment, not plumb or level where so intended, not true to intended grades and levels, contains sawdust shavings, wood or embedded debris, or does not fully conform to Contract provisions, shall be deemed to be defective Work and shall be removed and replaced.
- G. Concrete for Equipment Pads, Mechanical and Electrical Work: Unless otherwise indicated, strength shall have a minimum  $f'c = 3,000$  psi. Exposed concrete shall be provided with a hand trowel finish with radius corners and edges. Form and place concrete where necessary as described in Section 03 1000 Concrete Forming and Accessories, and reinforced as described in Section 03 2000 Concrete Reinforcing. Calcium chloride shall not be furnished in any concrete mix provided for the installation of underground electrical conduits. For concrete encasement of more than one conduit, furnish 3/4 inch maximum aggregate.

### 3.10 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

### 3.11 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION



SECTION 05 1200

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Structural steel.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 420 - Testing and Inspection.
3. Section 03 3000 - Cast-In-Place Concrete.
4. Section 05 3000 - Metal Decking.
5. Section 05 5000 - Metal Fabrications.
6. Section 05 1213 - Architectural Exposed Structural Steel
7. Section 09 9000 - Paints and Coatings
8. Section 09 9600 - High Performance Coatings

1.02 REFERENCES

A. California Building Code (2016 CBC), Chapter 22A, 2016 Edition

B. American Institute of Steel Construction (AISC):

1. AISC – Steel Construction Manual:
  - a. AISC 360 Specifications for Structural Steel Buildings.
  - b. AISC Code of Standard Practice for Steel Buildings and Bridges.
  - c. RCSC Specification for Structural Joints Using ASTM A325 or A490 Bolts.
2. AISC 341 - Seismic Provisions for Structural Steel Buildings, including Supplements.

3. AISC 358 - Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications.

C. American Society for Testing and Materials (ASTM):

1. ASTM A36 – Standard Specification for Carbon Structural Steel.
2. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
4. ASTM A123 – Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
5. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength.
7. ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 Ksi Minimum Tensile Strength.
8. ASTM A435 - Standard Specification for Straight-Beam Ultrasonic Examination of Steel Plates.
9. ASTM A490 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
10. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
11. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
12. ASTM A572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
13. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
14. ASTM A673 - Standard Specification for Sampling Procedure for Impact Testing of Structural Steel.

15. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
16. ASTM A992 – Standard Specification for Structural Steel Shapes.
17. ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink).
18. ASTM E23 - Standard Test Methods for Notched Bar Impact Testing of Metallic Materials.
19. ASTM E112 - Standard Test Methods for Determining Average Grain Size.
20. ASTM F436 – Standard Specification for Hardened Steel Washers.
21. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
22. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55 and 105-Ksi Yield Strength.
23. ASTM F1852 – Standard Specification for “Twist Off” Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tension Strength.

D. American Welding Society (AWS):

1. AWS D1.1 – Structural Welding Code - Steel.
2. AWS D1.8 – Structural Welding Code – Seismic Supplement.
3. AWS A2.4 – Standard Symbols for Welding, Brazing, and Nondestructive Examination.
4. AWS B2.1 – Specifications for Welding Procedures and Performance Qualification.

E. SSPC – Steel Structures Painting Council:

1. SP-2 - Hand Tool Cleaning.
2. PA-1 - Paint Application Specification No. 1.

### 1.03 REGULATORY REQUIREMENTS

- A. Structural steel shall conform to CBC requirements, except that steel manufactured by acid Bessemer process is not permitted for structural purposes.

- B. Sheet and strip steel other than those listed in CBC, if provided for structural purpose, shall comply with DSA requirements.

#### 1.04 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings, including complete details and schedules for fabrication and shop assembly of members, and details, schedules, procedures and diagrams showing the sequence of erection. Fully detail minor connections and fastenings not shown or specified in the Contract Documents to meet required conditions using similar detailing as shown in the Contract Documents. Include a fully detailed, well controlled sequence and technique plan for shop and field welding that minimizes locked in stresses and distortion; submit sequence and technique plan for review by the ARCHITECT.
  - 1. Include details of cuts, connections, camber, and holes in accordance with Figure 4.5 of AWS D1.1 or AISC Chapter J, weld position plan and other pertinent data. Indicate welds by standard AWS symbols, and show size, length and type of each weld.
  - 2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed for Work specified in other sections.
  - 3. Erection and Bracing Plan and Erection Procedure: Submit an erection and framing plan, including columns, beams, and girders, signed and sealed by a Structural or Civil Engineer registered in the State of California in accordance with Title 8 California Code of Regulations, Section 1710, Structural Steel Erection. Maintain a copy at the Project site as required by the California Division of Industrial Safety.
  - 4. Submit a list of steel items to be galvanized.
  - 5. Include identification and details of Architecturally Exposed Structural Steel (AESS) members, if applicable.
- B. Product Data: Submit copies of fabricator's specifications and installation instructions for the following products. Include laboratory test reports and other data required demonstrating compliance with these Specifications:
  - 1. Structural steel, each type; including certified copies of mill reports covering chemical and physical properties.
  - 2. Welding electrodes.
  - 3. Welding gas.
  - 4. Unfinished bolts and nuts.

5. Structural steel primer paint.
  6. High-strength bolts, including nuts and washers.
- C. Manufacturer's Mill Certificate: Submit, certifying that products meet or exceed specified requirements.
  - D. Mill Test Reports: Submit manufacturer's certificates, indicating structural yield and tensile strength, destructive and non-destructive test analysis.
  - E. Welding Procedure Specifications (WPS): Submit weld procedures for all welding on project to OWNER's testing laboratory for approval. After approval by testing laboratory, submit to ARCHITECT for Record. Weld procedures shall be qualified as described in AWS D1.5, AISC 341 and AISC 358, as applicable. Weld procedures shall indicate joints details and tolerances, preheat and interpass temperature, post-heat treatment, single or multiple stringer passes, peening of stringer passes for groove welds except for the first and the last pass, electrode type and size, welding current, polarity and amperes and root treatment. The welding variables for each stringer pass shall be recorded and averaged; from these averages the weld heat input shall be calculated. Submit the manufacturer's product data sheet for all welding material used.
  - F. Welder's Certificates: Field welders shall be Project certified in accordance with AWS D1.1. Shop welders shall be Project certified for FCAW in accordance with AWS D1.1.
  - G. Test Reports: Submit reports of tests conducted on shop and field welded and bolted connections. Include data on type of test conducted and test results.

#### 1.05 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement, except as otherwise indicated:
  1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges, modified as follows:
    - a. Replace "Structural Design Drawings" with "Contract Documents" throughout the document.
    - b. Paragraph 3.2 is hereby modified in it's entirety as follows: "Contract Documents including but not limited to architectural, mechanical, plumbing, electrical, civil and kitchen design drawings and specifications shall be used as supplement to the structural plans to define configurations and construction information."
    - c. Delete Paragraph 3.3.

- d. In Paragraph 4.4, delete the following sentence: “These drawings shall be returned to the Fabricator within 14 calendar days.”
  - e. Delete Paragraph 4.4.1.(a) in its entirety.
  - f. Paragraph 4.4.2 is hereby modified in it’s entirety as follows: “No review action, implicit or explicit, shall be interpreted to authorize changes in the Contract Documents.”
2. Perform welding in accordance with AWS Standards, AWS D1.1, and California Building Code Section 2204A.1 and approved Weld Procedure Specifications (WPS). Shop fabrication shall be inspected in accordance with CBC.
- B. Erect mock-up panel of fabricated structural steel meeting Architecturally Exposed Structural Steel (AESS) tolerances for exposed areas. Approval by ARCHITECT is required. Mock-up to remain for comparison but may not be left as part of the work.

## 1.06 DELIVERY, STORAGE AND HANDLING

- A. Store structural steel above grade on platforms, skids or other supports.
- B. Protect steel from corrosion.
- C. Store welding electrodes in accordance with AWS D 12.1. Deliver electrodes to the site in unbroken packages bearing the manufacturer's name and label identifying the contents.
- D. Store other materials in a weather-tight and dry place until installed into the Work.

## PART 2 – PRODUCTS

### 2.01 GENERAL

- A. Stock Materials: Provide exact materials, sections, shapes, thickness, sizes, weights, and details of construction indicated on Drawings. Changes because of material stock or shop practices will be considered if net area of shape or section is not reduced thereby, if material and structural properties are at least equivalent, and if overall dimensions are not exceeded.
- B. Shapes, bars, plates, tubes and pipes shall be made of materials with at least 16 percent recycled content if produced from Basic Oxygen Furnace (BOF) or at least 67 percent recycled content if produced from Electric Arc Furnace (EAF).

### 2.02 MATERIALS

- A. Steel shapes: ASTM A992, or ASTM A572 GR 50.
- B. Steel plates: ASTM A36 or A572-GR50 as noted on drawings.
- C. Steel tubing: ASTM A500, Grade B,  $F_y = 46$  ksi.
- D. Steel pipe: ASTM A120 standard weight for general use; ASTM A53 Grade B where used for structural purposes.
- E. Bolts and nuts: ASTM A307.
- F. High-strength bolts, nuts, and washers: ASTM A325 or ASTM A490 as indicated for the bolts, ASTM A563 Grade C for nuts, and ASTM F436 for carburized washers. All high-strength bolts shall have a suitable identifying mark placed on top of bolt head at the factory. Refer to drawings for bolt specification requirements.
- G. Anchor Bolts: ASTM A36, A307, A354, or F-1554 bolts as specified on contract documents.
- H. Electrodes: AWS D5.1, E70XX Series Low Hydrogen Electrodes as required for intended use. All electrodes shall have a minimum Notch -Toughness of 20 FT-Lb at -20 degree F.
- I. Primers: Lead-free metal primer:
  - 1. SSPC-Paint 20, Zinc-Rich Primer.
  - 2. SSPC-Paint 23, Latex Primer.
  - 3. SSPC-Paint 25 Zinc Oxide Primer.
- J. Galvanizing: ASTM A123.
- K. Shear stud connectors: ASTM A108, Grade 1015 forged steel, headed, uncoated, granular flux filled shear connector or anchor studs by Nelson Stud Welding Division, or equal.
- L. Grout: ASTM C1107, non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at seven days; of consistency suitable for application and a 30 minute working time.

## 2.03 FABRICATION

- A. Fabricate in accordance to AISC Code of Standard Practice for Steel Buildings and Bridges and AISC 360.

- B. **Cleaning and Straightening Materials:** Materials being fabricated shall be thoroughly cleaned of scale and rust, and straightened before fabrication. Cleaning and straightening methods shall not damage material. After punching or fabrication of component parts of a member, twists or bends shall be removed before parts are assembled.
- C. **Cutting, Punching, Drilling and Tapping:** Unless otherwise indicated or specified, structural steel fabricator shall perform the cutting, punching, drilling and tapping of Work so that Work of other trades will properly connect to steel Work.
- D. **Milling:** Compression joints depending on contact bearing shall be furnished with bearing surfaces prepared to a common plane by milling.
- E. **Use of Burning Torch:** Oxygen cutting of members shall be performed by machine. Gouges greater than 3/16 inch that remain from cutting shall be removed by grinding. Reentrant corners shall be shaped notch free to a radius of at least 1/2 inch. Gas cutting of holes for bolts or rivets is not permitted.
- F. **Steel exposed to weather shall be hot-dip galvanized.**
- G. **Galvanizing:** After fabrication, items indicated or specified to be galvanized shall be galvanized in largest practical sizes. Fabrication includes operations of shearing, punching, bending, forming, assembling or welding. Galvanized items shall be free from projections, barbs, or icicles resulting from the galvanizing process.
- H. **Welding:**
  - 1. Type of steel furnished in welded structures shall provide chemical properties suitable for welding as determined by chemical analysis. Welds shall conform to the verification and inspection requirements of CBC Chapter 17A. Conform to AWS D1.1, and CBC Chapter 22A.
  - 2. Materials and workmanship shall conform to the requirements specified herein and to CBC requirements, modified as follows:
    - a. No welded splices shall be permitted except those indicated on Drawings unless specifically reviewed by the ARCHITECT.
    - b. Drawings will designate joints in which it is important that welding sequence and technique be controlled to minimize shrinkage stresses and distortion.
  - 3. Welding shall be performed in accordance with requirements of the AWS Structural Welding Code.
  - 4. Architecturally Exposed Structural Steel: Verify that weld sizes, fabrication sequence, and equipment used for Architecturally Exposed Structural Steel



will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds ½ inch and larger. Grind flush butt welds. Dress exposed welds.

5. Remove erection bolts on welded, Architecturally Exposed Structural Steel; fill holes with plug welds; and grind smooth at exposed surfaces.

I. Shop Finish:

1. Notify the Project Inspector when Work is ready to receive shop prime coat. Work shall be inspected by the Project Inspector before installation of primer.
2. Structural steel and fittings shall receive a coat of primer, except:
  - a. Surfaces that will be galvanized.
  - b. Surfaces that will be fireproofed.
  - c. Surfaces that will be field welded.
  - d. Surfaces in contact with concrete.
  - e. Surfaces high strength bolted.
3. The primer specified shall be spray applied, filling joints and corners and covering surfaces with a smooth unbroken film. The minimum dry film thickness of the primer shall be 2.0 mils.

J. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

K. Fabricate Architecturally Exposed Structural Steel with exposed surfaces smooth, square, and free of surfaces blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness.

1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating and shop priming.
2. Comply with fabrication requirements, including tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for Architecturally Exposed Structural Steel.

L. Architecturally Exposed Structural Steel: use special care in unloading, handling and erecting the steel to avoid marking or distorting the steel members. Minimize damage to any shop paint when temporary braces or erection clips are used. Avoid unsightly surfaces upon removal. Grind smooth tack welds and holes filled with weld metal or

body solder. Plan and execute all operations in such a manner that the close fit and neat appearance of the structure will not be impaired.

#### 2.04 SHOP AND FIELD QUALITY CONTROL

- A. A special inspector, approved by DSA to inspect the Work of this section, shall inspect high-strength bolted connections. OWNER will provide a DSA approved independent testing laboratory to perform tests and prepare test reports in accordance with CBC 1704A. The Project Inspector shall be responsible for monitoring the work of the special inspector and testing laboratories to ensure that the testing program is satisfactorily completed.
- B. An AWS CWI certified special inspector, approved by DSA to inspect the Work of this section, shall inspect welded connections in accordance with CBC 1705A.2.5. The OWNER will provide a DSA approved independent testing laboratory to perform tests and prepare test reports. The Project Inspector shall be responsible for monitoring the work of the special inspector and testing laboratories to ensure that the testing program is satisfactorily completed.
- C. The independent testing laboratory shall conduct and interpret test and state in each report whether test specimens comply with requirements, and specifically state any deviations there from.
- D. Provide access to all places where structural steel Work is being fabricated or produced so required inspection and testing can be performed.
- E. The independent testing laboratory may inspect or test structural steel at plant before shipment; however, ARCHITECT reserves the right at any time before Contract Completion to deem materials not in compliance with the specified requirements as defective Work.
- F. Correct defects in structural Work when inspections and laboratory test reports indicate noncompliance with specified requirements. Perform additional tests as may be required to reconfirm noncompliance of original Work, and as may be required to show demonstrate compliance of corrected Work.
- G. Inspection of Structural Tube Steel/Hollow Structural Sections (HSS): Structural tube steel members (round, square, rectangular), disregarding steel origin, will be inspected during shop fabrication per DSA Bulletin 07-03. Inspector will perform a visual examination of the seam weld area for visible discontinuities. When defects are suspected, non-destructive testing will be considered.
- H. Welding: Inspect and test during fabrication and erection of structural steel assemblies as follows:

1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in the Work. Record Work required and performed to correct deficiencies.
2. Inspect welds. Welds shall be visually inspected before performing any non-destructive testing. Groove weld shall be inspected by ultrasonic or other approved non-destructive test methods. Testing shall be performed to AWS D1.1 Table 6.3 cyclically loaded non-tubular connections.
3. Ultrasonic testing shall be performed by a specially trained and qualified technician who shall operate the equipment, examine welds, and maintain a record of welds examined, defects found, and disposition of each defect. Repair and test defective welds.
4. Rate of Testing: Completed welds contained in joints and splices shall be tested 100 percent either by ultrasonic testing or by radiography.
5. Welds, when installed in column splices, shall be tested by either ultrasonic testing or radiography.
6. Base metal thicker than 1 ½-inch, when subjected to through-thickness weld shrinkage strains, shall be ultrasonically inspected by shear wave methods for discontinuities directly behind such welds. Tests shall be performed at least 48 hours after completed joint has cooled down to ambient air temperature.
7. Material discontinuities shall be reviewed based on the defect rating in accordance with the criteria of AWS D1.1 table 6.3 by the ARCHITECT and DSA.
8. Other method of non-destructive testing and inspection, for example, liquid dye penetrate testing, magnetic particle inspection or radiographic inspection may be performed on weld if required.
9. Lamellar Tearing: Lamellar-tearing resulting from welding is a crack (with zero tolerance) and shall be repaired in accordance with AWS D1.1.
10. Lamination: The rejection criteria shall be based on ASTM A435.
11. Where testing reveals lamination or conditions of lamellar tearing in base metal, the steel fabricator shall submit a proposed method of repair for review by the ARCHITECT. Test repaired areas as required.
12. 1Magnetic Particle Testing: Magnetic particle testing when required shall be provided in accordance with AWS D1.1 for procedure and technique. The standards of acceptance shall be in accordance with AWS D1.1 – Qualification.

- I. Lamellar Tearing: Prior to welding plates 1 to 1 ½-inch thick and greater and rolled shapes within the distance from 6 inches above the top of the joint to 6 inches below the bottom of the joint shall be checked by ultrasonic testing for laminations in base metal which may interfere with the inspection of the completed joint. Should these defects occur, members will be reviewed by the ARCHITECT and DSA. Welding procedure specifications in sub-section 1.5G specify welding practices to minimize lamellar tearing.
- J. Prior Testing of Base Material: Test material before fabrication.
- K. Lines and levels of erected steel shall be certified by a State of California licensed surveyor as set forth in related Division 01 section.
- L. Welded studs shall be tested and inspected by the special inspector in accordance with requirements of AWS D1.1 – Stud Welding.
- M. Record Drawings: After steel has been erected, correct or revise Shop Drawings and erection diagrams to correspond with reviewed changes performed in the field.

### PART 3 - EXECUTION

#### 3.01 PREPARATION

- A. Verify governing dimensions and conditions of the Work before commencing erection Work.
  - 1. Report discrepancies between drawings and field dimensions to ARCHITECT before commencing work.
  - 2. Beginning of installation means erector accepts existing conditions and surfaces underlying or adjacent to work of this section.
- B. Provide temporary shoring and bracing, and other support during performance of the Work. Remove after steel is in place and connected, and after cast-in-place concrete has reached its design strength.
- C. Coordinate prime coat repair and application with requirements of Section 09 9000.

#### 3.02 ERECTION

- A. Install structural steel accurately in locations, to elevations indicated, and according to AISC specifications and CBC requirements.
- B. Clean surfaces of base plates and bearing plates.
  - 1. Install base and bearing plates for structural members on wedges, shims, or setting nuts as required.

2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims; cut off flush with edge of base or bearing plate before packing with grout.
- C. Maintain erection tolerances of structural steel within AISC Code of Standard Practice for Steel Buildings and Bridges.
1. Architecturally Exposed Structural Steel members and components, plumbed, leveled and aligned to a tolerance not to exceed one-half the amount permitted for structural steel. CONTRACTOR to provide adjustable connections between Architecturally Exposed Structural Steel and the structural steel frame or the masonry or concrete supports, in order to provide the erector with means for adjustment.
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact after assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
- E. Do not permit thermal cutting during erection of structural steel.
- F. Where indicated for field connections, provide standard bolts complying with ASTM A307.
- G. Install high strength steel bolts at locations indicated. Assembly and installation shall be in accordance with CBC requirements.
1. Allowable hole sizes: 1/16 inch larger than bolt size.
  2. Use friction type connection with standard hardened steel circular, square or rectangular washer under bolt nut.
  3. Thoroughly clean area under bolt head, nut and washer. Remove all paint, lacquer, oil or other coatings except organic zinc-rich paints in accordance with SSPC, SP-2.
  4. Tighten bolts by power torque wrench or hand wrench until twist-off.
- H. CONTRACTOR shall be responsible for correcting detailing and fabrication errors and for correct fitting of all members and components.
- I. Erect structural steel plumb and level and to proper tolerances as set forth in the AISC Manual. Provide temporary bracing, supports or connections required for complete safety of structure until final permanent connections are installed.
- J. Install column bases within a tolerance of 1/8 inch of detailed centerlines, level at proper elevations. Support bases on double nuts and solidly fill spaces under bases with cement grout.

- K. Provide anchor bolts with templates and diagrams. CONTRACTOR shall be responsible for proper location and installation of bolts. Correct deficiencies and errors.
- L. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A780.

### 3.03 FITTING

- A. Closely fit members, finished true to line and in precise position required to allow accurate erection and proper joining in the field.
- B. Drilling to enlarge unfair holes will not be allowed. Allow only enough drifting during assembly to bring parts into position, but not enough to enlarge holes or distort the metal. Do not heat rolled sections, unless approved by ARCHITECT.

### 3.04 PUNCHING AND DRILLING

- A. Punch material 1/16 inch larger than nominal diameter of bolt, wherever thickness of metal is equal to or less than the diameter of the bolt plus 1/8 inch.
- B. Drill or sub-punch and ream where metal is equal to or more than the diameter of the bolt plus 1/8 inch. Make diameter for sub-punched and sub-drilled holes 1/16 inch larger than nominal diameter of bolt.
- C. Precisely locate holes to ensure passage of bolt through assembled materials without drifting. Enlarge holes when necessary to receive bolts by reaming; flame cutting to enlarge holes is not acceptable. Structural Steel members with poorly matched holes will be rejected.

### 3.05 FINISHING

- A. After erection, spots or surfaces where paint has been removed, damaged, or burned off, and field rivets, bolts, and other field connections shall be cleaned of dirt, oil, grease, and burned paint and furnished with a spot coat of the same primer installed during shop priming.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Install paint to exposed areas with the same material installed during shop painting. Install by brush or spray to provide a minimum dry film thickness of 1.5 mils.

### 3.06 FIELD QUALITY CONTROL

- A. OWNER will provide a special inspector and independent testing laboratory to perform field inspections and tests and to prepare test reports.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

3.07 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project Site.

3.08 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.09 HANDLING

- A. Both in shop and in the field, transport, handle and erect to prevent damage or overstressing of any component.

END OF SECTION

## SECTION 051213

### ARCHITECTURALLY EXPOSED STRUCTURAL STEEL FRAMING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

###### A. Section Includes:

1. Architecturally exposed structural steel (AESS).
2. Section 051200 "Structural Steel Framing" requirements that also apply to AESS.

###### B. Related Requirements:

1. Section 055000 "Metal Fabrications"
2. Section 099113 "Exterior Painting"
3. Section 099600 "High-Performance Coatings"

##### 1.3 DEFINITIONS

- A. AESS: Architecturally exposed structural steel.
- B. Category AESS 1: Structural steel that is categorized by ANSI/AISC 303, Section 10, as AESS 1 and may be designated AESS 1 or Category AESS 1 in the Contract Documents.
- C. Category AESS 2: Structural steel that is categorized by ANSI/AISC 303, Section 10, as AESS 2 and is designated as AESS 2 or Category AESS 2 in the Contract Documents.
- D. Category AESS 3: Structural steel that is categorized by ANSI/AISC 303, Section 10, as AESS 3 and is designated as AESS 3 or Category AESS 3 in the Contract Documents.
- E. Category AESS 4: Structural steel that is categorized by ANSI/AISC 303, Section 10, as AESS 4 and is designated as AESS 4 or Category AESS 4 in the Contract Documents.
- F. Category AESS C: Structural steel with custom characteristics that is categorized by ANSI/AISC 303, Section 10, as AESS C and is designated as AESS C or Category AESS C in the Contract Documents.
- G. SEAC/RMSCA Guide Specification: SEAC/RMSCA's "Sample Specification, Section 05 02 13: Architecturally Exposed Structural Steel."



#### 1.4 COORDINATION

- A. Coordinate surface preparation requirements for shop-primed items.
- B. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

#### 1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site.

#### 1.6 ACTION SUBMITTALS

##### A. Product Data:

1. Tension-control, high-strength, bolt-nut-washer assemblies.
2. Corrosion-resisting (weathering steel), tension-control, high-strength, bolt-nut-washer assemblies.
3. Filler.
4. Primer.
5. Galvanized-steel primer.
6. Etching cleaner.
7. Galvanized repair paint.

##### B. Shop Drawings: Show fabrication of AESS components.

1. Identify AESS category for each steel member and connection, including transitions between AESS categories and between AESS and non-AESS.
2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
3. Include embedment Drawings.
4. Indicate orientation of mill marks and HSS seams.
5. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain
6. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections. Indicate orientation and location of bolt heads.
7. Indicate exposed surfaces and edges and surface preparation being used.
8. Indicate special tolerances and erection requirements.
9. Indicate weep holes for HSS
10. Indicate surface preparation, primer, and coating requirements, including systems specified in other Sections.

##### C. Samples: Submit Samples to set quality standards for AESS.

1. Two steel plates, 3/8 by 8 by 4 inches, with long edges joined by a groove weld

2. Steel plate, 3/8 by 8 by 8 inches, with one end of a short length of rectangular steel tube, 4 by 6 by 3/8 inches, welded to plate with a continuous fillet weld.
3. Round steel tube or pipe, minimum 8 inches in diameter, with end of another round steel tube or pipe, approximately 4 inches in diameter, welded to its side at a 45-degree angle with a continuous fillet weld.

#### 1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer, fabricator and shop-painting applicator.
- B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

#### 1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172) and is experienced in fabricating AESS similar to that indicated on this Project.
- B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program, is designated an AISC-Certified Erector, Category ACSE, and is experienced in erecting AESS similar to that indicated on this Project.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint or SSPC-QP 3.
- D. Mockups: Build mockups of AESS to set quality standards for fabrication and installation.
  1. Build mockup of typical portion of AESS as shown on Drawings.
  2. Coordinate painting requirements with Section 099113 "Exterior Painting."
  3. Coordinate high-performance coatings requirements with Section 099600 "High-Performance Coatings."
  4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Use special care in handling AESS to prevent twisting, warping, nicking, and other damage during fabrication, delivery, and erection. Store materials to permit easy access for inspection and identification. Keep AESS members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect AESS members and packaged materials from corrosion and deterioration.
  1. Do not store AESS materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

## 1.10 FIELD CONDITIONS

- A. Field Measurements: Where AESS is indicated to fit against other construction, verify actual dimensions by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with requirements of ANSI/AISC 303, Sections 1 through 9 and as modified in Section 10, "Architecturally Exposed Structural Steel."

### 2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. Tension-Control, High-Strength, Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, round-head assemblies consisting of steel structural bolts with splined ends; ASTM A563, Grade DH heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
  - 1. Finish: Mechanically deposited zinc coating.
- B. Corrosion-Resisting (Weathering) Steel, Tension-Control, High-Strength, Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 3, round-head assemblies consisting of steel structural bolts with splined ends; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 3, hardened carbon-steel washers.

### 2.3 FILLER

- A. Polyester filler intended for use in repairing dents in automobile bodies.

### 2.4 PRIMER

- A. Steel Primer:
  - 1. Comply with Section 099113 "Exterior Painting" and Section 099600 "High-Performance Coatings."
  - 2. SSPC-Paint 23, latex primer.
  - 3. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Galvanized-Steel Primer:
  - 1. Etching Cleaner: MPI#25, for galvanized steel.
  - 2. Galvanizing Repair Paint

## 2.5 FABRICATION

- A. Shop fabricate and assemble AESS to the maximum extent possible. Locate field joints at concealed locations if possible. Detail assemblies to minimize handling and to expedite erection.
1. Use special care handling and fabricating AESS before and after shop painting to minimize damage to shop finish.
- B. Category AESS 1:
1. Comply with overall profile dimensions of AWS D1.1/D1.1M for welded built-up members. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
  2. Prepare surfaces according to Part 2 "Shop Priming" Article and SSPC-SP 6 (WAB)/NACE WAB-3.
  3. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and eased edges.
  4. Make intermittent welds appear continuous, using filler or additional welding.
  5. Seal weld open ends of hollow structural sections with 3/8-inch closure plates.
  6. Limit butt and plug weld projections to 1/16 inch.
  7. Install bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
  8. Remove weld spatter, slivers, and similar surface discontinuities.
  9. Remove blemishes and surface irregularities resulting from temporary braces or fixtures by filling or grinding, before cleaning, treating, and shop priming.
  10. Grind tack welds smooth unless incorporated into final welds.
  11. Remove backing and runoff tabs, and grind welds smooth.
- C. Category AESS 2:
1. Comply with overall profile dimensions of AWS D1.1/D1.1M for welded built-up members. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
  2. Prepare surfaces according to Part 2 "Shop Priming" Article and SSPC-SP 6 (WAB)/NACE WAB-3.
  3. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and eased edges.
  4. Make intermittent welds appear continuous, using filler or additional welding.
  5. Seal weld open ends of hollow structural sections with 3/8-inch closure plates.
  6. Limit butt and plug weld projections to 1/16 inch.
  7. Install bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
  8. Remove weld spatter, slivers, and similar surface discontinuities.
  9. Remove blemishes and surface irregularities resulting from temporary braces or fixtures by filling or grinding, before cleaning, treating, and shop priming.
  10. Grind tack welds smooth unless incorporated into final welds.
  11. Remove backing and runoff tabs, and grind welds smooth.
  12. Limit as-fabricated straightness tolerance to one-half that permitted for structural-steel materials in ANSI/AISC 303.

13. Limit as-fabricated curved structural steel tolerance to that permitted for structural-steel materials in ANSI/AISC 303.
14. Limit as-fabricated straightness tolerance of welded built-up members to one-half that permitted by AWS D1.1/D1.1M.
15. Conceal fabrication and erection markings from view in the completed structure.
16. Make welds uniform and smooth.

D. Category AESS 3:

1. Comply with overall profile dimensions of AWS D1.1/D1.1M for welded built-up members. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
2. Prepare surfaces according to Part 2 "Shop Priming" Article and SSPC-SP 6 (WAB)/NACE WAB-3.
3. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and eased edges.
4. Make intermittent welds appear continuous, using filler or additional welding.
5. Seal weld open ends of hollow structural sections with 3/8-inch closure plates.
6. Limit butt and plug weld projections to 1/16 inch.
7. Install bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
8. Remove weld spatter, slivers, and similar surface discontinuities.
9. Remove blemishes and surface irregularities resulting from temporary braces or fixtures by filling or grinding, before cleaning, treating, and shop priming.
10. Grind tack welds smooth unless incorporated into final welds.
11. Remove backing and runoff tabs, and grind welds smooth.
12. Limit as-fabricated straightness tolerance to one-half that permitted for structural-steel materials in ANSI/AISC 303.
13. Limit as-fabricated curved structural steel tolerance to that permitted for structural-steel materials in ANSI/AISC 303.
14. Limit as-fabricated straightness tolerance of welded built-up members to one-half that permitted by AWS D1.1/D1.1M.
15. Conceal fabrication and erection markings from view in the completed structure.
16. Make welds uniform and smooth.
17. Cut out mill marks from mill material or hide these markings from view in the completed structure. Where neither method is possible, remove mill marks by grinding and filling surfaces as approved by Architect.
18. Grind butt and plug welds smooth or fill, removing weld splatter exposed to view.
19. Orient HSS seams as indicated or away from view.
20. Align and match abutting member cross sections.
21. At visible open joints of copes, miters, and cuts, maintain uniform clear gaps of 1/8 inch .  
At closed joints, maintain uniform contact within 1/16 inch.
22. Fabricate with exposed surfaces smooth, square, and of surface quality approved by Architect.

E. Category AESS 4:

1. Comply with overall profile dimensions of AWS D1.1/D1.1M for welded built-up members. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.

2. Prepare surfaces according to Part 2 "Shop Priming" Article and SSPC-SP 6 (WAB)/NACE WAB-3.
  3. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and eased edges.
  4. Make intermittent welds appear continuous, using filler or additional welding.
  5. Seal weld open ends of hollow structural sections with 3/8-inch closure plates.
  6. Limit butt and plug weld projections to 1/16 inch.
  7. Install bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
  8. Remove weld spatter, slivers, and similar surface discontinuities.
  9. Remove blemishes and surface irregularities resulting from temporary braces or fixtures by filling or grinding, before cleaning, treating, and shop priming.
  10. Grind tack welds smooth unless incorporated into final welds.
  11. Remove backing and runoff tabs, and grind welds smooth.
  12. Limit as-fabricated straightness tolerance to one-half that permitted for structural-steel materials in ANSI/AISC 303.
  13. Limit as-fabricated curved structural steel tolerance to that permitted for structural-steel materials in ANSI/AISC 303.
  14. Limit as-fabricated straightness tolerance of welded built-up members to one-half that permitted by AWS D1.1/D1.1M.
  15. Conceal fabrication and erection markings from view in the completed structure.
  16. Make welds uniform and smooth.
  17. Cut out mill marks from mill material or hide these markings from view in the completed structure. Where neither method is possible, remove mill marks by grinding and filling surfaces as approved by Architect.
  18. Grind butt and plug welds smooth or fill, removing weld splatter exposed to view.
  19. Orient HSS seams as indicated or away from view.
  20. Align and match abutting member cross sections.
  21. At visible open joints of copes, miters, and cuts, maintain uniform clear gaps of 1/8 inch . At closed joints, maintain uniform contact within 1/16 inch.
  22. Fabricate with exposed surfaces smooth, square, and of surface quality approved by Architect.
  23. Treat HSS seams to appear seamless.
  24. Contour and blend welds and weld transitions between members, removing splatter exposed to view.
  25. Fill surface imperfections with filler and sand smooth to achieve surface quality approved by Architect.
  26. Minimize weld show-through and distortion on the opposite side of exposed connections by grinding to a smooth profile aligned with adjacent material.
- F. Erection marks, painted marks, and other marks are permitted on galvanized steel surfaces of completed structure.
- G. Cleaning Corrosion-Resisting (Weathering) AESS: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 6 (WAB)/NACE WAB-3.

## 2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

## 2.7 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123/A123M.
  - 1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
  - 2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
  - 3. Galvanize AESS attached to structural-steel frame and located in exterior walls.

## 2.8 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
  - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
  - 2. Surfaces to be field welded.
  - 3. Surfaces to be high-strength bolted with slip-critical connections.
  - 4. Corrosion-resisting (weathering) steel surfaces.
  - 5. Galvanized surfaces.
- B. Surface Preparation: Clean nongalvanized surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
  - 1. SSPC-SP 2.
  - 2. SSPC-SP 3.
  - 3. SSPC-SP 7 (WAB)/NACE WAB-4.
  - 4. SSPC-SP 14 (WAB)/NACE WAB-8.
  - 5. SSPC-SP 6 (WAB)/NACE WAB-3.
  - 6. SSPC-SP 10 (WAB)/NACE WAB-2.
  - 7. SSPC-SP 5 (WAB)/NACE WAB-1.
  - 8. SSPC-SP 8.
- C. Preparing Galvanized Steel for Shop Priming: After galvanizing, thoroughly clean steel of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

- D. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
  - 1. Stripe paint corners, crevices, bolts, welds, and eased edges.
  - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
  - 1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments, showing dimensions, locations, angles, and elevations.
- B. Examine AESS for twists, kinks, warping, gouges, and other imperfections before erecting.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep AESS secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

### 3.3 ERECTION

- A. Take special care during erection to avoid marking or distorting the AESS and to minimize damage to shop painting. Set AESS accurately in locations and to elevations indicated and according to ANSI/AISC 303 and ANSI/AISC 360.
  - 1. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Take care to avoid any blemishes, holes, or unsightly surfaces resulting from the use or removal of temporary elements.
  - 2. Grind tack welds smooth.
  - 3. Remove backing and runoff tabs, and grind welds smooth.
  - 4. Orient bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
  - 5. Remove erection bolts in Category AESS 4. AESS, fill holes with weld metal or filler, and grind or sand smooth to achieve surface quality approved by Architect.



6. Fill weld access holes in Category AESS 4. AESS with weld metal or filler and grind, or sand smooth to achieve surface quality as approved by Architect.
  7. Conceal fabrication and erection markings from view in the completed structure.
- B. In addition to ANSI/AISC 303, Section 10 requirements, comply with the following.
1. Erection of Category AESS 1:
    - a. Erect AESS to the standard frame tolerances specified in ANSI/AISC 303 for non-AESS.
    - b. Comply with AWS D1.1/D1.1M. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
    - c. Remove weld spatter, slivers, and similar surface discontinuities.
    - d. Grind off butt and plug weld projections larger than 1/16 inch.
    - e. Continuous welds shall be of uniform size and profile.
    - f. Ream holes that must be enlarged. Use of drift pins or burning is not permitted. Replace misaligned connection plates where holes cannot be aligned with acceptable appearance.
    - g. Splice members only where indicated on Drawings.
    - h. No torch cutting or field fabrication is permitted.
  2. Erection of Category AESS 3:
    - a. Erect AESS to the standard frame tolerances specified in ANSI/AISC 303 for non-AESS.
    - b. Comply with AWS D1.1/D1.1M. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
    - c. Remove weld spatter, slivers, and similar surface discontinuities.
    - d. Grind off butt and plug weld projections larger than 1/16 inch .
    - e. Continuous welds shall be of uniform size and profile.
    - f. Ream holes that must be enlarged. Use of drift pins or burning is not permitted. Replace misaligned connection plates where holes cannot be aligned with acceptable appearance.
    - g. Splice members only where indicated on Drawings.
    - h. No torch cutting or field fabrication is permitted.
    - i. Weld profiles, quality, and finish shall be as approved by Architect.
    - j. Make joint welds, including tack welds, appear continuous by filling intermittent welds.
  3. Erection of Category AESS 4:
    - a. Erect AESS to the standard frame tolerances specified in ANSI/AISC 303 for non-AESS.
    - b. Comply with AWS D1.1/D1.1M. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
    - c. Remove weld spatter, slivers, and similar surface discontinuities.
    - d. Grind off butt and plug weld projections larger than 1/16 inch.
    - e. Continuous welds shall be of uniform size and profile.

- f. Ream holes that must be enlarged. Use of drift pins or burning is not permitted. Replace misaligned connection plates where holes cannot be aligned with acceptable appearance.
- g. Splice members only where indicated on Drawings.
- h. No torch cutting or field fabrication is permitted.
- i. Weld profiles, quality, and finish shall be as approved by Architect.
- j. Make joint welds, including tack welds, appear continuous by filling intermittent welds.
- k. Grind welds smooth.
- l. Minimize weld show-through and distortion on the opposite side of exposed connections by grinding to a smooth profile aligned with adjacent material.
- m. Oversize welds where ground, contoured, or blended, and grind to provide a smooth transition, matching profile approved by Architect.

### 3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

### 3.5 REPAIR

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and touchup galvanizing to comply with ASTM A780/A780M.
- B. Touchup Painting:
  - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting, to comply with SSPC-PA 1 for touching up shop-painted surfaces.
    - a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
  - 2. Cleaning and touchup painting are specified in Section 099113 "Exterior Painting." and Section 099600 "High-Performance Coatings."
- C. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to inspect AESS as specified in Section 051200 "Structural Steel Framing." The testing agency is not responsible for enforcing requirements relating to aesthetic effect.
- B. Architect will observe AESS in place to determine acceptability relating to aesthetic effect.

END OF SECTION

SECTION 05 3000  
METAL DECKING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Floor and roof metal decking.
2. Shear connector studs for composite decking construction.
3. Edge strips, closure strips and decking accessories.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 420 - Testing and Inspection.
3. Section 03 3000 – Cast-In-Place Concrete.
4. Section 05 1200 - Structural Steel Framing.
5. Section 07 6000 - Flashing and Sheet Metal.

1.02 REFERENCES

A. ASTM International (ASTM):

1. ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
2. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
4. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.

5. ASTM D1056 - Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber.

B. American Welding Society (AWS):

1. AWS D1.1 - Structural Welding Code Sheet – Steel.
2. AWS D1.3 – Structural Welding Code Sheet – Sheet Steel.

C. American Iron and Steel Construction (AISI):

1. AISI – Specifications for the Design of Cold-Formed Steel Structural Members.

D. Underwriters Laboratory (UL):

1. UL – Fire Resistance Directory.

### 1.03 PERFORMANCE REQUIREMENTS

- A. Compute properties of deck sections on basis of effective design width as limited by provisions of the AISI specifications. Provide no less than deck section properties specified, including section modulus and moment of inertia per foot of width.

B. Regulatory Requirements:

1. Decking installed as part of a fire rated assembly shall meet the requirements of the applicable UL Fire Resistance Directory design number.
2. Work of this section shall be in accordance with CBC.

### 1.04 SUBMITTALS

- A. Shop Drawings: Drawings, sections and details indicate type of decking, location, finish, gage of metal, arrangement of sheets, necessary fabrication to incorporate decking into the Work, and relationship to openings and flashing.
- B. Product Data: For each type of decking specified, including structural properties, dimensions, profiles and finishes.
- C. Welder Certificates: Signed by CONTRACTOR certifying that welders comply with the requirements specified under Article “Quality Assurance”.

### 1.05 QUALITY ASSURANCE

- A. General: Metal decking steel shall conform to requirements of strengths and properties of standards specified.
- B. Qualifications of Welders: Properly certified for the type of Work involved in compliance with CBC requirements.
- C. Continuous inspection of welding will be performed by a special inspector, approved by DSA to inspect the Work of this section. Refer to Section 01 420 - Testing and Inspection. The Project Inspector will be responsible for monitoring the work of the special inspector to ensure that the inspection program is satisfactorily completed.
- D. Identification of metal decking steel shall conform to the standards specified in this section and the Drawings.
  - 1. Fabricator shall furnish sufficient evidence to the ARCHITECT attesting compliance with specified requirements.
  - 2. Conform to CBC requirements. Unclassified or unidentified decking is not permitted. Furnish deck manufacturer's certified mill analyses and test reports for each heat covering decking having a minimum  $F_y$  of 33 Ksi. In addition, for decking having  $F_y$  greater than 33 Ksi, testing laboratory shall perform one tension and elongation test and one bend or flattening test for each gage.
- E. Unidentifiable Steel: Steel which is not readily identifiable as to grade from markings and test records is not permitted to be provided as part of the Work of this section.
- F. Manufacturers shall be members of Steel Deck Institute (SDI).

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Protect steel deck from corrosion, deformation and other damage during delivery, storage and handling.
- B. Deck bundles shall be stored off the ground, with one end elevated to provide drainage. Bundles shall be protected against condensation with a ventilated waterproof covering.

### PART 2 - PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. ASC Steel Deck.
- B. Verco Manufacturing Co.

- C. Epic Metals Corporation.
- D. Equal with current ICC or IAPMO report approved by AOR.

## 2.02 MATERIALS

- A. Metal Decking:
  - 1. Roll-formed sheets conforming to ASTM A653, with G90 zinc coating.
  - 2. Section properties conforming to applicable provisions of latest edition of AISI - Specification for the Design of Cold-Formed Steel Structural Members.
- B. Flexible Closure Strips for Deck: Vulcanized, closed-cell, expanded chloroprene elastomer, complying with ASTM D1056, Grade SCE #41.
  - 1. Brittleness Temperature: Minus 40 degrees F, ASTM D746.
  - 2. Flammability Resistance: Self-extinguishing,
- C. Decking Accessories: Metal cover plates, sheet metal edging, metal closure strips, valley and ridge strips, seat angles, sump pans, flashings: 22 gage minimum, with ASTM A653, G90 zinc coating.
- D. Shear Connectors: Headed stud type, ASTM A108 Grade 1015, cold-finished carbon steel complying with AISC specifications.
- E. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035B and approved by the OWNER's Office of Environmental Health and Safety (OEHS).

## 2.03 FABRICATION

- A. Corrugated sheets or sections shall be designed to support required live load between supporting members.
- B. Provide decking in lengths to span over three or more supports.
- C. Except as detailed otherwise, provide decking with interlocking side laps, 2 inch minimum end bearing, and 1 ½-inch minimum side bearing.
- D. Welding: Provide materials and methods in accordance with recommendations of steel decking manufacturer and reviewed submittals. Hold decking tight to the supporting elements with screws or other means for proper welding or crimping of the decking edges. Conform to AWS D1.3, and to the patterns and weld types indicated, with welds free from sharp edges and protrusions. Field coat welds and abraded surfaces at completion with an anodic type galvanizing repair paint. Omit the field

paint coating where welds or abrasions are covered by concrete fill or sprayed fireproofing.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Verify supporting structure and existing conditions prior to starting work.
- B. Remove oil, dirt, paint, and rust from steel surfaces to which metal decking will be welded.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 OPENINGS

- A. Cut and reinforce units to provide openings which are located and dimensioned on the structural and mechanical Drawings.
- B. Provide openings, or other Work not indicated on the Drawings.

#### 3.03 INSTALLATION

- A. Install metal decking in accordance with decking manufacturers' recommendations, requirements of Drawings, Shop Drawings, and Specifications.
- B. Install metal decking on supporting steel framework and adjust to final position before permanently fastening in place.
  - 1. Install each unit to proper bearing on supports.
  - 2. Install units in straight alignment for entire length of run of cells with close registration of cells of one unit with those of abutting unit.
- C. Fasten decking to steel framework at ends of units and at intermediate supports. Welding shall be as indicated on Drawings.
- D. Fasten side laps between supports as indicated on Drawings.
- E. Perform field cutting parallel with cells in area between cells, leaving sufficient horizontal material to permit welding to support steel.
- F. Weld shear connectors to supports thru decking units as required by Drawings. Weld only on clean, dry surfaces. Do not weld shear connectors thru two layers of decking units.



3.04 METAL FLASHINGS AND CLOSURES

- A. Furnish, install, and weld in position, sheet metal closure flashing, closure angles, closure plates, profile plates, and shear plates.
- B. Close open ends of cell runs at columns, openings, walls, similar interruptions and termination.

3.05 FIELD QUALITY CONTROL

- A. Install steel decking under continuous inspection according to CBC Section 1704A.
- B. Welding inspection for steel deck diaphragms shall conform to CBC Section 2204A.1.

3.06 CLEAN UP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.07 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 05 52 13  
PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Pipe railings.

1.3 PERFORMANCE REQUIREMENTS

- A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

- 1. Aluminum: The lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.
- 2. Stainless Steel: 60 percent of minimum yield strength.
- 3. Steel: 72 percent of minimum yield strength.

- B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

- 1. Handrails:

- a. Uniform load of 50 lbf/ ft. applied in any direction.
- b. Concentrated load of 200 lbf applied in any direction.
- c. Uniform and concentrated loads need not be assumed to act concurrently.

- 2. Top Rails of Guards:

- a. Uniform load of 50 lbf/ ft. applied in any direction.
- b. Concentrated load of 200 lbf applied in any direction.
- c. Uniform and concentrated loads need not be assumed to act concurrently.

- 3. Infill of Guards:

- a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.

- b. Uniform load of 25 lbf/sq. ft. applied horizontally.
  - c. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
- 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

#### 1.4 SUBMITTALS

- A. Product Data: For the following:
- 1. Manufacturer's product lines of mechanically connected railings.
  - 2. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design.
- D. Samples for Verification: For each type of exposed finish required.
- 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
  - 2. Fittings and brackets.
  - 3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
    - a. Show method of finishing members at intersections.
- E. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- F. Welding certificates.

- G. Qualification Data: For testing agency.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

## 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.
- B. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1, "Structural Welding Code--Steel."
  - 2. AWS D1.2, "Structural Welding Code--Aluminum."
  - 3. AWS D1.6, "Structural Welding Code--Stainless Steel."

## 1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
  - 2. Provide allowance for trimming and fitting at site.

## 1.7 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Stainless-Steel Pipe and Tube Railings:
    - a. Blum, Julius & Co., Inc.
    - b. Paragon Aquatics; Division of Pentair Pool Products, Inc.
    - c. Pisor Industries, Inc.
    - d. Stainless Fabricators, Inc.
    - e. Sterling Dula Architectural Products, Inc.
    - f. Tubular Specialties Manufacturing, Inc.
    - g. Tuttle Aluminum & Bronze.
    - h. Wagner, R & B, Inc.; a division of the Wagner Companies.

### 2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

### 2.3 STAINLESS STEEL

- A. Tubing: ASTM A 554, Grade MT 304.
- B. Pipe: ASTM A 312/A 312M, Grade TP 304
- C. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.
- D. Plate and Sheet: ASTM A 666, Type 304.
- E. Expanded Metal: ASTM F 1267, Type II (expanded and flattened), Class 3 (corrosion-resistant steel), made from stainless-steel sheet complying with ASTM A 666, Type 304.
  - 1. Style Designation: 3/4 number 13.

## 2.4 FASTENERS

- A. General: Provide the following:
  - 1. Aluminum Railings: Type 304 stainless-steel fasteners.
  - 2. Stainless-Steel Railings: Type 304 stainless-steel fasteners.
  - 3. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
  - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
  - 2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
  - 3. Provide tamper-resistant flat-head machine screws for exposed fasteners, unless otherwise indicated.
- D. Anchors: Provide cast-in-place anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

## 2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
  - 1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Shop Primers: Provide primers that comply with Division 09 painting Sections.
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
  - 1. Use primer with a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- D. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
1. Use primer with a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  3. Products: Subject to compliance with requirements, provide one of the following:
    - a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
    - b. Carboline Company; Carbozinc 621.
    - c. ICI Devoe Coatings; Catha-Coat 313.
    - d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
    - e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
    - f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
    - g. Tnemec Company, Inc.; Tneme-Zinc 90-97.
- E. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- I. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
1. Water-Resistant Product: Where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

## 2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with either welded or nonwelded connections, unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove flux immediately.
  - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- J. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
  - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.



- K. Form changes in direction as follows:
  - 1. As detailed.
- L. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- M. Close exposed ends of railing members with prefabricated end fittings.
- N. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
  - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- Q. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with steel plate forming bottom closure.
- R. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
  - 1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

## 2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

## 2.8 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. 180-Grit Polished Finish: Oil-ground, uniform, directionally textured finish.
- D. 320-Grit Polished Finish: Oil-ground, uniform, fine, directionally textured finish.
- E. Polished and Buffed Finish: Oil-ground, 180-grit finish followed by buffing.
- F. Directional Satin Finish: No. 4.
- G. Satin Finish: No. 6 (240 grain/grit)
- H. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

### 3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
  3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

### 3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within 6 inches of post.

### 3.4 ANCHORING POSTS

- A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill

annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

- C. Cover anchorage joint with flange of same metal as post, attached to post with set screws.
- D. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch buildup, sloped away from post.
- E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
  - 1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.
  - 2. For stainless-steel pipe railings, weld flanges to post and bolt to supporting surfaces.
  - 3. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.
- F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

### 3.5 ANCHORING RAILING ENDS

- A. Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.

### 3.6 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
  - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
  - 2. Use type of bracket with predrilled hole for exposed bolt anchorage.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as follows:
  - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.

2. For hollow masonry anchorage, use toggle bolts.
3. For wood stud partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.

### 3.7 ADJUSTING AND CLEANING

- A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 90 00 Painting and Coating.
- D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

### 3.8 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 07920  
JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
  - 1. Joint sealants as indicated or required.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating sealant joint locations, with full-size sealant joint details.
- B. Product Data: Submit manufacturer's literature for each sealant material.
- C. Material Samples: Submit Samples indicating color range available for each sealant material intended for installation in exposed locations.
- D. Certifications: Submit manufacturer's certification materials comply with requirements specified.
- E. Site Samples: At locations required, provide a Sample of sealant for each typical installation, approximately 24" long, including joint preparation, backing, sealant and tooling. Allow backing to extend 6" beyond end of sealant for inspection of substrate.
- F. Test Reports: Submit manufacturer's adhesion compatibility test reports according to ASTM C 794 for each substrate.

1.03 QUALITY ASSURANCE

- A. Qualifications of Installer: The Work of this section shall be installed by a firm which has been in the business of installing similar materials for at least 5 consecutive years; and can show evidence of satisfactory completion of 5 projects of similar size and scope. Installer shall have applicators trained and approved by manufacturer for performing this Work.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Store in accordance with manufacturer's recommendations. Provide a uniform ambient temperature between 60 and 80 degrees F.

1.05 WARRANTY

- A. Manufacturer shall provide a 5 year material warranty.

- B. Installer shall provide a 2 year labor warranty.

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. Furnish sealants meeting following in-service requirements:
  - 1. Normal curing schedules are permitted.
  - 2. Non-staining, color fastness (resistance to color change), and durability when subjected to intense actinic (ultraviolet) radiation are required.
- B. Furnish the products of only one manufacturer unless otherwise required, sealant colors as selected to match the adjoining surfaces.

### 2.02 MATERIALS

- A. Sealants:
  - 1. Sealant 1: Single component . self-leveling, premium-grade polyurethane sealant with an accelerated curing capacity. Meets Federal Specifications TT-S-00230C, Type I, Class A. Meets AStmc-920, Type S, Grade P, Class 25, use T, M, A, G, I.
    - a. Sika Corporation, Sikaflex – 1c SL or approved equal
- B. Primer: Non-Staining Type. Provide primer as required and shall be product of manufacturer of installed sealant.
- C. Lacquer sealer shall be clear, as recommended by sealant manufacturer.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer.
- E. Sealants shall have normal curing schedules, shall be nonstaining, color fast and shall resist deterioration due to ultraviolet radiation.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Verify that joint openings are ready to receive Work and field tolerances are within the guidelines recommended by sealant manufacturer.

### 3.02 SURFACE PREPARATION

- A. Joints and spaces to be sealed shall be completely cleaned of all dirt, dust, mortar, oil, and other foreign materials which might adversely affect caulking Work. Where necessary, degrease with an solvent or commercial degreasing agent. Surfaces shall be thoroughly dry before application of sealants.
- B. If recommended by manufacturer, remove paint and other protective coatings from surfaces to be calked before priming and installation of sealants.

- C. Preparation of surfaces to receive sealant shall conform to the sealant manufacturer's specifications. Provide air pressure or other methods to achieve required results. Provide masking tape to keep sealants off surfaces that will be exposed in finished Work.
- D. Etch concrete or masonry surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5 percent solution of muriatic acid; neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.
- E. Perform preparation in accordance with ASTM C 804 for solvent release sealants, and ASTM C 962 for elastomeric sealants.
- F. Protect elements surrounding Work of this section from damage or disfiguration.

3.03 SEALANT APPLICATION SCHEDULE

	<u>Location</u>	<u>Type</u>	<u>Color</u>
A.	Exterior & Interior joints in horizontal surfaces of concrete; between metal & concrete masonry and mortar.	Sealant 1	To match adjacent material

3.04 APPLICATION

- A. Provide sealant around all openings in exterior walls, and any other locations indicated or required for structure weatherproofing and/or waterproofing.
- B. Sealants shall be installed by experienced mechanics using specified materials and proper tools. Preparatory Work (cleaning, etc.) and installation of sealant shall be as specified and in accordance with manufacturer's printed instructions and recommendations.
- C. Concrete, masonry, and other porous surfaces, and any other surfaces if recommended by manufacturer, shall be primed before installing sealants. Primer shall be installed with a brush that will reach all parts of joints to be filled with sealant.
- D. Sealants shall be stored and installed at temperatures as recommended by manufacturer. Sealants shall not be installed when they become too jelled to be discharged in a continuous flow from gun. Modification of sealants by addition of liquids, solvents, or powders is not permitted.
- E. Sealants shall be installed with guns furnished with proper size nozzles. Sufficient pressure shall be furnished to fill all voids and joints solid. In sealing around openings, include entire perimeter of each opening, unless indicated or specified otherwise. Where gun installation is impracticable, suitable hand tools shall be provided.
- F. Sealed joints shall be neatly pointed on flush surfaces with beading tool, and internal corners with a special tool. Excess material shall be cleanly removed. Sealant, where exposed, shall be free of wrinkles and uniformly smooth. Sealing shall be complete before final coats of paint are installed.



- G. Comply with sealant manufacturer's printed instructions except where more stringent requirements are indicated on Drawings or specified.
- H. Partially fill joints with joint backing material, furnishing only compatible materials, until joint depth does not exceed 1/2 inch joint width. Minimum joint width for metal to metal joints shall be 1/4 inch. Joint depth, shall be not less than 1/4 inch and not greater than 1/2 inch.
- I. Install sealant under sufficient pressure to completely fill voids. Finish exposed joints smooth, flush with surfaces or recessed as indicated. Install non-tracking sealant to concrete expansion joints subject to foot or vehicular traffic.
- J. Where joint depth prevents installation of standard bond breaker backing rod, furnish non-adhering tape covering to prevent bonding of sealant to back of joint. Under no circumstances shall sealant depth exceed 1/2 inch maximum, unless specifically indicated on Drawings.
- K. Prime porous surfaces after cleaning. Pack joints deeper than 3/4 inch with joint backing to within 3/4 inch of surface. Completely fill joints and spaces with gun applied compound, forming a neat, smooth bead.

### 3.05 MISCELLANEOUS WORK

- A. Sealing shall be provided wherever required to prevent light leakage as well as moisture leakage. Refer to Drawings for condition and related parts of Work.
- B. Install sealants to depths as indicated or, if not indicated, as recommended by sealant manufacturer but within following general limitations:
  - 1. For joints in concrete walks, slab and paving subject to traffic, fill joints to a depth equal to 75 percent of joint width, but not more than 3/4 inch deep or less than 3/8 inch deep, depending on joint width.
  - 2. For building joints, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.

### 3.06 CLEANING

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

### 3.07 CURING

- A. Sealants shall cure in accordance with manufacturer's printed recommendations. Do not disturb seal until completely cured.

### 3.08 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 07 95 00  
EXPANSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Architectural joint systems for open-air structures.
- B. Related Sections include the following:
  - 1. Division 03 Section "Cast-in-Place Concrete" for cast-in architectural-joint- system frames furnished, but not installed, in this Section.
  - 2. Division 07 Section "Joint Sealants" for liquid-applied joint sealants.

1.3 DEFINITIONS

- A. Maximum Joint Width: Widest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.
- B. Minimum Joint Width: Narrowest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.
- C. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint.
- D. Nominal Joint Width: The width of the linear opening specified in practice and in which the joint system is installed.

#### 1.4 SUBMITTALS

- A. Shop Drawings: Provide the following for each joint system specified and obtain approval prior to fabrication and shipment of materials to the job site:
  - 1. Placement Drawings: Include line diagrams showing plans, elevations, sections, details, splices, blackout requirement, entire route of each joint system, and attachments to other work. Where joint systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- B. Product Data: Submit copies of manufacturer's latest published literature for materials specified herein for approval, and obtain approval before materials are fabricated and delivered to the site. Data to clearly indicate movement capability of cover assemblies and suitability of material used in exterior seal for UV exposure.
- C. Samples for Initial Selection: For each type of joint system indicated.
  - 1. Include manufacturer's color charts showing the standard range of colors and finishes available for each exposed metal and elastomeric seal material.
- D. Certificates – Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of fire-rated expansion joint assemblies with requirements indicated.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Approved by manufacturer and having experience installing joint systems that are similar in design complexity.
- B. Source Limitations: Obtain all architectural joint systems through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of architectural joint systems and are based on the specific systems indicated. Refer to Division 01 Section "Product Requirements."
  - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Loading Characteristics: Standard loading refers to covers that are capable of withstanding up to 500 lb. point loads. Heavy duty refers to covers that are capable of withstanding up to 2000 lb. point loads.

- E. Fire-Test-Response Characteristics: Where indicated, provide architectural joint system and fire-barrier assemblies identical to those of assemblies tested for fire resistance per UL 2079 and/or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction. Fire rating not less than the rating of adjacent construction.
- F. Manufacturer to provide 5 year warranty for all joint covers.

## 1.6 COORDINATION

- A. Coordinate installation of exterior wall joint systems with roof expansion assemblies to ensure that wall transitions are watertight.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Aluminum: ASTM B 221, Alloy 6063-T5, 6063-T6, 6063-T52, 6061-T5, 6061-T6, 6061-T51, 6105-T5, 6105-T6, 6005-T5, 6005A-T5, 6005A-T61 for extrusions;  
ASTM B 209, Alloy 6061-T6, 3003-H14, 5005-H34 for sheet and plate.
  - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
  - 2. Mill Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
  - 3. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.
  - 4. Class II, Color Anodic Finish: AA-M12C22A32/A34 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, integrally colored or electrolytically deposited color coating 0.010 mm or thicker) complying with AAMA 611.
  - 5. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2604 and with coating and resin manufacturers' written instructions.
- B. Stainless Steel: ASTM A167, A240A, A240M - Type 304 for plates, sheet, and strips.
  - 1. Finish: No.4, directional satin.

- a. Grind and polish surfaces to produce uniform, directionally textured, polished

finish indicated, free of cross scratches. Run grain with long dimension of each piece.

- b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- C. Brass: ASTM B 36/B 36M, UNS Alloy C26000 for half hard sheet and coil.
- D. Bronze: ASTM B 455, Alloy C38500 for extrusions; Alloy C28000 Muntz Metal for plates.
- E. Elastomeric Seals: Preformed elastomeric membranes or extrusions to be installed in metal frames.
- F. Compression Seals: ASTM D2000; preformed rectangular elastomeric extrusions having internal baffle system and designed to function under compression.
- G. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required rating period.
- H. Moisture Barrier: 7-ply laminate reinforced Polyethylene.
- I. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

## 2.2 ARCHITECTURAL JOINT SYSTEMS, GENERAL

- A. General: Provide architectural joint systems of design, basic profile, materials, and operation indicated. While specified joint systems establish the function and aesthetic intent, it may be necessary for the manufacturer to modify the joint systems to accommodate the movement requirements as scheduled in the contract documents. Such modifications should be made without significant changes to the aesthetic or functional intent of the joint systems. Provide units with capability to accommodate variations in adjacent surfaces.
- B. Design architectural joint systems for the following size and movement characteristics:
  - 1. Nominal Joint Width
  - 2. Maximum Joint Width
  - 3. Minimum Joint Width
  - 4. Lateral Shear Movement Capability

## 2.3 ARCHITECTURAL JOINT SYSTEMS FOR BUILDING INTERIORS

- A. Construction Specialties, Inc., 6696 Route 405 Highway, Muncy, PA, shall manufacture expansion joint cover assemblies specified herein and indicated on the drawings. Other

manufacturers may be accepted as substitutions only if the manufacturer can demonstrate product compliance with the requirements of the contract documents. Substitution requests must be reviewed prior to bid and must include the following information:

1. Details
2. ASTM- E1399 test reports
3. Mock-ups
4. Reference list of projects with similar products as those specified herein.
5. Sample of written 5 year warranty

B. Floor-to-Floor Joint Systems:

1. Basis-of-Design Product: Construction Specialties, Inc. model SJPF-300
2. Type: Cover plate.
  - a. Exposed Metal: Aluminum.
    - 1) Finish: C/S #3 brushed, non-slip finish.
3. Cover Plate Design: Plain
4. Attachment Method: Mechanical anchors.
5. Load Capacity: Standard duty.

2.4 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and blockouts where architectural joint systems will be installed for installation tolerances and other conditions affecting performance of work.
  1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to architectural joint system manufacturer's written instructions.
- B. Repair concrete slabs and blockouts using manufacturer's recommended repair grout of compressive strength adequate for anticipated structural loadings.
- C. Coordinate and furnish anchorages, setting drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.
- D. Cast-In Frames: Coordinate and furnish frames to be cast into concrete.

### 3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing architectural joint assemblies and materials unless more stringent requirements are indicated.
- B. Metal Frames: Perform cutting, drilling, and fitting required to install joint systems.
  - 1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
  - 2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper joint installation and performance.
  - 3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
  - 4. Locate in continuous contact with adjacent surfaces.
  - 5. Standard-Duty Systems: Shim to level where required. Support underside of frames continuously to prevent vertical deflection when in service.
  - 6. Heavy-Duty Systems: Repair or grout blockout as required for continuous frame support and to bring frame to proper level. Shimming is not allowed.
  - 7. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.
- C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
  - 1. Provide in continuous lengths for straight sections.
  - 2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
  - 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- D. Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer before installing compression seals.

- E. Terminate exposed ends of joint assemblies with field- or factory-fabricated termination devices.
- F. Fire-Resistance-Rated Assemblies: Coordinate installation of architectural joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.
  - 1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.
- G. Water Barrier: Provide water barrier at exterior joints and where called for on Drawings. Provide drainage fittings where indicated.

#### 3.4 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over joints. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION



## SECTION 09 9000

### PAINTING AND COATING

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Section Includes:

1. Interior and exterior painting.

###### B. Following items shall not be painted:

1. Brass valves, chromium or nickel-plated piping and fittings.
2. Boiler control panels and control systems.
3. Fabric connections to fans.
4. Flexible conduit connections to equipment, miscellaneous name plates, stamping, and instruction labels and manufacturer's data.
5. Mechanical and electrical utility lines, piping and heating and ventilation ductwork in tunnels, under-floor excavated areas or crawl spaces, attic spaces and enclosed utility spaces.
6. Flag, floodlight, parking light poles and loudspeaker poles, metal stairs, handrails and chain-link fence with a galvanized finish, unless otherwise noted.
7. Structural and miscellaneous steel, open web steel joists and metal floor decking, which will not be exposed in final construction, shall have no finish other than one coat of shop primer.
8. Hardboard covering on tops and backs of counters and benches.
9. Brass, bronze, aluminum, lead, stainless steel and chrome or nickel-plated surfaces.
10. Non-metallic walking surfaces unless specifically shown or specified to be painted.

##### 1.02 REGULATORY REQUIREMENTS

- ###### A. Paint materials shall comply with the Food and Drug Administration's (F.D.A.) Lead Law and the current rules and regulations of local, state and federal agencies governing the use of paint materials.

##### 1.03 SUBMITTALS

- A. List of Materials: Before submittal of samples, submit a complete list of proposed paint materials, identifying each material by distributor's name, manufacturer's name, product name and number, including primers, thinners, and coloring agents, together with manufacturers' catalog data fully describing each material as to contents, recommended installation, and preparation methods. Identify surfaces to receive various paint materials.
- B. Material Samples: Submit manufacturer's standard colors samples for each type of paint specified. Once colors have been selected, submit Samples of each color selected for each type of paint accordingly:
  - 1. Samples of Paint and Enamel must be submitted on standard 8 ½" x 11" Leneta Opacity-Display Charts. Each display chart shall have the color in full coverage. The sample shall be prepared from the material to be installed on the Work. Identify the school on which the paint is to be installed, the batch number, the color number, the type of material, and the name of the manufacturer.
  - 2. Elastomeric shall be submitted in duplicate samples of the texture coating. Samples will be not less than 2 ½ by 3 ½ in size and installed upon backing. Finished Work will match the reviewed Sample in texture.
  - 3. Materials and color samples shall be reviewed before starting any painting.
- C. For transparent and stained finishes, prepare samples on same species and quality of wood to be installed in the Work, with written description of system used.

1.04 QUALITY ASSURANCE

- A. Certification of Materials: With every delivery of paint materials, the manufacturer shall provide written certification the materials comply with the requirements of this section.
- B. Coats: The number of coats specified is the minimum number. If full coverage is not obtained with the specified number of coats, install additional coats as required to provide the required finish.
- C. Install coats and undercoats for finishes in strict accordance with the recommendations of the paint manufacturer as reviewed by the Architect.
- D. Paint materials shall comply with the following as a minimum requirement:
  - 1. Materials shall be delivered to Project site in original unbroken containers bearing manufacturer's name, brand number and batch number.
  - 2. Open and mix ingredients on premises in presence of the Project Inspector.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Storage and Mixing of Materials: Store materials and mix only in spaces suitable for such purposes. Maintain spaces clean and provide necessary precautions to prevent fire. Store paint containers so the manufacturer's labels are clearly displayed.

1.06 SITE CONDITIONS

- A. Temperature: Do not install exterior paint in damp, rainy weather or until surface has thoroughly dried from effects of such weather. Do not install paint, interior, or exterior, when temperature is below 50 degrees F, or above 90 degrees F, or dust conditions are unfavorable for installation.

1.07 WARRANTY

- A. Manufacturer shall provide a three year material warranty.
- B. Installer shall provide a three year application warranty.

1.08 MAINTENANCE

- A. Provide at least one gallon of each type, color and sheen of paint coating installed. Label containers with color designation indicated on Drawings.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS

- A. Furnish the products of only one paint manufacturer unless otherwise specified or required. Primers, intermediate and finish coats of each painting system must all be the products of the same manufacturer, including thinners and coloring agents, except for materials furnished with shop prime coat by other trades.
- B. Factory mix paint materials to correct color, gloss, and consistency for installation to the maximum extent feasible.
- C. Paint materials to be minimum "Architectural Grade".
- D. Gloss degree standards shall be as follows:

HIGH GLOSS	70 and above	EGGSHELL	30 to 47
SEMI-GLOSS	48 to 69	SATIN	15 to 29

2.02 MANUFACTURERS

- A. Acceptable manufacturers, unless otherwise noted:
  - 1. Dunn-Edwards Corporation Paints
  - 2. Frazee Paints and Wall coverings

3. Vista Paints
4. Sherwin Williams
5. ICI Paints
6. Equal.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Examine surfaces to receive paint finish. Surfaces which are not properly prepared and cleaned or which are not in condition to receive the finish specified shall be corrected before prime coat is installed.
- B. New woodwork shall be thoroughly cleaned, hand sandpapered, and dusted off. Nail holes, cracks or defects in Work shall be filled. On stained woodwork, fill shall be colored to match stain. Filling shall be performed after the first coat of paint, shellac or varnish has been installed.
- C. Plaster surfaces except veneer plaster shall be allowed to dry at least 3 weeks before painting. Veneer plaster shall be allowed to dry sufficiently to receive paint as determined by moisture meter tests.
- D. Metal surfaces to be painted shall be thoroughly cleaned of rust, corrosion, oil, foreign materials, blisters, and loose paint.
- E. Do not install painting materials to wet, damp, dusty, dirty, finger marked, rough, unfinished or defective surfaces.
- F. Concrete surfaces shall be dry, cleaned of dirt and foreign materials and in proper condition to receive paint. Neutralize spots demonstrating effects of alkali.
- G. Mask off areas where necessary.

### 3.02 APPLICATION

- A. Backpainting: Immediately upon delivery to the Project site, finish lumber and millwork shall be backpainted on surfaces that will be concealed after installation. Items to be painted shall be backpainted with priming coat specified under "Priming".
- B. Priming: New wood and metal surfaces specified to receive paint finish shall be primed. Surfaces of miscellaneous metal and steel not embedded in concrete, and surfaces of unprimed plain sheet metal Work shall be primed immediately upon delivery to the Project site. Galvanized metal Work and interior and exterior woodwork shall be primed immediately after installation. Priming of surfaces and priming coat shall be as follows:
  1. Knots, Pitch and Sap Pockets: Shellac before priming.

5. Galvanized Metal Work: Clean oil, grease and other foreign materials from surfaces. Install vinyl wash pretreatment coating. Follow manufacturer's instructions for drying time, and then prime with one coat of metal primer.
  6. Unprimed Iron, Steel, and Other Uncoated Metals: Where specified to be painted, prime with one coat of metal primer.
  7. Shop Primed Metal Items: Touch up bare and abraded areas with metal primer before installation of second and third coats.
  8. Coats shall be installed evenly and with full coverage. Finished surfaces shall be free of sags, runs and other imperfections.
- C. Allow at least 24 hours between coats of paint.
- D. Each coat of painted woodwork and metal, except last coat, shall be sandpapered smooth when dry. Texture-coated gypsum board shall be sanded lightly to remove surface imperfections after first coat of paint has been installed.
- E. Do not "paint-out" UL labels, fusible links and identification stamps.

### 3.03 CLEANING

- A. Remove rubbish, waste, and surplus material and other adjacent Work.
- B. Remove paint, varnish and brush marks from glazing material and, upon completion of painting Work, wash and polish glazing material both sides. Glazing material, which is damaged, shall be removed and replaced with new material.
- C. Clean hardware and other unpainted metal surfaces with recommended cleaner. Do not furnish abrasives or edged tools.

### 3.04 SCHEDULE

- A. Exterior:
1. Concrete: 3 coats. Flat 100 percent acrylic.
    - a. First Coat: Concrete sealer.
    - b. Second and Third Coats: Exterior 100 percent acrylic.
  2. Metal: 3 coats. Shall be cleaned and pre-treated. Items to be painted include, but are not limited to: steel columns and miscellaneous steel items, gravel stops, metal doors and frames, hoods and flashings.
    - a. First Coat: As specified in this section under Priming.

b. Second and Third Coats: Exterior gloss enamel.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.06 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

## SECTION 099600

### HIGH-PERFORMANCE COATINGS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. This Section includes surface preparation and application of high-performance coating systems on the following substrates:
  - 1. Exterior Substrates:
    - a. Steel.
    - b. Galvanized metal.
- B. Related Sections include the following:
  - 1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
  - 2. Division 09 painting Sections for special-use coatings and general field painting.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product List: For each product indicated. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. coatings.

##### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

##### 1.5 PROJECT CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F (10 and 35 deg C).

- B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

## PART 2 - PRODUCTS

### 2.1 HIGH-PERFORMANCE COATINGS, GENERAL

#### A. Material Compatibility:

- 1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
- 2. Provide products of same manufacturer for each coat in a coating system.

#### B. Colors: Match existing fence.

##### 1. METAL PRIMERS

#### C. Epoxy ester primer, rust inhibitive water based.

- 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- 2. Products: Subject to compliance with requirements, provide one of the following:
  - a. Vista Paint #4500 Galva-Poxy White – first coat, or approved equal.
  - b. Vista Paint #4510 Galva-Poxy Red Oxide – second coat, or approved equal.

### 2.2 EPOXY COATINGS

#### A. Alkyd enamel, water reducible gloss

- 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- 2. Products: Subject to compliance with requirements, provide one of the following:
  - a. Vista Paint #5800 Perma-Kote, or approved equal.

### 2.3 APPLICATION

#### A. Apply high-performance coatings according to manufacturer's written instructions to all exterior exposed structural members, u.n.o.

- 1. Use applicators and techniques suited for coating and substrate indicated.
- 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
- 3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.



- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

## 2.4 FIELD QUALITY CONTROL

- A. Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when coatings are being applied:
  - 1. Owner will engage the services of a qualified testing agency to sample coating material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
  - 2. Testing agency will perform tests for compliance with specified requirements.
  - 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with specified requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

## 2.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

## 2.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Steel Substrates:
  - 1. High-Build Epoxy Coating System:
    - a. Prime Coat: Epoxy ester primer, Vista #4500, or approved equal
    - b. Intermediate Coat: Epoxy ester primer, Vista #4510, or approved equal
    - c. Topcoats 3rd & 4<sup>th</sup> coats: Alkyd enamel, Vista #5800, or approved equal
- B. Galvanized-Metal Substrates:

1. Epoxy Coating System:

- a. Prime Coat: Epoxy ester primer, Vista #4500, or approved equal
- b. Intermediate Coat: Epoxy ester primer, Vista #4510, or approved equal
- c. Topcoats 3<sup>rd</sup> & 4<sup>th</sup> coats: Alkyd enamel Vista #5800, or approved equal

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 subcontractors 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. Coordinate and cooperate in every way with other trades in order to avoid interference and assure a satisfactory job.
- E. 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.
- F. **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 five 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 (3) meters below finish grade and located with a vertical and horizontal accuracy within  $\pm 12$ -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.
- G. 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 PERMITS

- A. Take out and pay for all required permits, inspections and examinations without additional cost to the DISTRICT.

1.05 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. The Life Safety Code – NFPA 101.
  7. The Uniform Building Code - UBC.
  8. International Building Code – IBC.
  9. National Fire Protection Agency-NFPA.
  10. National Fire Alarm Code – NFAC/NFPA 72.

11. Underwriter's Laboratory-UL.
12. Other applicable State and Local Government Agencies laws and regulations.
13. 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-111: Recommended Practice Installing Nonmetallic Raceways
  - d. NECA/NEIS-331: Standards for Installing Building and Service Entrance Grounding
  - e. NECA/NEIS-407: Recommended Practice for Installing Panelboards
  - f. NEIS/NECA and IESNA-501: Recommended Practice for Installing Exterior Lighting Systems

- 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 is 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.

1.06 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 four hundred 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 (3) ring binders. Divider tabs shall be provided in the three (3) 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 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 (3) 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 (2) 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 (1) or more than fifteen (15) students shall attend each instruction session. Submit fifteen (15) 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.

1.07 CLEANING EQUIPMENT, MATERIALS, PREMISES

- A. 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.

1.08 JOB CONDITIONS - PROTECTION

- A. 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.

1.09 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 (1) 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 (2) 100% open lane(s) (12-foot lane width) for vehicular traffic at all times during construction, for vehicle access to all areas.

1.10 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 (2) 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 ampere 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 (2) 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.

#### 1.11 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 (3) 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 (2) point method test per IEEE Standard No. 81, Section 8.2.1.1, to determine the ground resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.
- D. The testing, calibrating and setting of all ground and ground fault equipment, circuit breakers, circuit device protection relays, and meters adjustable settings shall be by an independent testing laboratory. Set as recommended by the respective manufacturer and coordination study so as to be coordinated with other protection devices within the electrical design. Bound and tabulated copies of the test and settings shall be sent to the District's Representative.

- E. Ampere and Voltage Measurements
1. Measure and record ampere and line voltage measurements under full load on all panel feeders, switchboard, and switchgear feeders, motor control centers and motor circuits provided in the contract. Record measurements at the equipment tested and submit to the District's Representative for review.
  2. Ampere voltage readings shall be:
    - a. Phase A-B, A-C and B-C.
    - b. Phase A-Neutral, B-Neutral and C-Neutral.
  3. The ampere and voltage readings shall be not less than 20-minutes duration for each test. Record and submit the measured minimum, maximum and 20-minute average for each ampere and voltage value and test location. Voltage and ampere measurements shall occur at the connected load end of each respective feeder, not at the source of supply end of each feeder.
  4. Test equipment shall be accurate within plus or minus 1%.
  5. Branch circuit devices 40 ampere or less and motor loads ten (10) 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.

## 1.12 COMMISSIONING - Cx

### A. General

1. The commissioning shall verify the electrical systems for the term of the contract, by observation; and by calibration; and by testing. The commissioning shall ensure the electrical systems perform interactively and correctly, according to the contract and operational requirements.
2. Commissioning shall provide startup, testing and documented confirmation of the contract constructed systems, materials and work, functions in compliance within the criteria set forth in the Contract Documents to the satisfaction of the District's needs. The commissioning scope shall encompass each system identified as requiring "commissioning" by the Contract Documents, including but not limited to:
  - a. Electrical circuits' protection, short circuit, overcurrent, and ground fault devices.
  - b. Electrical circuits monitoring and metering.
  - c. Light fixtures, lamps and ballasts.
  - d. Lighting control devices, equipment and lighting control systems.
  - e. Standby and emergency electric power supply equipment and systems.
  - f. Fire alarm, equipment, devices and fire alarm systems.
  - g. Additional systems described in the contract documents.
3. Commissioning process shall review all of the shop drawing submittals, including:
  - a. Controls, operation and maintenance requirements.
  - b. Facility performance testing compliance.
  - c. Project contract requirements compliance.
  - d. Compliance with basis for design and operational descriptions provided in the contract.
4. Commissioning shall be the process of ensuring all the systems described in the Contract Documents comply with the Contract Document design; all systems are installed properly; all systems are functional, tested and capable of being operated and maintained to perform within the contract requirements and design intent.
5. Functional setup, recalibration, correcting deficiencies, retesting and the associated costs, for system(s) that fail commissioning, shall be the responsibility of the CONTRACTOR. The CONTRACTOR shall include all commissioning costs in the contract scope of work.
6. Complete all commissioning functions prior to the occupancy of the facility by the District, unless directed otherwise by the District's Representative.
7. Submit three (3) copies of commissioning documentation to District's Representative.
8. Commissioning, unless specifically indicated otherwise, shall be performed by factory- trained technician(s) authorized and certified by the Manufacturers of the respective equipment/systems. Where specifically indicated, commissioning shall be performed by Independent Test Lab.

### B. Commissioning Procedures

1. Prepare a commissioning matrix identifying components and systems included in the commissioning scope; the status; actions completed and actions to be completed.
2. Verify CONTRACTOR compliance with Contract Document requirements manufacturer's recommendations and approved shop drawings.
3. Perform startup, functional tests, reports, and document results.
4. Evaluate and document the setup parameters, software, operating condition and performance of each system at the time of functional test completion. Document and record each performance parameter and condition, in the commissioning report.
5. Schedule testing and prepare descriptions of testing.
6. Describe measures performed to correct deficiencies.
7. Verify that instructions to District's Representatives, Operations and maintenance manuals comply with Contract Documents.
8. Prepare warranty matrix identifying the start dates, expiration dates, routine preventative maintenance dates and the District's responsibility for performing preventative maintenance and keeping logs for each maintenance function and warranty claims.
9. Confirm completion of all punch list items that have been acceptably accomplished and a list of what has not been acceptably completed.
10. Describe uncorrected deficiencies accepted by the DISTRICT.

C. Commissioning Phasing

The commissioning phases of work shall include the following activities:

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

1.13 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 Representative, with approval in writing.
- 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 generator(s). 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.
- 1.16 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.
- 1.17 SPARE FUSES
- A. Provide three (3) 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.
- 1.18 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. Equipment racks and terminal cabinets
  - b. Panels
  - c. Conduits with floor, ceiling or wall attachment support and conduits with suspension attachments.
  - d. Lighting equipment
  - e. 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 (2) 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 (2) layers of number 4-size steel-rebar laid horizontally and uniformly spaced 6-inches on center. Position rebar in two (2)

directions (90-degrees opposed) and centered inside the concrete house keeping 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 (2) copies of all test results as required under this section.
2. Two (2) copies of local and/or state code enforcing authorities final inspection certificates.
3. Copies of record drawings as required under the General Conditions, pertinent Division One Sections and Electrical General Provisions.
4. Two (2) 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

## SECTION 26 05 15

### 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, time-switches, disconnect switches and 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 and junction boxes: Pressed steel, steel thickness not less than 0.062-inch, hot-dip galvanized, knockout (KO) type with conduit entrances and quantities size to match conduits shown connecting to respective outlet box. U.L.-514 listed and labeled. Minimum required box depth is exclusive of extension-ring depth.
  2. Provide boxes of proper code size for the number of wires or conduits passing through or terminating therein, but in no case shall box be less than 4.0 inch square by 2.125 inch deep, unless specified elsewhere or noted otherwise on the drawings. 2.5 inch minimum depth for box widths 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 (2) conduits connect to the outlet box.
    - b. Conduit "homerun" connects to outlet box.
  4. 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.

5. Boxes installed in masonry or concrete shall be U.L. "concrete-tight" approved for installation in concrete, and shall allow the placing of conduit without displacing reinforcing bars.
6. Provide fixture-supporting device in outlet boxes for surface mounted fixtures as required.
7. Provide solid gang boxes for three or more switches, for mounting behind a common device plate.
8. Provide barriers for all 277-volt devices, between line voltage and low voltage devices and where more than one device is installed in an outlet box.
9. Individual audio/visual, telephone, computer or data outlets: 4.69 inch square by 2.125 inch deep minimum with two gang extension ring on flush boxes.

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. Sizes as indicated on the drawings and in no case of less size or material thickness than required by the governing code. Exercise care in locating underground pull boxes to avoid installation in drain water flow areas.
1. General purpose sheet steel pull boxes: Install only in dry protected locations with removable screw covers. Manufacturer's standard baked enamel finishes.
  2. Weatherproof sheet steel pull boxes: Fabricate of code gauge, hot-dip galvanized steel with gasketed weathertight cover of same material. Manufacturer's standard baked exterior enamel finish.

2.03 SWITCHES

- A. Provide circuit switches totally enclosed, Bakelite or composition base, toggle type with 277 volt A.C. rating for full capacity or contacts for incandescent or fluorescent lamp loads. Switch ratings shall be 20 ampere only. Color as selected by OWNER'S REPRESENTATIVE.
- B. Where switches are mounted in multiple gang assembly and are operating at 277 volts and/or 277 volts and 120 volts mounted in same outlet box, there shall be a barrier installed between each switch.

2.04 RECEPTACLES

- A. All receptacles 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. Color as selected by OWNER'S REPRESENTATIVE.

- B. Duplex convenience receptacles shall be grounding type, 120 volt, 15 ampere, and shall have two current carrying contacts and one grounding contact which is internally connected to the frame. Outlet shall accommodate standard parallel blade cap and shall be side wired:
  - 1. Hubbell, Specification Grade Commercial Series, Ivory, or equal.
- C. Weatherproof receptacle: Ground fault type duplex receptacle, mounted in a flush hinged door enclosure with lock and key. Enclosure shall be a P & S #4600 with a #1591F46 receptacle. On exposed conduit runs, weatherproof ground fault type receptacle as hereinbefore specified, installed in "FS" conduit with one of the following spring door type covers:
  - 1. Hubbell, Specification Grade Commercial Series, or equal.
- D. Special outlets shall be as indicated on the drawings.

#### 2.05 PLATES

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

#### 2.06 VANDALPROOF FASTENINGS

- A. Provide approved vandalproof type screws, bolts, nuts where exposed to sight throughout the project. Screws for such items as switch plates, receptacle plates, fixtures, communications equipment, fire alarm, blank covers, wall and ceiling plates to be spanner head stainless steel, tamperproof type. Provide OWNER with six (6) screwdrivers for this type.

#### 2.07 STRUCTURAL AND MISCELLANEOUS STEEL

- A. Structural and miscellaneous steel used in connection with electrical work and located out-of-doors or in damp locations, to 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 TIMESWITCHES

- A. Timeswitches
  - 1. All timeswitches shall have synchronous motor drive for operation on 120 or 277 volts, 60 Hertz, A.C. and shall be furnished with a ten-hour, spring-driven,



reserve-power motor. Contacts shall be rated 40A per pole.

a. Exterior lighting timeswitches for control of individual circuits or electrically operated relays shall have astronomic dial and shall be Tork 7000ZL Series or approved equal by Paragon or Intermatic.

2. All timeswitches shall be mounted in separate section in top of panelboards under separate lockable door unless otherwise indicated on drawings. Clear opening for timeswitch shall be a minimum of 12" x 12".

B. Contactors and/or Relays/Timeswitch Cabinet

1. Contactors, relays, and/or timeswitches not indicated to be mounted in electrical panels shall be mounted in a cabinet, size as required, with hinged lockable door keyed same as panelboards. Construction of cabinet shall be similar to terminal cabinets.

2. Each contactor, relay or timeswitch mounted in the contactor cabinet shall be barriered in its own compartment, and shall be installed on Lord sound absorbing mounts.

3. Contactor cabinets shall be of the same manufacturer as the panelboards.

4. Where relays and/or contactors occupy the same enclosure as timeswitches they shall have a clear acrylic shield installed over each relay or contactor to guard line exposed parts from accidental contact by nonauthorized personnel.

2.09 DISCONNECT SWITCHES (SAFETY SWITCHES)

A. Disconnect switches shall be rated 600 volt A.C., NEMA Type HD, quick-make, quick-break, h.p.- rated, fused Class "R", in NEMA Type I enclosure, lockable with number of poles and amperage as indicated on the drawings. Provide neutral bus and conductor landing lugs, size to match conductors shown on drawings. Where enclosure is indicated W.P. (weatherproof) switches shall be raintight NEMA Type 3R enclosure, lockable. 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.

2.10 WIREWAY

A. General

1. Unobstructed lay in type, metal wireway, fittings and connectors U.L. listed for use as wireway and auxiliary gutter. Length, elbows and "T-S" as shown on drawings. Minimum cross-section size 4 inches X 4 inches, but not less than shown on the drawings. Suitable for mounting in any position orientation.

B. Construction

1. Minimum metal gauge shall not be less than 14 gage.

2. Cover shall be hinged entire length of cover. Cover shall be held in the closed position with bolts and nuts.

3. Provide spring nuts on all hardware fastener penetrations into the interior of the wireway to protect against wire insulation damage.

4. The inside of 90-degree corners in the wireway shall be a 45-degree bevel.

5. Grounding continuity between wireway sections and fittings shall be continuous the entire length of the wireway.

- C. Finish
  - 1. Indoor non-raintight, rust inhibitor phosphatizing base coating and baked enamel finish, manufacturer's standard color.
  - 2. Raintight or 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, and in compliance with DSA.
- 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. 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 multigang 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.
- B. Flush mounted boxes shall be attached to two studs or structure members by means of metal supports.
- C. 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.
- D. Surface mounted outlets shall be attached to concrete or masonry walls by means of expansion shields.
- E. Where outlets are shown at same or adjacent location, use multigang boxes.
- F. 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.

1. Where the separation cannot be maintained, provide a solid backing behind and completely enclosing each outlet box.
  2. 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.
  3. The backing shall consist of the following:
    - a. 5/8 inch thick gypsum board anchored in place for "stud" wall construction.
    - b. Solid "mortar" to completely fill the outlet box "cell" behind the box in masonry construction.
- G. 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 inside the wall, to maintain the fire rating of wall with the installed outlet boxes.
- H. 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.

### 3.03 WIREWAY INSTALLATION

- A. 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 ft. on center.

END OF SECTION

## 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) 0.75 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
      - 3) 0.75 inch through 1.25-inch conduit/fitting size-1,000 ampere RMS

(without external bonding jumper).

- 4) 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.
  - b. 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).
  - c. 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 [minus 20] 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 0.75-inch through 2.0-inch. EMT is not allowed for exterior locations, including under covered walks,

- shelters, or roof overhangs. EMT is not allowed less than ten (10) feet above FF, not in concrete, not underground, and not in runs longer than 100’.
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 used only for making motor connections, conduit drop from remote junction boxes to fixtures installed above the suspended ceiling, and as specifically noted on the drawings. FMC shall not be used for runs longer than 8 feet; at any exposed locations; for any conduit size larger than 1-1/4”.
  4. FMC shall comply with ANSI-C.33.84 and ANSI C33.92; NEMA FB-1; CEC 12-1100.
  5. FMC Fittings
    - a. FMC fittings shall be malleable iron construction or steel construction.

- b. Fitting shall automatically cause the FMC raceway throat opening to be centered with respect to the fitting throat opening.
  - c. Straight and angled connector termination fittings shall be threaded on one end and shall include a threaded locknut, suitable for connection to threaded and unthreaded enclosures.
  - d. The attachment of the fittings to FMC shall be angled saddle type, to engage and interlock with the FMC spiral groove, and shall be unaffected by vibration. Direct bearing screw type fittings shall not be used.
  - e. Direct FMC conduit-to-FMC conduit coupling of FMC shall not be permitted.
  - f. Shall comply with ANSI C33.9, and ANSI C33.92 (latest revision); NEMA FB1 (latest revision); U.L. 514.
6. FMC fittings as manufactured by:
- a. Straight Termination Connectors
    - 1) Thomas & Betts-3110 Series (with locknut)
  - b. 45 & 90 Degree Angle Connectors
    - 1) Thomas & Betts-3130 Series (with locknut)
  - c. FMC to EMT conduit combination coupling:
    - 1) Thomas & Betts 503TB Series.
- E. Liquid Tight Flexible Metal Conduit (LTFMC)
- 1. The metal conduit core of LTFMC shall comply with the same requirements as FMC conduit, with the addition of a thermoplastic exterior flexible jacket over the metal core.
  - 2. The exterior jacket shall be positively locked to the metal core to prevent jacket “sleeving”.
  - 3. The LTFMC shall be rated for installation and operating service temperatures of between minus 20 degrees centigrade through plus 90 degrees centigrade.
  - 4. The LTFMC jacket shall be suitable for continuous exposure to sunlight, rainwater, water vapor, mineral oils and liquid solvents, without penetrating into the conduit and without deteriorating the jacket.
  - 5. LTFMC sizes from 0.75-inch through 1.25-inches shall include an additional internal ground conductor, fabricated by the manufacturer, as an integral part of the conduit core.
  - 6. Direct LTFMC conduit-to-LTFMC conduit coupling of LTFMC shall not be permitted.
  - 7. LTFMC shall be allowed for conduit size ranges from 0.75-inch through 4.0-inches.
  - 8. In addition to the requirements for FMC conduit, LTFMC shall also comply with ANSI C-33.84 (latest revision); NEMA-FB1 (latest revision); CEC 12-1400 (latest revision).
  - 9. LTFMC fittings
    - a. Fittings shall include an external mechanical ground/bond wire connector.
    - b. The attachment of the fitting to LTFMC shall be threaded compression type onto the conduit core with locknut and liquid tight jacket compression seal. The fitting shall automatically prevent “sleeving” of the jacket.



- c. Straight and angled termination connector fittings shall be threaded on one end and shall include locknut suitable for connection to threaded and unthreaded enclosures.
  - 10. LTFMC fittings as manufactured by:
    - a. Termination connector fittings:
      - Straight Termination Connectors
        - 1) Thomas & Betts-5331 GR Series.
        - 2) Appleton-STB Series; STN-L Series for use with preformed “knockouts”.
        - 3) Emerson- OZ/Gedney-4QSeries.
      - 45 & 90 Degree Angle Connectors
        - 1) Thomas & Betts-5341GR and 5351GR Series.
        - 2) Appleton-STB-L Series; STN-L Series for use with preformed “knockouts”.
        - 3) Emerson-OZ/Gedney-4Q Series
    - b. LTFMC to RMC conduit to conduit combination coupling fittings:
      - 1) Thomas & Betts-5271 GR Series.
      - 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.  
In-line form “C” conduit bodies shall be prohibited.
- 2. The interior space “length” of 90 degree “elbow” conduit bodies shall not be less than six (6) times the diameter size of the largest conduit connecting to the conduit body.
- 3. Conduit body covers shall be removable, gasketed; watertight “domed” metal covers “Mogul-Type” with threaded screw attachment to the conduit body.
- 4. Lubricated, reusable, wire roller guards inside the conduit body shall protect wire from insulation damage during wire “pulling”.
- 5. Conduit body fittings shall comply with UL 514.
- 6. 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 inches 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

**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.
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 shall be copper:
- 1. Wire size shown on the drawings is for copper conductors, unless specifically indicated otherwise.
  - 2. 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.
  - 3. 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.
  - 4. Connector aid shall be used for all terminations and connections. Connector aid shall be Burndy Pentrox A, NO-OX-1D Grade "A".
  - 5. 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-inches 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-inches 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:
    - a. Feeder & Branch Circuit Protection Min. Equip Ground Wire Size

15 Amp	#12
20 Amp	#12
30 to 60Amp	#10
70 to 100 Amp	#8
101 to 200 Amp	#6
201 to 400 Amp	#2
401 to 600 Amp	#1
801 to 1000 Amp	2/0
1001 to 1200 Amp	3/0

1201 to 1600 Amp	4/0
1601 to 2000 Amp	250 MCM
2001 to 2500 Amp	350 MCM
2501 to 4000 Amp	500 MCM

4. Isolated grounds - Raceways containing branch circuit or feeder phase conductors connected to panelboards equipment, or receptacles with isolated grounds or isolated ground bus shall contain a dedicated insulated ground conductor connected to the isolated ground system only. The isolated ground conductor shall be continuous the length of the raceways and connected only to the isolated ground terminals in addition to and independent of the equipment bonding/ground conductor. The isolated ground conductor shall be sized as indicated above, for equipment ground/bond wire.
  5. Splices in ground/bond wires shall be permitted only at the following locations:
    - a. Ground buses with listed and approved ground lugs.
    - b. Where exothermic welded ground/bond wire splices are provided.
  6. Provide ground/bond wire jumpers for conduit fittings with ground lugs, expansion and deflection conduit fittings at conduit fittings connecting between metallic and non-metallic raceways and to bond metal enclosures to conduit fittings with ground lugs.
- E. Where conductors are run in parallel in multiple raceways, the grounding conductor shall be run in parallel. Each parallel equipment-grounding conductor shall be sized on the basis of the ampere rating of the overcurrent device protecting the circuit conductors in the raceway. When conductors are adjusted in size to compensate for voltage drop, grounding conductors, where required, shall be adjusted proportionately in size.
- F. Ground conductors for branch circuit wiring shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws, 6-32 or larger.
- G. Each panelboard, switchboard, pull box or any other enclosure in which several ground wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.
- H. Provide a separate ground/bond insulated grounding electrode conductor, copper wire from the main electrical service ground bus to each of the following locations. The ground/bond conductor shall be sized to comply with applicable codes and as indicated on the drawings, but in no case smaller than the following:
1. Main service entrance equipment ground bus:
    - a. Services smaller than 1200 ampere 1.5-inch conduit with 1#4/0.
    - b. Services 1200 ampere and larger 2.5-inch conduit with 1#500MCM.
    - c. Where a separate ground bus is not required, connect ground to electrical equipment metal housing
  2. Each telephone backboard and signal system backboard location, 1.25-inch conduit with 1#1.
  3. Metal cold water pipe located inside the building, 1.5-inch conduit with 1#4/0.

4. Outdoor underground metal cold water pipe, make connection five feet from the building, 1.5-inch conduit with 1#4/0.
5. Each transformer (size as indicated and to comply with applicable codes).
6. Each service entrance ground bus and each separately derived ground rod system:
  - a. Services smaller than 1200 ampere 1.5-inch conduit with 1#4/0.
  - b. Services 1200 ampere and larger 2.5-inch conduit with 1#500MCM.
7. Separate 1.25 inch conduit with 1#2 (AWG) bonding conductor to each interior metal pipe system located in the same building, including but not limited to, the following:
  - a. Fire sprinkler system each stand pipe location (water based and non-waterbased).
  - b. HVAC chilled water supply and return, at each pump location.
  - c. Roof drains.
  - d. Waste liquid disposal systems.
  - e. Metal gas pipe service entrance and service meters.
  - f. Hydraulic elevator hydraulic pipes.

### 3.03 CONDUIT

#### A. General

1. The sizes of the conduits for the various circuits shall be as indicated on the drawings, but not less than the conduit size required by code for the size and quantity of conductors to be installed in the conduit.
2. Conduits shall be installed concealed from view. Install conduits concealed in walls, concealed below floors and concealed above ceilings, except as specifically noted otherwise.
  - a. Conduits shall not be installed in concrete floors.
3. The following systems shall be considered as circuits 100 volts and less, all other circuits shall be considered to be over 100-volts (power circuits) unless specifically noted otherwise: Fire alarm, energy management control, telephone, public address, data, computer, television, intercom, intrusion alarm and nurse call.
4. Conduits shall be provided complete with conduit bends, conduit fittings, outlet boxes, pullboxes, junction boxes, conduit anchors/supports, grounding/bonding for a complete and operating conductor/wire raceway system.
5. Metal and nonmetal conduits shall be provided mechanically continuous between termination connection points. Metal conduit shall be provided electrically continuous between termination connection points.
6. Individual conduit paths and home runs shown on the drawings shall be maintained as separate individual conduits for each homerun and path.
7. Conduits, conduit fittings and installation work occurring in classified hazardous materials locations shall comply with applicable code Class 1 Division 1 requirements, unless specifically noted otherwise.
8. Transitions between conduits constructed of different materials and occurring in above grade locations shall be allowed only at outlet boxes, junction boxes, pull boxes, and equipment enclosures unless specifically indicated otherwise. Provide outlet boxes and junction boxes.

9. Metal conduit terminating to nonmetal enclosures; terminating into metal enclosures with “concentric ring” knockouts; terminating into metal enclosures with knockout reducing washers, including but not limited to equipment housings, outlet boxes, junction boxes, pull boxes, cable trenches, manholes, shall be provided with a ground/bonding lug integrated with the conduit termination conductor fitting construction, by the fitting manufacturer. The lug shall provide for connection of a grounding/bonding conductor (insulated or uninsulated). The grounding lug shall be located on the fitting, inside the termination enclosure.
10. The type of conduit, type of conduit fittings, and type of conduit supports and method of conduit installation shall be suitable for the conditions of use and conditions of location of installation based on the manufacturer’s recommendations; based on the applicable codes and based on the requirements of the contract documents.

**B. RMC Installation Locations**

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

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

**C. PVC Coated RMC Installation Locations**

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

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

**D. EMT Installation Locations**

EMT conduit and EMT fittings may be installed in the following locations, for circuit conductors operating below 600 volts to ground; locations containing only

“non-hazardous materials”; only dry locations:

1. Concealed in hollow non masonry/non-concrete, metal stud frame and wood stud frame walls and floors.
2. Concealed above ceilings.
3. Exposed inside interior enclosed crawl spaces.
4. Exposed interior locations placed 10-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 8-feet. Circuits requiring continuous conduit lengths exceeding 8-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 six feet or less, minimum FMC conduit size shall be 0.75-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 (3) 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 (3) three 1-inch conduits from the bottom of the panel into the accessible space below the panel. Cap conduits for future use.
  - c. Conduits stubbed underground outside of building line for future use shall be terminated a minimum of five feet clear (whichever distance is greater) of building or adjacent concrete walks and AC paving. The stubout conduit shall be capped. Provide concrete monuments, 6-inches by 6-inches by 15-inches deep, buried flush with grade over the capped ends. The face of monument shall be furnished with 3-inch square brass plates securely mounted and engraved with the number and size of conduits and type of service (i.e., "POWER", "TEL.", etc.).
  - d. Conduits stubbed into ceiling or floor spaces from outlets for telephone, video, computer/data or television shall be provided with an insulated throat bushing, on the end of each conduit stubout.
  - e. Conduit stubouts from outlet boxes and equipment located in hollow stud walls, into ceiling and floor spaces, shall be EMT or RMC conduit. The stubouts shall terminate into the ceiling and floor spaces with a conduit termination connector fitting.
  - f. Empty conduit stubs into building spaces and equipment shall be individually identified with a "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 and 20-ampere 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 ten pounds of red oxide cement coloring uniformly mixed with each cubic yard of concrete for conduit encasement.
    - d. Conduits located below or adjacent to structural foundations shall be



- separated from the foundation by a minimum of 12-inches. Conduits located below structural foundations shall be fully and continuously concrete backfilled and encased between the bottom of the foundation to the bottom of the conduits. The concrete shall be 4000 PSI 28 day cure strength instead of 2000-PSI concrete.
- e. Conduits of any size and type (including 15 ampere and 20 ampere 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 of aggregate greater than 3-inches.
  - 3) Concrete and slurry mix (2000-PSI) shall be machine vibrated during installation to remove “air-voids”.
  - 4) The slurry mix shall consist of concrete, clean rock, clean sand and clean water mixture. Maximum shrinking of slurry mix shall not exceed 5% wet to dry.
- h. Do not backfill until District’s Representative has approved installation and as-built drawings are up to date. Promptly install conduits after excavation has been done, so as to keep the excavations open as short a time as possible. Excess soil from trenching shall be removed from the site.
- i. Install underground conduit, except under buildings, not less than 24-inches below finished grade in non-traffic areas and 30-inches below finished grade in traffic areas, including roads and parking areas. Not less than 48-inches below finished grade under public/ private transit system right of way and railroad right of way. Dimensions shall be measured to the top of the conduit.
- j. Conduit crossing existing underground utilities shall cross below the bottom depth of the existing utilities. If the top portion of the existing utility depth below finish grade exceeds 72-inches and the specified separation and depths are maintained when crossing over the top of the existing underground utility, the conduit may cross above the existing underground utility.
- k. Provide long radius horizontal bends (minimum radius of 36-times the conduit diameter) in underground conduits where the conduit is in excess of 100-feet long.
- 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 (1) 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 (3) 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 off 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>
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- 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.
11. At each conduit penetration of a “sound-rated” wall, floor or ceiling. Provide two (2) 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. Rigid steel conduit or electrical metallic tubing shall not be strapped or fastened to equipment subject to vibration or mounted on shock absorbing bases.
15. 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.
16. RNMC conduit:
  - a. Joints and fittings shall be solvent welded to RNMC conduit. Joints and fittings shall be watertight and airtight after fabrication.
17. Tighten each conduit fittings and fitting appurtenance, to the “torque” (allowable tolerance 5%) value recommended by the fitting manufacturer and applicable code. If three (3) 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 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.

I. 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.

J. 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 x 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.

K. 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.

L. 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-inches less than diameter of duct at center, tapering to 0.5-inches 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 (2) 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 or the DISTRICT'S Representative.
- E. All wiring, including low voltage, shall be installed in conduit.
- F. Control wiring to conform to the wiring diagrams shown on the mechanical drawings and the manufacturer's wiring diagrams.
- G. All splices in exterior pull boxes and light poles shall be cast resins encapsulated.
  1. Power conductor splices - 3M Scotchcast Series 82/85/90; Plymouth or equal.
  2. Control and signal circuits 3M Scotchcast series 8981 through 8986, Plymouth or equal.

- H. Neatly group and lace all wiring in panelboards, motor control centers and terminal cabinets with plastic ties at 3-inch on centers. Tag all spare conductors.

3.07 TESTING

A. Testing Conduit and Conduit Bends

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

1. A round tapered segmented semi-rigid mandrel with a diameter approximately 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



## SECTION 26 05 43

### PULLBOXES

#### 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 racks, hooks, supports, ladders, covers, grounding, manholes, vaults, pullboxes, joint sealing compound etc.
- B. Submit detailed shop drawings including dimensioned plans, elevations, details, structural calculations signed by a California State registered Structural ENGINEER and descriptive literature for all component parts.

#### PART 2 - PRODUCTS

##### 2.01 GENERAL

- A. Each concrete precast section shall be identified by having the manufacturer's name and address, along with respective section weight cast into an interior face or permanently attached thereto. Associated Concrete Products, Jensen Precast Products, Brooks Products or equal.
- B. Structure Construction
1. The precast steel reinforced concrete structure walls, floor and roof shall safely sustain the loads and pressure resulting from vertical and lateral earth loading and vehicular loading. Based on the following criteria:
    - a. Minimum earth density shall be 120 lbs./cu.ft.
    - b. Minimum equivalent fluid pressure for lateral pressure due to earth shall be 85 lbs./sq.ft. undrained earth conditions, minimum safety factor for buoyancy shall be 1.25.
    - c. Vehicular load rating shall be H-20 in compliance with latest AASHTO specifications.
    - d. Design shall be based on maximum depth of fill over the structure as indicated on the drawings, but not less than 36 inches.
    - e. Design and details shall comply with minimum ACI 318-63 code requirement. Minimum concrete 28-day cure strength shall be 3,000 psi.
  2. Precast structure shall be designed to withstand forces due to additional inward

load of 4,000 pounds (working load) with safety factor of two (2), acting perpendicular to the surface at any pulling iron.

3. Structures shall be single piece or horizontal multi-section construction as required for field installation conditions. Multi-sections shall interlock with "Tongue and groove" joint mating surfaces to insure a rigid assembly.
4. All structure precast joints shall be sealed with preformed cold field applied plastic joint sealing compound. Joint sealing compound shall not leak, sag or flow at the joints with 10 psi water pressure applied for 24 hours. Chemically resistant to acid, alkali's and saturated hydrogensulfide.
5. Each precast structure section shall have suitable knockouts or openings in the vertical walls for the duct banks and conduits entering the structure. Provide a 1 inch diameter knockout in each corner of the floor slab, 6 inch from adjacent walls, for installation of ground rods.

C. Intercept Manhole/Pullbox Structures

1. Intercept type manhole/pullbox structures shall comply with the requirements of non-intercept manholes and pullboxes, respectively. Plus the additional requirements listed below.
2. Manholes/pullboxes shown to be installed at the same location as replacement for existing manhole/pullbox shall be custom fabricated "intercept" multi-section type.
3. The structure shall be provided with multiple, vertical and horizontal custom fabricated sections for fitting around existing manholes/conduits/duct banks/conductors entrances into the structure during manhole installation without disturbing existing manholes/pullboxes. The structures shall allow placement of the structures without disconnecting or disrupting existing circuits during the installation. The structure walls shall be slotted to fit around existing concrete encased conduit entrances.
4. Provide cast-in-place concrete steel reinforced foundation/footings and floor for the intercept structure. The foundation shall be installed prior to removal of existing manhole/ pullbox. The floor shall be installed after removal of the existing manhole/pullbox structure. The foundation/footing and floor shall be designed, and engineered as part of precast structure.
5. The structure foundation/footings shall be "keyed" to match keying of manhole precast wall sections.

2.02 PULLBOXES

- A. Pullboxes shall have deep recess conduit knockout concrete extensions at two opposite end walls. Additional shallow recess knockouts shall be provided on the other two walls for conduit entrances.
- B. Pullboxes shall be provided with a minimum of one precast concrete 6 inch extension grade ring "tongue and groove" matting surfaces to insure rigid assembly.
- C. Pullbox sizes shall be as indicated ori drawings but in no case less than required by applicable codes. Minimum depth of the pullbox shall not be less than 42 inch.

- D. The pullbox floor sump shall extend through the concrete floor into the gravel bedding, below the pullbox.

2.03 COVERS AND FRAME ASSEMBLIES

- A. Traffic rated per AASHO for H20 loading.
- B. Pullboxes
  - 1. Hot dip galvanized steel single piece flush fitting with threaded flush hold down, slotted head, stainless steel studs.
  - 2. Topping frame shall be hot dip galvanized steel angle frame where the pullbox is installed in paving or concrete work.
  - 3. Top ring frame shall be armor band type where the pull box is installed in exposed earth or landscaping.
  - 4. Cover openings larger than eight (8) square feet of surface area, shall be provided with "split" two (2) piece cover type. Each "split" cover shall be hinged open-close with Torsion- Spring type cover, to assist in the ease of opening and closing the cover.
  - 5. Cover openings eight (8) square feet or smaller surface area shall be single piece covers.
- C. Covers shall be permanently marked in the cover metal as follows:
  - 1. "E" or "Electric" for covers on structures containing power circuits under 600 volts and "HV" or "High voltage" for covers on structures containing power circuits over 600 volts.
  - 2. "Signal" for covers containing signal circuits.

2.04 CABLE RACKS

- A. Cable racks, installed on the vertical walls of the structure, including hooks and porcelain insulator cable cradles, shall be sufficient to accommodate the cables and splices.
- B. Vertical racks shall be installed on all walls of the structure a minimum of 24-inches on center within 6-inches of floor and top of wall. A rack shall be installed within 18-inches of each corner of each wall. Additional racks spaced equally on each wall shall be installed, spacing between vertical wall racks shall not exceed 24 inches.
  - 1. Wall racks shall be slotted to accept removable hooks and lock hooks into place.
  - 2. Non-metallic, 50 percent (minimum) glass reinforced nylon or non-metallic material of the same characteristics.
  - 3. The installed cable racks, cable support hooks with arms and wall anchor bolts shall support the following minimum loads for each hook/arm, with a 2000 percent minimum safety factor. Based on multiple hook/arms located not less than 9-inches on center along the entire vertical length of the support rack:

<u>Hook/Arm Length</u>	<u>Minimum Weight Each Hook/Arm Supported</u>	<u>Maximum Allowable Hook/Arm Deflection</u>
a. 8-inch	450 pounds	0.25-inch
b. 14-inch	350 pounds	0.37-inch

c. 20-inch                                      250 pounds                                      0.37-inch

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

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

#### 2.05                      PULL-IN-IRONS

- A. Pull-in-irons shall be a galvanized steel bar bent in a "U" shape, and cast in the structure walls and floors.
- B. A floor pull-in-iron shall be centered under the manhole entry ring in the structure floor.
- C. Pull-in-irons shall not be less than 6 inches above or below, in the opposite wall from each knockout panel for conduit entrances.
- D. Pull-in-irons shall project from the structure wall into the structure approximately four inches.

#### 2.06                      DRAINAGE SUMPS

- A. Provide drainage sump with cast iron metal grate in the floor of each structure. Minimum diameter of 12-inches by 4-inches deep. Provide a removable cast iron grate over the sump.

### PART 3 - EXECUTION

#### 3.01                      EXCAVATION

- A. Excavate for installation of precast structures removes excess excavated material from the site.
- B. Saw cut existing paving and concrete as required for excavation.
- C. Provide a minimum of 6-inches deep bedding base of crushed rock 3/8-inch - 1/2-inch size in the bottom of the excavation. Bedding shall be level and well compacted by a minimum of four passes with a plate type mechanical vibrator.
- D. Back fills and compact earth around precast structure after installation of the structure to 90-percent minimum compaction in 12-inch lifts. Replace paving concrete, landscaping above structure to match existing.

#### 3.02                      INSTALLATION

- A. Install precast structures per manufacturer recommendations to provide a dry watertight installation. Set cover flush with existing grade or finish surface. Where precast structure is installed in pedestrian walkway or vehicular traffic way with a sloping finish grade. Slope cover to match existing finish surface slope.

- B. Install structures to avoid surface water drainage flow lines, and existing utilities.
- C. Exterior concrete walls tops and bases of precast structure shall be damp-proofed with two coats of a bituminous damp-proofing material, minimum finish thickness 4-mil.
- D. Connections to Precast Structure
  - 1. Lines connecting to precast structures shall be constructed to have a cast in place concrete tapered section adjacent to the structure and extending a minimum of 48 inch out from the structure to provide shear strength.
  - 2. Precast structure shall be constructed to provide for keying the concrete envelope of the conduit line into the wall of the structure. Mechanical vibrators shall be used when this portion of the envelope is poured to assure a seal between the envelope and the wall of the precast structure.
- E. Entrances of conduits/ducts shall terminate with endbells inside the precast structure. Slope conduit entrances into manhole to insure top of conduit entrances into manhole are a minimum of 6-inches below manhole ceiling. Maximum conduit slope shall not exceed 1-inch per "running" foot of conduit.
- F. Manholes and pullboxes shown to intercept existing conduit, remove portion of existing conduit approximately 4-feet back from manhole wall, regrade and excavate conduit entrance and extend existing conduit into manhole or pullbox to match existing conduit quantity and size. Provide "horizontal, split" conduit and split conduit coupling to extend existing conduit into manholes and pullboxes.

### 3.03 GROUNDING

- A. Provide 10-feet long by 0.75-inch diameter copper clad, steel, driven ground rods through the floor of the precast structure. Provide a minimum of two ground rods in opposite corners in manholes and vaults, one ground rod in pullboxes. Ground rod shall extend 6-inches above the floor line. Where rock bottom is encountered, bury ground rod in horizontal trench with projection into precast structure. Seal off openings around ground rods.
- B. Ground permanently and effectively together all metal equipment cases, metallic, cable racks, ladders, etc., with #4 bare copper bonding conductor. Provide U.L. compression bonding fittings at each ground connection.

END OF SECTION

## SECTION 26 50 00

### LIGHTING FIXTURES

#### PART 1 - GENERAL

##### 1.01 SCOPE

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

##### 1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. General
1. Submit certification letter from manufacturers of Lamps and Ballasts and power supplies, (or alternately, manufacturer's published catalog data) stating/showing the specific lamp, ballast, or power supply combination comply with manufacturer recommendation and approval for the combined use, shown on the drawings.
  2. Provide complete manufacturers catalog data information for each light fixture (luminaire), ballast, lamp, materials, auxiliary equipment/devices, finishes and photometrics.
- B. Performance Certification
1. Submit manufacturer's certified lamp and ballast tests report data showing compliance with contract document.
  2. Submit manufacturer's letter of certification for each fixture type, confirming the proposed combination of specific lamp, ballast and auxiliary components for each light fixture (luminaire) type will function together correctly and perform in compliance with the requirements of the contract documents as follows:
  3. "The proposed lamp(s), lamp ballast(s) (where, applicable), lamp sockets and fixture have been tested as an assembly. The proposed fixture products assembly are certified by the manufacturer to function within the required temperature, lumen output, electrical characteristics and operational life described in the contract documents".
- C. Light Fixture Samples
1. If requested by the DISTRICT'S Representative, provide a sample of each fixture proposed as a substitution for a specified fixture. Sample fixture shall be complete with specified lamps, 3-wire grounding "SO" cord and plug for 120-volt 60Hz, AC plug-in operation. Sample fixtures shall be delivered to the District's Representative's office for review, the samples shall be picked up within 10-

working days after review comments have been received; any samples left beyond this time will be discarded by the District's Representative. Decision of District's Representative regarding acceptability of any lighting fixture is final.

1.03 QUALITY ASSURANCE (ADDITIONAL REQUIREMENTS)

- 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 Document 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. UL – Underwriters' Laboratory:
    - a. UL – 8750: Light Emitting Diode – LED
    - b. UL - 1598C: Equipment for use in Lighting Products and Replacements
  2. NEMA – National Electrical Manufacturers Association:
    - a. NEMA – SSL #1, #3 and #6: Electronic Drivers for LED; LED and Incandescent Lamp Replacement
    - b. NEMA – LSD #44, #45, #49 and #51: SSL-solid state lighting
  3. United States Federal Government:
    - a. FCC – Part 18: EMI and RFI emissions limitations.
    - b. EPA: Energy conservation publications and waste disposal regulations.
  4. ETL and C.B.M. certified and approved.
  5. Electrical installation standards, National Electrical Contractors' Association:
    - a. NEIS/NECA and IESNA – 500 Recommended Practice for: Installing indoor Commercial Lighting Systems.
    - b. NEIS/NECA and IESNA – 501: Recommended Practice for installing Exterior Lighting Systems
    - c. NEIS/NECA and IESNA - 502: Recommended Practice for installing Industrial Lighting Systems.
  6. Illuminating Engineering Society – IES (IESNA):
    - a. IES – LM41: Photometric and Reporting.
    - b. IES – 587: Transient Surge Protection.
    - c. IES – LM79: Solid State Lighting (SSL) Testing and Measurement.
    - d. IES – LM80: Testing for Lifetime of LED.
  7. ANSI-American National Standards Institute:
    - a. ANSI – C81
    - b. ANSI – C82
    - c. ANSI – C62.41: Transient Withstand
    - d. ANSI – C78: Lamps
  8. State California Code of Regulations - Title-24:Energy Code
  9. DALI – Digital Addressable Lighting Interface, shall comply with latest versions of IEC- 60929 and NEMA-243. See Specification Section 16575 "DALI Lighting Controls" for additional requirements.

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. Complete Fixture
  - 1. Provide light fixtures complete including lamps, ballasts, lamp holders sockets, housings, ceiling and wall trim "rings" for each ceiling type, mounting and adapter support brackets, diffusers/lenses and outlet boxes.
  - 2. Include an allowance of \$300.00 to provide a light fixture for each lighting fixture outlet shown on drawings without a fixture type designation.
- B. Specific Fixture Requirements and Fixture Schedule Information
  - 1. The catalog numbers included in the description of the various types of lighting fixtures shall be considered to establish the type or class of the fixture with a particular manufacturer only. The fixture length, number of lamps and lamp types, component materials, accessories, mounting type, ceiling, wall and install adapters, operation voltage, and all other components required to fulfill the total description of the fixture based on all drawing information, branch circuits, voltages, specification information, and shall be included in the contract requirements regardless of whether or not the catalog number specifically includes these components.
  - 2. Lighting fixtures shall be the types as indicated in fixture schedule on the drawings and as described in the specifications.
  - 3. All fixtures of the same fixture type shall be the same manufacturer and of identical finish and appearance, unless indicated otherwise on drawings.
- C. Manufacturer Certification of Operation
  - 1. Lamps and lamp ballasts and power supplies (drivers) shall be recommended and certified by the respective manufacturer(s), to be "matched" to operate correctly together, within the published characteristics, for efficacy, lamp starting, operating life hours, lumen output, power factor, power input, operating line ampere, sound intensity, and temperature.

### 2.02 LIGHT FIXTURES (LUMINAIRES)

- A. General
  - 1. Lighting fixtures shall have all parts, ballasts, sockets, support attachments, trim flanges and fittings necessary to complete and properly install the fixture at the indicated installation locations. All fixtures shall be provided with lamps of size and type specified.
  - 2. Ceiling and/or wall surface mounted lighting fixtures shall not have any exposed chase nipples or conduit knockouts visible to view within fixture housing. Lighting fixtures mounted in continuous rows shall have chase nipples or conduit knockouts between lighting fixture housing, but shall not have visible chase nipples/conduit knockouts on the visible ends of the continuous row of lighting fixtures.
  - 3. Where fixture color is indicated to be selected by the ARCHITECT and/or District's Representative, provide two (2) color chip samples for each color for review.



4. Recessed fixtures with attached junction box shall be provided with a junction box permanently attached to the plaster ring so that the junction box is accessible through the fixture opening when the fixture is removed. Connection between fixture and pull box shall be flexible metal conduit with not less than 16AWG "AF" or "CF" type fixture rated copper wires, high temperature wire insulation for not less than 600 volts AC. The flexible conduit shall be sufficient length, so that when the fixture is removed, the pullbox is readily accessible.
5. Recessed fixtures shall be Underwriters' Laboratory approved for recessed installation with plaster frame and attached pull box. Lamp enclosure, reflectors and finish wiring shall not be installed until plastering is completed. Exposed finish trim shall not be installed until finish painting of the adjacent surface is completed.
6. The fixture shall bear Underwriters' Laboratory label of approval for the wattage and installation indicated.
7. Light fixtures installed outdoors, in damp or wet locations shall be UL labeled for said location as "damp-location" and "wet-location" for the respective installation location.
8. Fixtures in contact with thermal/building insulation shall be UL listed and rated for direct contact installation in thermal insulation systems.
9. Lamp auxiliary support brackets shall be heat-resistant, non-dielectric. Alternatively, metal auxiliary lamp support brackets shall be electrically isolated from the fixture, to prevent glass decomposition.

B. Lens and Diffusers

1. Acrylic plastic or Plexiglas for the light fixture diffusers or fixtures lenses, shall be 100% virgin material.
2. Thickness of not less than 0.125-inch, as measured at the "THINIST" portion on the diffuser or lens. However, thickness shall be increased to sufficient construction and camber to prevent the lens and diffusers from having any noticeable sag over the entire normal life of the installation.
3. Diffusers shall be formed from cast sheet by a vacuum and/or pressure technique.
4. Lighting fixtures containing lamps with dichroic reflectors and light fixtures with non-dichroic lens/diffuser shall be rated for high temperature lamp operations resulting from lamp heat redirected (reflected) back into the fixture.

2.03 SOLID STATE LIGHTING (SSL), LIGHT EMITTING DIODES (LED) LAMPS, POWER SUPPLIES, AND LIGHT FIXTURES (ADDITIONAL REQUIREMENTS)

A. General

1. Solid State LED light source (lamps), related control equipment (driver-power supply), and luminaire (light fixture) optics for light output distribution.
2. Shall comply with the US-DOE Energy Star Program for SSL-LED. Submit documentation with Shop Drawings.
3. Shall comply with the latest revision IESNA LM-79 and LM-80. Submit documentation with Shop Drawings.
4. SSL chromaticity shall comply with latest revision NEMA and ANSI – C78.377. Submit documentation with Shop Drawings.

5. Submit with Shop Drawings two (2) samples of each light fixture type employing SSL, with prewired 120 volt, 60Hz AC “SO” cord and plug-in cap.
- B. LED Lamps
1. Lamp lumen output and overall efficiency shall be based on the LED lamps installed in specified fixture and ambient operating temperature.
  2. Lamp Color Rendition Index (CRI) shall equal or exceed CRI – 80, unless noted otherwise on drawings.
  3. Lamp color output shall be 4000-degree K (100K), unless noted otherwise on drawings.
  4. CRI and lamp color temperature shall be same for all light fixtures of the same fixture type.
- C. LED Power Supply (driver)
1. Combination of power supply and SSL – lamp shall be tested and certified by respective manufacturers for performance and proper operation.
  2. Provide dimming type driver where indicated on drawings. Driver and dimming equipment shall be tested and certified by respective manufactures for performance and proper operation.

## PART 3 - EXECUTION

### 3.01 LIGHT FIXTURE INSTALLATION

- A. General
1. The CONTRACTOR shall verify actual ceiling and wall construction types as defined on the Architectural drawings and furnish all lighting fixtures with the correct mounting devices, trim rings, brackets whether or not such variations are indicated by fixture catalog number. The CONTRACTOR shall verify depth of all recessed lighting fixtures with Architectural drawings prior to ordering fixtures. Any discrepancies that would cause recessed lighting fixtures not to fit into ceiling shall be reported to the District’s Representative prior to release of order to the supplier of the fixtures.
  2. On acoustical tile ceilings, fixture outlets shall be accurately located in the center, at the intersection of the four (4) corners or at the center of the joints of two tiles.
  3. The CONTRACTOR shall aim the exterior adjustable lighting fixtures after dark in the presence of, and at a time convenient to the District’s Representative.
  4. Fixtures shall be ordered and furnished to operate correctly on the branch circuit voltage connected to the respective fixture as shown on the site plan and floor plan electrical drawings. The voltages shown on the fixture schedule are for generic fixture information only.
  5. Install and connect lighting fixtures to the circuits and control sequences indicated on the drawings and to comply with respective manufacturer's instructions/recommendations.
  6. Lighting fixtures in building interstitial spaces, in mechanical plumbing and electrical spaces /rooms, are shown in their approximate locations. Do not install lighting outlets or light fixtures until the mechanical, plumbing and electrical

equipment/pipes/ductwork are installed; then adjust and install lighting in revised clear (non-interfering) locations to provide best even-illumination. Coordinate the locations with all other trades prior to lighting installation.

7. Provide conduit and DALI Loop (Bus) communications lighting control network circuit connections, to each light fixture with DALI ballasts.

### 3.02 LENS AND DIFFUSERS

- A. Lens, diffusers, internal reflectors shall be completely cleaned of all dust, dirt and fingerprints after the installation of the light fixtures and lamps, and after all trades have completed work and prior to occupancy of the facility by the DISTRICT.

### 3.03 COMMISSIONING LIGHTING FIXTURES (ADDITIONAL REQUIREMENTS)

- A. General
  1. Verify correct lighting control configurations and operation in each room / area.
  2. Verify light fixture support-hangers, ceiling grid clips and seismic restraints comply with the Contract Documents.
  3. Remove protective shipping/installation shields on fixtures. Verify fixtures and lamps are clean and free of construction debris. Clean light fixtures found to be contaminated or dirty.
  4. Setup, program, and function test lighting control systems to perform each of the indicated control functions, area/room zones and sequences.
  5. Provide “aiming”, directional adjustment of light fixtures, both indoor and outdoor. Aiming shall comply with manufacturer’s aiming diagrams, and as directed by District’s Representative.
- B. Sample spot-check in each room the following lighting fixture information:
  1. Lamp type and performance data.
  2. Ballast type and performance data.
  3. Combined lamp/ballast certification of performance and compatibility by respective manufacturer.
  4. Verify instructional signage is placed inside each lighting fixture in compliance with Contract Documents.

END OF SECTION

SECTION 26 56 00  
EXTERIOR LIGHTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
  - 1. Exterior luminaires with Light Emitting Diode LED and Drivers.
- B. Related Sections include the following:
  - 1. Division 26 Section 26 50 00 "Lighting Fixtures" for exterior luminaires normally mounted on exterior surfaces of buildings.

1.03 DEFINITIONS

- A. CRI: Color-rendering index.
- B. Luminaire: Complete Light Emitting Diode LED lighting fixture, including Drivers housing if provided.
- C. Pole: Luminaire support structure, including tower used for large area illumination.
- D. Standard: Same definition as "Pole" above.

1.04 SUBMITTALS

- A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
  - 1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
  - 2. Details of attaching luminaires and accessories.
  - 3. Details of installation and construction.
  - 4. Luminaire materials.

5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.
  - a. Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
6. LED Drivers, including energy-efficiency data.
7. Light Emitting Diode LED, including life, output, and energy-efficiency data.
8. Materials, dimensions, and finishes of poles.
9. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.

B. Shop Drawings:

1. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
2. Design calculations, certified by a qualified professional engineer, indicating strength of screw foundations and soil conditions on which they are based.
3. Wiring Diagrams: Power and control wiring.

C. Samples for Verification: For products designated for sample submission in Exterior Lighting Device Schedule. Each sample shall include lamps and ballasts.

D. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4 and that load imposed by luminaire has been included in design.

E. Qualification Data: For agencies providing photometric data for lighting fixtures.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For luminaires and poles to include operation and maintenance manuals.

H. Warranty: Special warranty specified in this Section.

## 1.05 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.

- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with IEEE C2, "National Electrical Safety Code."
- E. Comply with NFPA 70.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- B. Retain factory-applied pole wrappings on fiberglass and laminated wood poles until right before pole installation. Handle poles with web fabric straps.
- C. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

#### 1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
  - 1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
  - 2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
  - 3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
  - 4. Warranty Period for Lamps: Replace lamps and fuses that fail within 12 months from date of Substantial Completion; furnish replacement lamps and fuses that fail within the second 12 months from date of Substantial Completion.
  - 5. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

#### 1.08 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Globes and Guards: 10 percent of each type and rating installed. Furnish at least one of each type.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
- B. In Exterior Lighting Device Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified on the lighting fixture schedule.

### 2.02 LUMINAIRES, GENERAL REQUIREMENTS

- A. Luminaires shall comply with UL 8750 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
- B. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Light Shields: Factory installed Light Emitting Diode LED shall arranged to block light distribution to indicated portion of normally illuminated area or field.
- J. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
  - 1. White Surfaces: 85 percent.
  - 2. Specular Surfaces: 83 percent.

3. Diffusing Specular Surfaces: 75 percent.
- K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
  - L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finishes process and color of pole or support materials.
  - M. Factory-Applied Finish for Steel luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
    1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
    2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
      - a. Color: As selected by Architect from manufacturer's full range.

#### 2.03 LED DRIVER FOR Light Emitting Diode LED

- A. Comply with ANSI 8750-2009 and UL 8750 and capable of open-circuit operation without reduction of average lamp life. Include the following features, unless otherwise indicated:
  1. LED Driver Circuit: Constant-wattage and high-power-factor type.
  2. Minimum Starting Temperature: Minus 22 deg F.
  3. Normal Ambient Operating Temperature: 104 deg F.
- A. Light Emitting Diode LED
  1. Light Emitting Diode LED: ANSI 8750-2009, CRI 80 (minimum), color temperature 4000K, and average rated life of 100,000 hours, minimum.

### PART 3 - EXECUTION

#### 3.01 LUMINAIRE INSTALLATION

- A. Install Light Emitting Diode LED's light source and driver in each luminaire.
- B. Fasten luminaire to indicated structural supports.
  1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.



- C. Adjust luminaires that require field adjustment or aiming.

### 3.02 POLE INSTALLATION

- A. Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
- B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features, unless otherwise indicated on Drawings:
  - 1. Fire Hydrants and Storm Drainage Piping: 60 inches.
  - 2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
  - 3. Trees: 15 feet.
- C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Division 03 Section "Cast-in-Place Concrete."
- D. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level recommended by pole manufacturer.
  - 1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
  - 2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
  - 3. Install base covers, unless otherwise indicated.
  - 4. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.
- E. Embedded Poles with Tamped Earth Backfill: Set poles to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
  - 1. Dig holes large enough to permit use of tampers in the full depth of hole.
  - 2. Backfill in 6-inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.
- F. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch- wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.
- G. Raise and set poles using web fabric slings (not chain or cable).

### 3.03 CORROSION PREVENTION

- A. Steel Conduits: Comply with Division 26 Section "Raceway and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

### 3.04 GROUNDING

- A. Ground metal poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."
  - 1. Install grounding electrode for each pole, unless otherwise indicated.
  - 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
- B. Ground nonmetallic poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."
  - 1. Install grounding electrode for each pole.
  - 2. Install grounding conductor and conductor protector.
  - 3. Ground metallic components of pole accessories and foundations.

### 3.05 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
  - 1. Verify operation of lighting controls.
- C. Illumination Tests:
  - 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):
    - a. IESNA LM-50, "Photometric Measurements of Roadway Lighting Installations."
    - b. IESNA LM-64, "Photometric Measurements of Parking Areas."
    - c. IESNA LM-72, "Directional Positioning of Photometric Data."
- D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

### 3.06 DEMONSTRATION

- A. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

## SECTION 311000

### SITE CLEARING

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Protection of existing trees indicated to remain.
  - 2. Removal of trees and other vegetation.
  - 3. Topsoil stripping and stockpiling.
  - 4. Clearing and grubbing.
  - 5. Removing above-grade improvements.
  - 6. Removing below-grade improvements.
- B. Related Sections:
  - 1. “Temporary Facilities and Controls” Section for temporary utility services, construction and support facilities, and security and protection facilities.
  - 2. “Execution” Section for field engineering and surveying.
  - 3. “Construction Waste Management and Disposal” and “Sustainable Design Requirements” Section for additional LEED requirements.
  - 4. “Structure Demolition” Section for demolition of buildings, structures, and site improvements.
  - 5. “Selective Structure Demolition” Section for partial demolition of buildings or structures.

##### 1.03 PROJECT CONDITIONS

- A. Traffic: Conduct site-clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close

or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.

- B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
  - 1. Protect improvements on adjoining properties and on Owner's property.
  - 2. Restore damaged improvements to their original condition, as acceptable to property owners. The full width of pavements damaged due to construction access and other construction-related activities shall be replaced with a structural section (pavement and base) at least equal to the adjacent existing section.
  - 3. Protect existing utility lines indicated to remain. Notify Owner immediately of any damage to or encounter with an unknown existing utility line. Immediately repair damage to existing utility lines.
  
- C. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place against unnecessary cutting, breaking or skinning of roots, ANY skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.
  - 1. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
  - 2. Provide protection for roots over 1-1/2 inch in diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt or other acceptable coating formulated to use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
  - 3. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations in a manner acceptable to Architect. Employ a licensed arborist to repair damage to trees and shrubs.
  - 4. Replace trees that cannot be repaired and restored to full-growth status, as determined by arborist.
  
- D. Improvements on Adjoining Property: Authority for performing removal and alteration work on property adjoining Owner's property will be obtained by Owner prior to award of contract.
  - 1. Extent of work on adjacent property is indicated on Drawings.

- E. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated or directed.
- F. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place. Contractor shall abide by all conditions in the Storm Water Pollution Prevention Plan Prepared by others.
- G. Soil stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

1.04 EXISTING SERVICES

- A. General: Indicated locations are approximate; determine exact locations before commencing Work.
- B. Arrange and pay for disconnecting, removing, capping, and plugging utility services. Notify affected utility companies in advance and obtain approval before starting this Work.
- C. Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

PART 2 - PRODUCTS

2.01 NONE

PART 3 - EXECUTION

3.01 SITE CLEARING

- A. General: Remove shrubs, grass, and other vegetation, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site disposal of stumps and roots.
  - 1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
  - 2. Unless specifically designated to remain, strip the upper two inches (minimum) of soil containing vegetation and root growth within the Limits of Work shown on the Drawings.
- B. Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is reasonably free of subsoil, clay

lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material.

1. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material. Remove heavy growths of grass from areas before stripping.
    - a. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.
  2. Stockpile topsoil in storage piles in areas indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles, if required, to prevent wind erosion. Limit height of stockpiles to 72 inches.
  3. Dispose of unsuitable or excess topsoil as specified for disposal of waste material.
- C. Clearing and Grubbing: Clear site of trees, shrubs, and other vegetation, except for those indicated to be left standing.
1. Completely remove stumps, roots, and other debris protruding through ground surface.
  2. Use only hand methods for grubbing inside drip line of trees indicated to remain.
  3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
    - a. Place fill material in horizontal layers not exceeding 8 inches loose depth, and thoroughly compact each layer and compact in accordance with the requirements specified in Division 31 Section "Earth Moving" to make the new surface conform with the existing adjacent surface of the ground.
  4. Trim trees, designated to be left standing within the cleared areas, of dead branches 1-1/2 inches or more in diameter; and trim all branches to heights and in a manner as indicated. Neatly cut limbs and branches to be trimmed close to the bole of the tree or main branches. Paint cuts more than 1-1/4 inches in diameter with specified tree-wound paint.
- D. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.

1. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings. Removing abandoned underground piping or conduits interfering with construction are included under this Section.

3.02 DISPOSAL OF WASTE MATERIALS

- A. Burning on Owner's Property: Burning is not permitted on Owner's property.
- B. Removal from Owner's Property: Remove waste materials and unsuitable or excess topsoil from Owner's property.
- C. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other project work.

END OF SECTION

## SECTION 311200

### DEMOLITION

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Demolition and removal of buildings. Removal of trees and other vegetation.
  - 2. Demolition and removal of structures.
  - 3. Demolition and removal of site improvements.
  - 4. Disconnecting, capping or sealing, and abandoning site utilities in place.
  - 5. Disconnecting, capping or sealing, and removing site utilities.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. "Cutting and Patching" Section for cutting and patching procedures for demolition operations.
  - 2. Division 1 Section "Schedules and Reports" Section for demolition schedule requirements
  - 3. Division 1 Section "Construction Facilities and Temporary Controls" Section for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures for demolition operations.
  - 4. "Contract Closeout" Section for record document requirements.
  - 5. "Selective Demolition" Section for partial demolition of a building or structure undergoing alterations and for the removal, salvage, or reuse of materials in new construction.



6. "Tree Protection and Trimming" Section for protecting trees remaining on-site.
7. "Site Clearing" Section for site clearing and removing above- and below-grade improvements.
8. "Earth Moving" Section for soil materials, excavating, backfilling, and site grading.

1.03 DEFINITIONS

- A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
- B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.
- C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in locations indicated.
- D. Existing to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during demolition and then cleaned and reinstalled in their original locations.

1.04 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.
- B. Historical items indicated remain the Owner's property. Carefully remove and salvage each item in a manner to prevent damage and deliver promptly to the Owner.
- C. Historical items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to the Owner, which may be encountered during demolition, remain the Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to the Owner.
  1. Cooperate with Owner's archaeologist or historical adviser.

1.05 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.
- B. Proposed dust-control measures.
- C. Proposed noise-control measures.
- D. Schedule of demolition activities indicating the following:
  - 1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
  - 2. Dates for shutoff, capping, and continuation of utility services.
- E. Inventory of items to be removed and salvaged.
- F. Inventory of items to be removed by Owner.
- G. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by demolition operations.
- H. Record drawings at Project closeout according to "Contract Closeout" Section.
  - 1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.
- I. Landfill records for record purposes indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.06 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed demolition Work similar to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Pre-demolition Conference: Conduct conference at Project site to comply with pre-installation conference requirements of Division 1 Section "Project Meetings."

1.07 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of Work.
- B. Owner assumes no responsibility for actual condition of buildings to be demolished.
  - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Asbestos: It is not expected that asbestos will be encountered in the course of this Contract. If any materials suspected of containing asbestos are encountered, do not disturb the materials. Immediately notify the Architect and the Owner.
  - 1. Asbestos will be removed by Owner before start of Work.
- D. Asbestos: Asbestos is present in the building or structure to be demolished. A report on the presence of asbestos is on file for review and use. Examine the report to become aware of locations where asbestos is present.
  - 1. Asbestos abatement is specified elsewhere in the Contract Documents.
  - 2. Do not disturb asbestos or any material suspected of containing asbestos except under the procedures specified elsewhere in the Contract Documents.
- E. Storage or sale of removed items or materials on-site will not be permitted.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. Requirements for satisfactory soil materials are specified in "Earth Moving" Section.
  - 1. Obtain approved borrow soil materials off-site when sufficient satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.

- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. Survey the 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.
- E. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

### 3.02 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
  - 1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.
    - a. Provide not less than 72 hours' notice to Owner if shutdown of service is required during changeover.
- B. Owner will arrange for disconnecting and sealing indicated utilities serving structures to be demolished before start of demolition work, when requested by Contractor.
- C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving structures to be demolished.
  - 1. Owner will arrange to shut off indicated utilities when requested by Contractor.
  - 2. Arrange to shut off indicated utilities with utility companies.
- D. Utility Requirements: Refer to “Electrical” and “Mechanical” Sections for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

### 3.03 PREPARATION

- A. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.
- B. Employ a certified, licensed exterminator to treat building and to control rodents and vermin before and during demolition operations.

- C. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
  
- D. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.
  - 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
  - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
  - 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
  
- E. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of buildings to be demolished and adjacent buildings to remain.
  - 1. Strengthen or add new supports when required during progress of demolition.

3.04 EXPLOSIVES

- A. Explosives: Use of explosives will not be permitted.
- B. Explosives: Do not bring explosives to the site or use explosives without written consent of Owner and authorities having jurisdiction. Such written consent will not relieve Contractor of total responsibility for injury to people or for damage to property due to blasting operations. Perform required blasting in compliance with governing regulations.

3.05 POLLUTION CONTROLS

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
  - 1. Do not create hazardous or objectionable conditions, such as ice, flooding, and pollution, when using water.

- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 1. Do not create hazardous or objectionable conditions, such as ice, flooding, and pollution, when using water.
- C. Clean adjacent buildings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before start of demolition.

3.06 POLLUTION CONTROLS

- A. Building Demolition: Demolish buildings completely and remove from the site. Use methods required to complete Work within limitations of governing regulations and as follows:
  - 1. Locate demolition equipment throughout the building and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  - 2. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
  - 3. Small buildings may be removed intact when permitted by Architect and approved by authorities having jurisdiction.
  - 4. Demolish concrete and masonry in small sections.
  - 5. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  - 6. Break up and remove concrete slabs on grade, unless otherwise shown to remain.
  - 7. Remove air-conditioning equipment without releasing refrigerants.
- B. Below-Grade Construction: Demolish foundation walls and other below-grade construction, as follows:
  - 1. Remove below-grade construction, including foundation walls, to at least 12 inches (300 mm) below grade.
  - 2. Remove below-grade construction, including foundation walls and footings, to the depths indicated.
  - 3. Completely remove below-grade construction, including foundation walls and footings.

4. Break up and remove below-grade concrete slabs, unless indicated to remain.
  5. Break up below-grade concrete slabs into sections no larger than 24 inches (600 mm) square and leave in place.
- C. Filling Below-Grade Areas: Completely fill below-grade areas and voids resulting from demolition of buildings and pavements with soil materials according to requirements specified in Division 2 Section "Earthwork."
- D. Damages: Promptly repair damages to adjacent facilities caused by demolition operations.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Burning: Burning of demolished materials will be permitted only at designated areas on Owner's property, providing required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.
- D. Disposal: Dispose of demolished materials at designated spoil areas on Owner's property.
- E. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION

## SECTION 312000

### EARTH MOVING

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Preparing and grading sub-grades for slabs-on-grade, walks, pavements, and landscaping.
  - 2. Excavating and backfilling for buildings and structures.
  - 3. Drainage and moisture-control fill course for slabs-on-grade.
  - 4. Base course for walks and pavements.
  - 5. Subsurface drainage backfill for walls and trenches.
  - 6. Excavating and backfilling for underground utilities and appurtenances outside building lines.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
  - 1. “Cast-in-Place Concrete” Section for concrete encasings, cradles, and appurtenances for utility systems.
  - 2. “Site Clearing” Section for site stripping, grubbing, topsoil removal, and tree protection.
  - 3. “Turf and Grasses” Section for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
  - 4. “Plants” Section for finish grading in planting areas and tree and shrub pit excavation and planting.
  - 5. “Subdrainage” Section for drainage of foundations.

##### 1.03 REFERENCE SPECIFICATION



- A. Perform all work in accordance with applicable provisions of "Standard Specifications for Public Works Construction", latest edition. Unless otherwise noted, mention herein of section numbers refers to sections of the Reference Specification. Where Reference Specification refers to "Agency", substitute the word "Owner". Where Reference Specification refers to "Engineer", substitute the word "Architect". Where Reference Specification is in conflict with these Specifications, these Specifications shall govern.

1.04 DEFINITIONS

- A. Excavation: Consists of the removal of material encountered to subgrade elevations and the re-use or disposal of materials removed.
- B. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below aggregate base, drainage fill, or topsoil materials.
- C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.
- D. Base Course: The layer placed between the subgrade and surface pavement in a paving system.
- E. Drainage Fill: Course of washed granular material supporting slab-on-grade placed to cut off upward capillary flow of pore water.
- F. Unauthorized Excavation: Consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Architect. Unauthorized excavation, as well as remedial work directed by the Architect, shall be at the Contractor's expense.
- G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.
- H. Utilities: Include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.
- I. Compaction: Any method of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of Compaction" is expressed as a percentage of the maximum dry density obtained by the test procedure described in ASTM D 1557 for general soil types abbreviated in this Specification as "\_\_\_ percent of maximum dry density".
- J. Hard Material: Weathered rock, dense consolidated deposits or conglomerate materials which are not included in the definition of "rock" but which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

- K. Lift: A layer or course of soil placed on top of previously prepared or placed soil in a fill or embankment.
- L. Unsatisfactory Material: Soil or other material identified as having insufficient strength or stability to carry intended loads without excessive consolidation or loss of stability.

1.05 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
  - 1. Location of borrow materials.
- B. Photographs or video tape of existing adjacent structures and site improvements.

1.06 QUALITY ASSURANCE

- A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.
- B. Testing and Inspection Service: Owner will employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.
- C. Testing and Inspection Service: Employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.
- D. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."
  - 1. Before commencing earthwork, meet with representatives of the governing authorities, Owner, Architect, consultants, Geotechnical Engineer, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

1.07 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Architect and then only after acceptable temporary utility services have been provided.

1. Provide a minimum 48-hours' notice to the Architect and receive written notice to proceed before interrupting any utility.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active.
- C. Groundwater elevations that may be indicated are those existing at the time that subsurface investigations were made and do not necessarily represent groundwater elevations at the time of construction.
- D. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures are in place.

## PART 2 – PRODUCTS

### 2.01 SOIL MATERIALS

- A. General: Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations.
- B. Satisfactory Soil Materials: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.
- C. Unsatisfactory Soil Materials: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.
- D. Backfill and Fill Materials: Satisfactory soil materials.
- E. Base Material: Shall conform to crushed aggregate base or fine-gradation crushed miscellaneous base in accordance with section 200-2.2 or 200-2.4, respectively, of the Reference Specification, and compacted to at least 95% of the maximum dry density as determined by ASTM Test Method D 1557.
- F. Engineered Fill: Well graded granular soil with an expansion index less than 20 and free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.
- G. Bedding Material: Shall be base materials with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve; or clean sand classified in accordance with ASTM D 2487.
- H. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, ASTM D 448, coarse aggregate grading size 57, with 100 percent passing a 1-1/2-inch sieve and not more than 5 percent passing a No. 8 sieve.

- I. Filtering Material: Evenly graded mixture of natural or crushed gravel or crushed stone and natural sand, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 50 sieve.
- J. Sand: ASTM C33, fine aggregate.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.02 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility.
- B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick minimum, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 2'-6" deep.
  - 1. Tape Colors: Provide tape colors to utilities as follows:
    - a. Red: Electric.
    - b. Yellow: Gas, oil, steam, and dangerous materials.
    - c. Orange: Telephone and other communications.
    - d. Blue: Water systems.
    - e. Green: Sewer systems, incl. storm drain.
    - f. White: Steam systems.
- C. Filter Fabric: Manufacturer's standard non-woven pervious geotextile fabric of polypropylene, nylon or polyester fibers, or a combination.
  - 1. Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D 4759 and the referenced standard test method in parentheses:
    - a. Grab Tensile Strength (ASTM D 4632): 120 lb.
    - b. Apparent Opening Size (ASTM D 4751): #70 U.S. Standard sieve.
    - c. Permeability (ASTM D 4491): 150 gallons per minute per sq. ft.
- D. Subsurface Drainage Geotextile: Manufacturer's standard non-woven needle punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters, with elongation greater than 50 percent, complying with AASHTO M 288 and the following, measured per test methods referenced:
  - 1. Survivability: Class 2, AASHTO M 288.

2. Apparent Opening Size: No. 60 (0.250-mm) sieve maximum, ASTM D 4751.
  3. Permittivity: 0.2 per second minimum, ASTM D 4491.
  4. UV Stability: 50 percent after 500 hours' exposure, ASTM D 4355.
- F. Separation Geotextile: Manufacturer's standard woven geotextile, manufactured for separation applications, made from polyolefins or polyesters, with elongation less than 50 percent, complying with AASHTO M 288 and the following, measured per test methods referenced:
1. Survivability: Class 2, AASHTO M 288.
  2. Apparent Opening Size: No. 60 (0.250-mm) sieve maximum, ASTM D 4751.
  3. Permittivity: 0.02 per second minimum, ASTM D 4491.
  4. UV Stability: 50 percent after 500 hours' exposure, ASTM D 4355.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Tree protection is specified in the "Site Clearing" Section.
- D. Prepare subgrade and place base materials in accordance with sections 301-1.2 and 301-2, respectively, of the Reference Specification.

### 3.02 DEWATERING

- A. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

### 3.03 EXCAVATION

- A. General: Shall be to the contours and dimensions indicated. Keep excavations free from water and debris while construction is in progress. Notify the Owner immediately in writing where it becomes necessary to remove hard, soft, weak, or wet material to a depth greater than indicated. Unless otherwise indicated, concrete placed below grade will be formed and excavations shall allow for placement and removal of forms. Side cuts shall be cribbed and shored as required.
- B. Explosives: Do not use explosives.
- C. Unclassified Excavation: Excavation is unclassified and includes excavation to required subgrade elevations regardless of the character of materials and obstructions encountered.

### 3.04 STABILITY OF EXCAVATIONS

- A. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.
- B. Unshored Temporary Excavations: Unshored temporary excavations may be sloped back at 1 to 1 (horizontal to vertical) or flatter. Where sloped embankments are used, the tops of the slopes should be barricaded to prevent vehicles and storage loads within seven feet of the tops of the slopes. If the temporary construction slopes will be maintained during the rainy season, construct berms along the tops of the slopes where necessary to prevent run-off water from entering the excavation and eroding the slope faces.

### 3.05 EXCAVATION FOR STRUCTURES

- A. Excavation Limits: Shall be to a tolerance of plus-or-minus 0.10 foot and shall extend at least five feet laterally beyond the building limits at the excavation level. The excavation side slopes shall not exceed a slope ratio of 1 to 1, horizontal to vertical, unless they are positively retained by shoring or other approved methods. Over-excavation side slopes may be vertical, as long as they are no higher than allowed by the State of California Construction Safety Orders, in which case they shall be no steeper than 1 to 1. If cut below depths indicated, excavations shall be filled with concrete when the foundations or footings are placed.
  - 1. Excavations for Footings and Foundations:
    - a. Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
    - b. Excavations shall be such that all footings be founded on at least 2 feet of properly compacted soil. This 2 feet shall consist of compacted fill; or, in cases where the footing bottom would otherwise be in cut, may consist of as little as 2 feet of over-excavation, with one foot of scarified and compacted existing soil

beneath the excavation (i.e. the total over-excavation may only need to be 2 feet). This determination shall be made in the field by the geotechnical engineer.

2. Pile Foundations: Stop excavations 36 inches above bottom of the supported foundations before piles are placed. After piles have been placed, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Appurtenances: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot. Do not disturb bottom of excavations intended for bearing surface.

### 3.06 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavations shall be such that all walks and pavements are founded on at least 2 feet of properly compacted soil. This determination shall be made in the field by the geotechnical engineer.

### 3.07 EXCAVATION FOR UTILITY TRENCHES

- A. Excavation made with power-driven equipment is not permitted within two feet of any known utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, use hand or light equipment excavation. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines and other existing work affected by the excavation work of this Section until approval for backfill is granted by the geotechnical engineer. Immediately report damage to utility lines or subsurface construction to the Owner.
- B. Where unidentified existing utilities are encountered, determine whether these are active or abandoned. Remove interfering portions of abandoned utilities and cap or plug open ends of pipe to remain. The cap or plug must seal the opening in such a manner that would permit remaining portions of the utility to be reactivated. Notify Owner for instructions on utilities which are determined to be active. Do not proceed without instructions, except to correct an immediate hazard or emergency condition. Relocation work performed on an active utility without obtaining prior approval from Owner shall be done at the Contractor's expense and liability.
- C. In areas where compacted backfill has been placed, additional consolidation may occur after completion due to changes in moisture content and surcharge. Utility connections crossing this backfill, and improvements adjoining the building at the backfill line shall be installed taking into account this additional consolidation, or sufficient time shall be scheduled between backfilling operations and such improvements to allow this consolidation to take place. Damage to utilities or

other improvements due to Contractor's negligence in regard to this paragraph shall be repaired at the Contractor's expense.

- D. Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, and any other damage. Repair and re-establish damaged or eroded grades and slopes and restore surface construction prior to acceptance.
- E. Cutting Pavement and Curbs: Saw cut with neat, parallel, straight lines one foot wider than trench width on each side of trenches and one foot beyond each edge of pits. If an existing pavement joint or cracked area is within two feet outside of a designated sawcut line shown on the Drawings, removal and resurfacing shall be to that joint, and/or shall include the crack or cracked area, unless otherwise approved by Architect.
- F. Contractor shall pothole at all identifiable crossings of existing utilities prior to any trenching operations and provide Architect with a survey of the top elevations (and bottom elevations, if applicable), of possible interferences so that an evaluation of necessary adjustments to the current profile or alignment may be made. Additionally, Architect shall be given the opportunity to view possible conflicts in the field prior to providing revised designs.
- G. Provide a minimum cover from grade of 3 feet for water mains and gas mains. Storm drains and sewers shall be to the depths indicated. Where settlements greater than the tolerance allowed herein for grading occur in trenches and pits due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation.
- H. Keep excavations free from water while construction is in progress.
- I. Notify the Owner immediately in writing if it becomes necessary to remove rock or hard, unstable, or otherwise unsatisfactory material to a depth greater than indicated. Excavate large rock, boulders, and other unyielding material to an overdepth at least 6 inches below the bottom of the pipe, conduit, duct and appurtenances, unless otherwise indicated or specified. Over-excavate soft, weak, or wet excavations to an overdepth at least 12 inches below the bottom of the pipe, conduit, duct or appurtenances unless otherwise indicated or specified.
- J. Excavate trenches to indicated slopes, lines, depths, and invert elevations.
  - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- K. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, except where sloping of sides is



allowed. Sides of trenches shall not be sloped from the bottom of the trench up to the elevation of the top of the pipe. See plans for detail.

- L. At the option of the Contractor, the excavations may be cut to an overdepth of not less than 4 inches and refilled to required grade as specified.
- M. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove stones and sharp objects to avoid point loading.
  - 1. For pipes or conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
  - 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
  - 3. Dig bell holes and depressions for joints after trench has been graded. Dimension of bell holes shall be as required for properly making the particular type of joint to ensure that the bell does not bear on the bottom of the excavation.

### 3.08 APPROVAL OF SUBGRADE

- A. Notify Architect when excavations have reached required subgrade.
- B. When Architect determines that unforeseen unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
  - 1. Unforeseen additional excavation and replacement material will be paid according to the Contract provisions for changes in Work.
- C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Architect.

### 3.09 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation. Lean concrete fill with 28-day compressive strength of 2500 psi (17.2 MPa), may be used to bring elevations to proper position when acceptable to the Architect.
  - 1. Fill unauthorized excavations under other construction as directed by the Architect.

- B. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the Architect.

### 3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind-blown dust.
  - 1. Stockpile soil materials away from edge of excavations a minimum distance of 7 feet or depth of excavation, whichever is greater. Do not store within drip line of remaining trees.

### 3.11 BACKFILL

- A. Backfill excavations promptly, but not before completing the following:
  - 1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
  - 2. Surveying locations of underground utilities for record documents.
  - 3. Testing, inspecting, and approval of underground utilities.
  - 4. Concrete formwork removal.
  - 5. Removal of trash and debris from excavation.
  - 6. Removal of temporary shoring and bracing, and sheeting.
  - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

### 3.12 UTILITY TRENCH BACKFILL AND COMPACTION

- A. Backfilling of exterior utility trenches shall not be undertaken until geotechnical engineer has received 24-hours notice, until required tests and inspections have been completed, and until as-built location notes have been furnished. Remove uninspected backfill in accordance with requirements of this specification. Use hand-operated, plate-type, vibratory, or other suitable hand tampers in areas not accessible to larger rollers or compactors. Avoid damaging pipes and protective pipe coatings.
- B. Place backfill material in accordance with Section 306-1.3.2 of the Reference Specifications and achieve at least 90% of the maximum density per ASTM D 1557. The top 12 inches of backfill in the building or paved areas shall be compacted to 95% of maximum density per ASTM D 1557.

- C. Compaction by ponding or flooding will not be permitted.
- D. Place and compact bedding course on rock and other unyielding bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- E. Concrete backfill trenches that carry below or pass under footings and that are excavated within 18 inches of footings. Place concrete to level of bottom of footings.
- F. Provide 4-inch-thick concrete base slab support for piping or conduit with less than 2'-6" of cover below finish surface of roadways. After installation and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway base.
- G. Place and compact initial backfill of satisfactory soil material or aggregate base material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit.
  - 1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
- H. Coordinate backfilling with utilities testing.
- I. Fill voids with approved backfill materials as shoring and bracing, and sheeting is removed.
- J. Place and compact final backfill of satisfactory soil material to final subgrade.
- K. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.
- L. Manholes and other appurtenances: Provide at least 12 inches clear from outer surfaces to the embankment or shoring. Remove rock as specified herein. Remove unstable soil that is incapable of supporting the structure to an over-depth of one foot and refill with gravel or sand to the proper elevation and compact to 95% percent of maximum density.

3.13 FILL

- A. Preparation: Remove vegetation, topsoil, debris, wet, and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.
  - 1. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing surface.

- B. When subgrade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface to depth required, pulverize, moisture-condition or aerate soil and re-compact to required density.
- C. Place fill material in layers to required elevations for each location listed below.
  - 1. Under grass, use satisfactory excavated or borrow soil material.
  - 2. Under walks and pavements, use base material or satisfactory excavated or borrow soil material.
  - 3. Under steps and ramps, use base material.
  - 4. Under building slabs, use drainage fill material.
  - 5. Under footings and foundations, use engineered fill.

### 3.14 MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to minimum 2 percent above optimum moisture content for cohesive soils and to near optimum for cohesionless soils.
  - 1. Do not place backfill or fill material on surfaces that are muddy, frozen or contain frost or ice.
  - 2. Remove and replace, or scarify and air-dry satisfactory soil material that is too wet to compact to specified density.
    - a. Stockpile or spread and dry removed wet satisfactory soil material.

### 3.15 COMPACTION

- A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations. Place backfill and fill uniformly along the full length of each structure. Keep rollers and other heavy equipment at least 18 inches from footings, foundations, piers and walls of buildings and accessory construction. Use mechanical and hand tampers weighing at least 90 pounds with a maximum face area of 48 inches square to compact backfill within 18 inches of construction and where access is restricted.
- C. Percentage of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of maximum dry density according to ASTM D 1557:

1. For general site fills, compact each layer of backfill or fill material at 90 percent maximum dry density.
2. Under structures, building slabs, steps, and pavements, scarify and compact the top 12 inches below subgrade at 95 percent maximum dry density.
3. Under walkways, scarify and compact the top 6 inches below subgrade at 90 percent maximum dry density.
4. Under lawn or unpaved areas, compact the top 6 inches below subgrade at 85 percent maximum dry density.

### 3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
1. Provide a smooth transition between existing adjacent grades and new grades.
  2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.
  3. All hillside grading or construction of fill slopes shall conform to the minimum standards listed in Chapter 70 of the UBC.
  4. Fill slopes shall be keyed and benched into firm, natural ground when the existing slope to receive the fill is 5:1 or steeper (horizontal to vertical). Keys shall be tilted into the slope, shall be a minimum of one equipment width wide and shall be a minimum of three feet deep at the outside edge.
  5. If necessary, the Contractor's selected equipment and construction procedure shall be altered, changed or modified in order to meet the specified compaction requirements. Flooding and water jetting is prohibited.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
1. Lawn or Unpaved Areas: Plus or minus 0.10 foot, unless otherwise indicated.
  2. Concrete Walks: Plus or minus 0.05 foot.
  3. Pavements:
    - a. Concrete: 0.02 foot minus, with no high spots.

- b. Asphalt: 0.05 foot minus, with no high spots.
- C. Grading Inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 BASE COURSE

- A. Under pavements and walks, place base course material on prepared subgrades to pavements.
  - 1. Compact base courses at optimum moisture content to required grades, lines, cross sections and thickness to not less than 95 percent relative compaction in accordance with ASTM D 1557 and ASTM D 4718.
  - 2. Shape base to required crown elevations and cross-slope grades.
  - 3. When thickness of compacted base course is 6 inches or less, place materials in a single layer.
  - 4. When thickness of compacted base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.18 PAVEMENT REPAIR

- A. Repair or patch asphalt pavement as specified in Asphalt Paving Section. Repair or patch concrete pavement and curbs as specified in Concrete Paving Section. Do not repair pavement until trench has been backfilled and compacted as herein specified.

3.19 FIELD QUALITY CONTROL

- A. Testing Agency Services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
  - 1. Perform field in-place density tests according to ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), or ASTM D 2937 (drive cylinder method), as applicable.
    - a. Field in-place density tests may also be performed by the nuclear method according to ASTM D 6938, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 6938.
    - b. When field in-place density 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 the Architect.

2. Footing Subgrade: At footing subgrades, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of each subgrade with related tested strata when acceptable to the Architect.
  3. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
  4. Foundation Wall Backfill: In each compacted backfill layer, perform at least one field in-place density test for each 100 feet or less of wall length, but no fewer than two tests along a wall face.
  5. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet or less of trench, but no fewer than two tests.
- B. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required. Re-compact and retest until required density is obtained.

### 3.20 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.
  1. Scarify or remove and replace material to depth directed by the Architect; reshape and re-compact at optimum moisture content to the required density.
- C. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.
  1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

### 3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION



SECTION 321216  
ASPHALT PAVING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
  - 1. Hot-mix asphalt paving.
  - 2. Hot-mix asphalt patching.
  - 3. Asphalt surface treatments:
    - a. Fog seals.
    - b. Slurries.
  - 5. Subgrade preparation.
- B. Related Sections include the following:
  - 1. “Earth Moving” Section for aggregate base courses and aggregate pavement shoulders.
  - 2. “Concrete Paving Joint Sealants” Section for joint sealants and fillers at paving terminations.
  - 3. “Pavement Marking” Section for pavement marking requirements.

1.03 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the following standard specifications:
  - 1. Reference Specification: Perform all work in accordance with applicable provisions of "Standard Specifications for Public Works Construction", latest edition. Unless otherwise noted, mention herein of section numbers refers to sections of the Reference Specification. Where Reference Specification refers to "Agency", substitute the word "Owner". Where Reference Specification refers to "Engineer", substitute the word "Architect". Where Reference Specification is in conflict with these Specifications, these Specifications shall govern.

2. Measurement and payment provisions and safety program submittals included in Reference Specifications do not apply to this Section.
3. The latest edition of the Asphalt Institute's publication "The Asphalt Handbook".
4. Standard Specifications, July 1999 or latest edition; California Department of Transportation (Caltrans).
5. California Test Methods, latest edition; California Department of Transportation (Caltrans) Transportation Laboratory.
6. Standards of the American Association of State Highway and Transportation Officials (AASHTO), 1998 or latest edition. Standards of the American Association of State Highway and Transportation Officials (AASHTO), 1998 or latest edition.

1.04 SUBMITTALS

- A. Product Data: For each product specified. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: For each job mix proposed for the Work.
- C. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.
- C. Regulatory Requirements: Conform to applicable standards of authorities having jurisdiction for asphalt paving work on public property.
- E. Asphalt-Paving Publication: Comply with Asphalt Institute's "The Asphalt Handbook," except where more stringent requirements are indicated.
- F. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 01 Section "Project Management and Coordination" Review methods and procedures related to asphalt paving including, but not limited to, the following:

1. Review condition of substrate and preparatory work performed by other trades.
2. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
3. Review and finalize construction schedule for paving and related work. Verify availability of materials, paving Installer's personnel, and equipment required to execute the Work without delays.
4. Review inspection and testing requirements, governing regulations, and proposed installation procedures.
5. Review forecasted weather conditions and procedures for coping with unfavorable conditions.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
1. Prime and Tack Coats: Minimum surface temperature of 60 deg F (15.6 deg C).
  2. Slurry Coat: Comply with weather limitations of ASTM D 3910.
  3. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
  4. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 – PRODUCTS

2.01 ASPHALT PAVEMENT MATERIALS

- A. Asphalt Pavement Leveling Course: Conform to Performance Grade B-PG 64-10 in section 203-1.2 and section 203-6 of the Reference Specification.
- B. Asphalt Pavement Wearing (Surface) Course : Conform to Performance Grade III C2-PG 64-10 or III C3-PG 64-10 in section 203-1.2 and section 203-6 and section 400-4 to be used with Class III asphalt of the Reference Specification.
- C. Prime Coat: Grade SC-70 liquid asphalt conforming to section 203-2 of the Reference Specification.

- D. Tack Coat: Emulsified asphalt grade SS-1h conforming to section 203-3 of the Reference Specification.
- E. Asphalt Paint: conform to ASTM D41 or D43 per Section 203-8 of the Reference Specification.
- G. Slurry Seal: Emulsified asphalt grade SS-1h or CSS-1h and aggregate conforming to section 203.5 of the Reference Specification.
- H. Fog Seal: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- I. Water: Potable.

2.02 AUXILIARY MATERIALS

- A. Herbicide Treatment: Commercial chemical for weed control, registered by Environmental Protection Agency (EPA). Provide granular, liquid, or wettable powder form.
- B. Sand: ASTM D 1073, Grade Nos. 2 or 3.

PART 3 – EXECUTION (HOT-MIX ASPHALT)

3.01 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Subgrade and Base:
  - 1. Proof-roll subgrade or base course using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Notify Architect in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.02 COLD MILLING

- A. Cold mill existing asphalt concrete pavement in accordance with section 302-5.2 of the Reference Specification.

3.03 PATCHING AND REPAIRS

- A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Re-compact new subgrade. Excavate rectangular or trapezoidal

patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.

1. Tack coat faces of excavation and allow to cure before paving.
  2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
  3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
1. Pump hot undersealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to re-seat pieces firmly.
  2. Remove disintegrated or badly broken pavement. Prepare and patch with hot-mix asphalt.
- C. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.
1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.
- D. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of 1/4 inch (6 mm). Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.
- E. Asphalt paint: Apply uniformly to existing surfaces of previously constructed asphalt or Portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m) of surface.
1. Allow asphalt paint to cure undisturbed before paving.
  2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

### 3.04 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

1. Sweep loose granular particles from surface of unbound aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
1. Mix herbicide with prime coat when formulated by manufacturer for that purpose.
- C. Prime Coat: Comply with section 302-5.3 of the Reference Specification. Apply primer at a rate of between 0.20 and 0.25 gallons per square yard to top surface of base course prior to asphalt placement.
- D. Tack Coat: If a leveling course has been used for construction traffic, apply tack coat to all leveling course surfaces in accordance with section 302-5.4 of the Reference Specification at a rate of 0.10 gallons per square yard.
- E. Asphalt Paint: Apply uniformly to existing surfaces of previously constructed asphalt or Portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m) of surface.
1. Allow asphalt paint to cure undisturbed before paving.
  2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

### 3.05 GEOTEXTILE INSTALLATION

- A. Apply bond coat, consisting of asphalt cement, uniformly to existing surfaces at a rate of 0.20 to 0.30 gal./sq. yd. (0.8 to 1.2 L/sq. m).
- B. Place paving geotextile promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches (100 mm) and transverse joints 6 inches (150 mm).
1. Protect paving geotextile from traffic and other damage and place overlay paving the same day.

### 3.06 HOT-MIX ASPHALT PLACING

- A. The asphalt pavement shall be completed in phases; the leveling course during construction for temporary construction traffic and storage of materials and; the wearing (surface) course just prior to turnover to Owner; unless the entire paving operation is completed just prior to turnover to the Owner. If this method is

chosen, then no construction traffic or storage of materials shall be allowed on the finished pavement surface after its completion. Contractor shall schedule final surface course paving operations so that the required waiting period specified in the "Pavement Marking" Section will allow project completion within the specified time.

- B. Construct asphalt pavement in accordance with section 302-5 of the Reference Specification and as shown on the Drawings.
- C. Two Layer Method: The leveling course shall be installed to elevations which will allow the future placement of a wearing (surface) course no thinner than 1-1/2 inches. Prior to placing the wearing (surface) course, repair all areas damaged during construction use, thoroughly clean the leveling course of all loose material and place a tack coat pursuant to paragraph 3.4.D. herein.

Contractor is further cautioned that the use of this two-layer method will result in construction traffic using pavements which are thinner than designed for the traffic expected for the completed project, and that damage due to wheel loads and materials storage during construction is probable. Any such damage shall be repaired to the satisfaction of the Architect and the Owner prior to placement of the surface course.

### 3.07 JOINTS

- A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
  - 1. Clean contact surfaces and apply tack coat.
  - 2. Offset longitudinal joints in successive courses a minimum of 6 inches (150 mm).
  - 3. Offset transverse joints in successive courses a minimum of 24 inches (600 mm).
  - 4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook."
  - 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
  - 6. Compact asphalt at joints to a density within 2 percent of specified course density.

### 3.08 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
  - 1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
- B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and re-rolling to required elevations.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
  - 1. Average Density: 96 percent of reference laboratory density according to ASTM D 1559, but not less than 94 percent nor greater than 100 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.
- F. Repairs: Remove paved areas that are defective, pond water or are contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt, with a thickness one inch greater than the existing, and to match existing finish surface grades such that no local ponding of water will result. Compact by rolling to specified density and surface smoothness. Note that no application of seal coats of any kind will be allowed for any reason on pavements newer than one year. This is to allow for proper curing of the newly placed asphalt pavement, as recommended by The Asphalt Institute.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### 3.09 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:



1. Leveling Course: Plus or minus 1/2 inch (13 mm).
  2. Surface Course: Plus 1/4 inch (6 mm), no minus.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
1. Leveling Course: 1/4 inch (6 mm).
  2. Surface Course: 1/8 inch (3 mm).
  3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

### 3.10 SURFACE TREATMENTS

- A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. (0.45 to 0.70 L/sq. m) to existing asphalt pavement and allow to cure. Lightly dust areas receiving excess fog seal with a fine sand.
- B. Slurry seals: Apply in accordance with section 302-4 of the Reference Specification.
1. Roll slurry seal to smooth ridges and provide a uniform, smooth surface.

### 3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.
1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. Finish Grade: Completed pavement surface shall be tested for proper drainage through flood testing. Contractor shall schedule a flood test to be held in the presence of the Architect and the Owner to assure that the finished pavement surfaces are consistent with the intent of the Grading Plans with respect to surface

drainage, and that drainage devices function properly. It is suggested that a water truck or fire hose be used for the flooding; garden hoses will not be acceptable. Pavements not deemed acceptable subsequent to this test shall be removed and replaced pursuant to paragraph 3.3 herein. Overlays with thicknesses less than 1-1/2 inches will not be acceptable for these repairs.

- F. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.
  - 1. Reference laboratory density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 1559, and compacted according to job-mix specifications.
  - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
    - a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, but in no case will fewer than 3 cores be taken.
    - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- G. Replace and compact hot-mix asphalt where core tests were taken.
- H. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION

SECTION 321313  
CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes exterior Portland cement concrete paving for the following:
  - 1. Curbs.
  - 2. Walkways.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. "Earth Moving" Section for subgrade preparation, grading and base course.
  - 2. "Cast-in-Place Concrete" Section for general building applications of concrete.
  - 3. "Concrete Paving Joint Sealants" Section for joint fillers and sealants within concrete paving and at joints with adjacent construction.
  - 4. "Pavement Marking" Section for pavement marking requirements.

1.03 SYSTEM DESCRIPTION

- A. Provide concrete pavement according to the materials, workmanship, and other applicable requirements of the following standard specifications:
  - 1. Reference Specification: Perform all work in accordance with applicable provisions of "Standard Specifications for Public Works Construction", latest edition. Unless otherwise noted, mention herein of section numbers refers to sections of the Reference Specification. Where Reference Specification refers to "Agency", substitute the word "Owner". Where Reference Specification refers to "Engineer", substitute the word "Architect". Where Reference Specification is in conflict with these Specifications, these Specifications shall govern.

2. Measurement and payment provisions and safety program submittals included in Reference Specifications do not apply to this Section.

#### 1.04 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Design mixes for each class of concrete. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Product data for integral colored concrete pigments. Include manufacturer's instructions for mixing, placement, curing, and sealing.
- D. Minutes of pre-installation conference.

#### 1.05 QUALITY ASSURANCE

- A. Concrete Standards : Comply with provisions of the following standards, except where more stringent requirements are indicated.
  1. American Concrete Institute (ACI)
    - a. 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
    - b. 301, Specifications for Structural Concrete
    - c. 305.1, Specification for Hot Weather Concreting
    - d. 306.1, Standard Specification for Cold Weather Concreting
    - e. 318, Building Code Requirements for Structural Concrete and Commentary
  2. American Society for Testing and Materials International (ASTM)
    - a. A 307, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength
    - b. A 615, Standard Specification for Deformed and Plain Carbon-Steel Bars
    - c. A 1064, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
    - d. C 31, Standard Specification for Making and Curing Concrete Test Specimens in the Field
    - e. C 33, Standard Specification for Concrete Aggregates
    - f. C 39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens for Concrete Reinforcement
    - g. C 42, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

- h. C 94, Standard Specification for Ready-Mixed Concrete
  - i. C 143, Standard Test Method for Slump of Hydraulic-Cement Concrete
  - j. C 150, Standard Specification for Portland Cement
  - k. C 171, Standard Specification for Sheet Materials for Curing Concrete
  - l. C 172, Standard Practice for Sampling Freshly Mixed Concrete
  - m. C 231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
  - n. C 309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
  - o. C 881, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
  - p. C 979, Standard Specification for Pigments for Integrally Colored Concrete
  - q. C 1028, Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method
  - r. C 1059, Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete
  - s. C 1602, Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
  - t. D 2047, Standard Test Method for Static Coefficient of Friction of Polish- Coated Flooring Surfaces as Measured by the James Machine
3. American State Highway and Transportation Officials (AASHTO)
- a. M 182, Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats
- B. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Concrete Testing Service: Engage a qualified independent testing agency to perform materials evaluation tests and to design concrete mixes.
- D. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Section "Project Management and Coordination" and the following:
- 1. Before installing Portland cement concrete paving, meet with representatives of authorities having jurisdiction, Owner, Architect, consultants, independent testing agency, and other concerned entities to

review requirements. Notify participants at least 3 working days before conference.

1.06 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.01 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other acceptable panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

- 1. Use flexible or curved forms for curves of a 100-foot or less radius.

- B. Form Release Agent: Provide commercial formulation form-release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

- 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

- a. Debond Form Coating, L & M Construction Chemicals.
    - b. Crete-Lease 880 VOC, Cresset Chemical Company.
    - c. MasterFinish Series, BASF Corporation

2.02 REINFORCING MATERIALS

- A. Reinforcing Bars and Tie Bars: ASTM A 615, Grade 40 for #3 bars and Grade 60 for bars larger than #3, deformed.
- B. Plain, Cold-Drawn Steel Wire: ASTM A 1064.
- C. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.
- D. Dowel Sleeves: Speed Dowel, Aztec Concrete Accessories, Inc.
- E. Hook Bolts: ASTM A 307, Grade A bolts, internally and externally threaded. Design hook bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

- F. Supports for Reinforcement: Chairs, spacers, dowel bar supports and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Use wire bar-type supports complying with CRSI specifications.
  - 1. Use supports with sand plates or horizontal runners where base material will not support chair legs.

2.03 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type II, low alkali.
  - 1. Use one brand of cement throughout Project. Coordinate with Section "Cast-In-Place Concrete."
  - 2. Provide white cement when required to achieve specified color in integral colored concrete.
- B. Normal-Weight Aggregates: ASTM C 33, Class 4M non-reactive, and as follows. Provide aggregates from a single source.
  - 1. Maximum Aggregate Size: 1-inch.
  - 2. Do not use fine or coarse aggregates that contain substances that cause spalling.
  - 3. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect.
- C. Water: ASTM 1602, Potable.
- D. Admixtures: Comply with requirements specified in Section "Cast-In-Place Concrete."
  - 1. Integral Colored Concrete: Use admixtures only as approved by the color pigment manufacturer. Do not use admixtures that will alter the color of integral colored concrete.
  - 2. Do not use admixtures containing calcium chloride or chloride ions.
- E. Aggregate for Integral Colored Concrete: ASTM C 33, Class 4M, non-reactive, and as follows: Provide aggregates from a single source.
  - 1. Maximum Aggregate Size and Type: 3/8-inch (range from 1/4-inch to 3/8-inch), pea gravel.
  - 2. Do not use fine or coarse aggregates that contain substances that cause spalling.

3. Percentage of Fine Aggregate to Pea Gravel: 60 percent fines to 40 percent course aggregate.
4. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Architect.

## 2.04 CURING MATERIALS

- A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 3.
- B. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
  1. Waterproof paper.
  2. Polyethylene film.
  3. White burlap-polyethylene sheet.
- C. Liquid Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B. Moisture loss not more than 0.55 kg./sq. meter in 72 hours when applied at a rate of 200 sq. ft./gal.
  1. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.
  2. Products: Subject to compliance with requirements, provide one of the following:
    - a. L & M Cure R, L & M Construction Chemicals, Inc.
    - b. 1100-Clear, W.R. Meadows, Inc.
    - c. MasterKure CC 180WB (formerly Kure-N-Seal), BASF Corporation
  3. Do not use sodium silicate type curing agents.
  4. For integral colored concrete plaza and stair pavement, provide curing compound meeting the specified requirements and approved by the manufacturer of the integral color pigments for use on integral colored concrete paving. Coordinate with manufacturer of integral colored concrete pigments and determine compatibility of the curing compound with integral color pigment. Curing compound manufactured by the pigment manufacturer that also meets the requirements of this Section is acceptable.
    - a. Do not use curing compound that will alter the color of integral colored concrete.



- D. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Eucobar; Euclid Chemical Co.
    - b. E-Con; L&M Construction Chemicals, Inc.
    - c. MasterKure ER 50 (formerly Confilm), BASF Corporation,
- E. Surface Retarder (Exposed Seeded Surfaces): Sika ‘Rugaslo B’, Sovig ‘Top Surface Conreveal’, BASF Corporation ‘MasterFinish’ Series, or approved equal.
- F. Non-Shrink Grout: Suereisen No. F-100, Upco ‘Upcon,’ 5-Star, BASF Corporation ‘Masterflo 713’, or approved equal, non-metallic, non-staining, premixed grout.
- G. Sealant Bead (this applies only when referenced by paving conditions on the Drawings.): Polysulfide composition, equal to THIOKOL or “TREMCO SPECTRUM”. Color to match adjacent paving.
- H. Aggregate (this applies only when referenced on the Drawings.): (Exposed Aggregate Concrete) “\_\_\_\_\_” and “\_\_\_\_\_” aggregate, 3/8 inches in diameter washed stones. Submit a half-pound sample of each to Landscape Architect for approval prior to making jobsite sample.

2.05 RELATED MATERIALS

- A. Bonding Agent: Acrylic or styrene butadiene, complying with ASTM C 1059, Type II.
- B. Epoxy Adhesive: ASTM C 881, two-component material suitable for dry or damp surfaces. Provide material type, grade, and class to suit requirements.
- C. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Bonding Agent:
    - a. SBR Latex; Euclid Chemical Co.
    - b. Daraweld C; W.R. Grace & Co.
    - c. Everbond; L&M Construction Chemicals, Inc.
  - 2. Epoxy Adhesive:
    - a. MasterEmaco ADH Series (formerly Conpressive Series); BASF Corporation
    - b. Rezi-Weld 1000; W.R. Meadows, Inc.
- D. Concrete Sealer: Water-based, deep penetrating, non-staining, non-darkening silane micro emulsion.

1. Positive chloride-ion screening, prevents water intrusion, minimizes rebar corrosion and potential concrete spalling, and protects against damaging effects of alkalis and other contaminants.
  2. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.
  3. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
    - a. Pentane WB, L & M Construction Chemicals, Inc. This product is intended to establish the characteristics and level of quality intended for this Project.
    - b. MasterProtect H 1000 (formerly Hydrozo 100), BASF Corporation
  4. For integral colored concrete plaza and stair pavement, provide sealer meeting the specified requirements and approved by the manufacturer of the integral color pigments for use on integral colored concrete paving. Coordinate with manufacturer of integral colored concrete pigments and determine compatibility of the sealer with integral color pigment. Sealer manufactured by the pigment manufacturer that also meets the requirements of this Section is acceptable.
    - a. Do not use sealer that will alter the color of integral colored concrete.
- E. Color Pigments/Coloring Admixtures: ASTM C 979. For integral colored concrete use coloring pigments that are finely ground non-fading mineral oxides of synthetic or natural varieties and do not contain fillers, adulterants, or admixtures that will affect the characteristics or performance of the concrete mix design.
1. Color: Match Architect's sample.
  2. Products:
    - a. Davis Colors, Davis Colors Co.
    - b. Chromix Admixtures, L. M. Scofield Co.
    - c. MasterColor, BASF Corporation
    - d. Approved equal

## 2.06 CONCRETE MIX

- A. Prepare design mixes for each type and strength of normal-weight concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use a qualified independent testing agency for preparing and reporting proposed mix designs.

1. Do not use the Owner's field quality-control testing agency as the independent testing agency.
  2. Prepare mixes for integral colored concrete in accordance with color pigment manufacturer's instructions.
    - a. Maximum Pigment Dosage Rate: 10 percent of the weight of cement.
    - b. Use the same aggregate, brand and type of cement for all integral colored concrete.
- B. Proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties:
1. Compressive Strength (28-Day): 4000 psi, for walks.
  2. Compressive Strength (28-Day): 3500 psi, for curbs.
  3. Compressive Strength (28-Day): 3000 psi, for all other site concrete.
  4. Minimum cement content: shall be 5-1/4 sacks per cubic yard.
  5. Maximum concrete slump: shall be 3 inches, plus or minus 1/2 inch, for all walks; and 4 inches, plus or minus 1 inch for all other Portland cement concrete paving, except for integral colored concrete paving maintain a slump of 3 inches.
  6. Water/Cement Ratio: shall be less than or equal to 0.5.
- C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.
- D. Admixtures: Comply with requirements specified in Section "Cast-In-Place Concrete".

## 2.07 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.
1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

## 2.08 HERBICIDE TREATMENT

- A. Commercial chemical for weed control, registered by Environmental Protection Agency. Provide granular, liquid, or wettable powder form.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:
  - a. Dow Chemical U.S.A.
  - b. E.I. Du Pont de Nemours & Co., Inc.
  - c. FMC Corp.
  - d. U.S. Borax and Chemical Corp.

## 2.09 SOURCE QUALITY CONTROL

- A. Color Control for Integral Colored Concrete: Arrange for the services of a qualified technical representative of the color pigment manufacturer, equipped with wet-batch color control test devices, at the ready-mix plant to ensure concrete of uniform color and matching Architect's sample for the mock-up and after mock-up is approved, matching mock-up with final concrete.

## PART 3 - EXECUTION

### 3.01 SURFACE PREPARATION

- A. Proof-roll subgrade or base surface prepared by others to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.
- C. Herbicide Treatment: Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted, dry subbase prior to application of prime coat.

### 3.02 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
- B. Check completed formwork and screeds for grade and alignment to following tolerances:
  1. Top of Forms: Not more than 1/8 inch in 10 feet.
  2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.
- C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

### 3.03 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

### 3.04 JOINTS

- A. General: Construct contraction, construction, and isolation joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.
  - 1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.
  - 2. Make joints, including sawed joints, full depth required and from edge to edge of paving.
- B. Contraction Joints: Provide weakened-plane contraction joints, sectioning concrete into areas approximately 10 feet square, unless otherwise shown on Drawings. Construct contraction joints for a depth equal to at least 1/4 of the concrete thickness, as follows:
  - 1. Tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool.
  - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into hardened concrete when cutting action will not tear, abrade, or otherwise damage surface and before development of random contraction cracks.
  - 3. Inserts: Form contraction joints by inserting pre-molded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or caps of two-piece assemblies after concrete has hardened. Clean groove of loose debris.

- C. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.
  - 1. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.
  - 2. Provide tie bars at sides of paving strips where indicated.
  - 3. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
  - 4. Locate construction joints to correspond with a planned contraction joint or score line as shown on the drawings.
- D. Isolation Joints:
  - 1. Isolation-Type Joints: Form isolation joints of preformed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, and other fixed objects.
  - 2. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is required.
  - 3. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
  - 4. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint
- E. Installation of joint fillers and sealants is specified in Division 03 Section "Cast-in-Place Concrete".
- F. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one half of dowel length to prevent concrete bonding to one side of joint.
- G. Where plastic "zip strips" are used to construct concrete joints, cut and remove, as a minimum, the top 1/4 inch of these strips after concrete has cured, and coordinate installation of joint filler, if shown on the Drawings.

### 3.05 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

- B. Moisten subgrade or base to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- C. Comply with requirements and with ACI 301 for measuring, mixing, transporting, and placing concrete.
- D. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- E. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- F. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 301.
  - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcing, dowels, and joint devices.
- G. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.
- H. Curbs: When automatic machine placement is used for curb placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete.
- I. Cold-Weather Placement: Comply with provisions of ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
  - 2. Do not use frozen materials or materials containing ice or snow.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

4. Do not place concrete on surfaces that are frozen.
- J. Hot-Weather Placement: Place concrete complying with ACI 305.1 and as specified when hot weather conditions exist.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
  3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

### 3.06 CONCRETE FINISHING

- A. Float Finish: Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.
1. Burlap Finish: Drag a seamless strip of damp burlap across concrete, perpendicular to line of traffic, to provide a uniform gritty texture finish.
  2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across concrete surface perpendicular to line of traffic to provide a uniform fine line texture finish.
  3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
  4. Do not use troweling machines within 12 inches of electrical junction and outlet boxes which are set to finish flush with concrete slabs. Float and trowel such areas by hand with wood floats and steel trowels, taking care to see that concrete is finished flush with box cover and matches adjacent surfaces.
- B. Finishing formed surfaces:
1. Curb forms shall leave a smooth face.
  2. Remove all fins.



- C. Provide steel trowel finish on tops of curbs and flow lines of curbs.
- D. Final Tooling: Tool edges of paving, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.
  - 1. Radius: 1/4 inch.
  - 2. Radius: 3/8 inch.
- E. Finish surfaces to produce a uniform appearance throughout area involved and throughout adjacent areas with the same treatment.
- F. Where concrete finishing occurs adjacent to finished metal or other surfaces, particularly where serrated or indented surfaces occur, remove all traces of cement film before allowing to harden.
- G. Apply integral wood float and broom finish to the all concrete pavements and walkways, unless otherwise shown on the Drawings.
  - 1. After screeding and compacting, finish with a wood float using a circular motion to produce a uniform texture and finish throughout.
  - 2. For vehicular traffic areas, the finish shall be coarse enough to provide a non-slip surface with a minimum static friction coefficient of 0.6.
  - 3. For pedestrian traffic areas, finish shall be a non-slip surface with a minimum static coefficient of friction of 0.6.
    - a. For ramps, the static coefficient of friction shall be a minimum of 0.8. Ramps are defined as any sloping path of travel with a slope in the direction of travel of 5.0%, or greater.
  - 4. Tests for coefficient of friction shall be either ASTM C-1028 (field test) or ASTM D-2047 (laboratory test).

### 3.07 SPECIAL FINISHES

- A. Integral Colored Concrete Finish: Apply a float finish as described in "Concrete Finishing" Article. After float finish, apply textured finishes as follows:
  - 1. Where indicated, apply a medium-to-coarse-textured broom finish as described for pedestrian traffic areas in the "Concrete Finishing" Article.
  - 2. Where indicated, apply a sandblast finish as follows:
    - a. Sandblast surfaces uniformly, at the same age, using the same equipment and operators. Match approved mock-up for texture and color.

- b. Medium Sandblast Finish: Expose course aggregate with maximum reveal of 1/4-inch. Make color uniform.
3. Cure concrete with the specified curing compound in accordance with pigment manufacturer's curing instructions. Apply the curing compound immediately after final finishing. Do not use any other curing method unless specifically approved in writing by the pigment manufacturer and the Architect.

### 3.08 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306.1 for cold weather protection and ACI 305.1 for hot weather protection during curing.
- B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure integral colored concrete by curing compound as approved by the manufacturer of the color pigments used in the concrete mix. Cure other concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
  1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.
  2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
  3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
- E. Spray-apply concrete sealer to all concrete pavement. Comply with sealer manufacturer's application instructions.

- F. Integral Colored Concrete: Comply with recommendations of color pigment manufacturer for curing, sealing, and protecting integral colored concrete to provide color retention and uniformity.

### 3.09 FIELD QUALITY CONTROL TESTING

- A. The Owner will employ a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include the following:
  - 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
    - a. Slump: ASTM C 143; one test at point of placement for each compressive-strength test but no less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
    - b. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test but no less than one test for each day's pour of each type of air-entrained concrete.
    - c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
    - d. Compression Test Specimens: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless directed otherwise. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
    - e. Compressive-Strength Tests: ASTM C 39; Frequency as specified in ACI 301.
  - 2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
  - 3. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
  - 4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
  - 5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

- B. Test results will be reported in writing to Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in paving, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day and 28-day tests.
- C. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- D. Additional Tests: The testing agency will make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.
- E. Manufacturer's Field Service: When placing integral colored concrete, arrange for the services of a qualified technical representative of the color pigment manufacturer, equipped with wet-batch color control test devices to ensure concrete of uniform color and matching approved mock-up.

### 3.10 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section. Concrete which is not true to line and plane, which is not thoroughly troweled and properly surfaced as required, which varies in excess of 1/4-inch along a 10-foot straight edge, which is scuffed or has a rough top surface, except where required, or which does not connect properly to adjoining work, does not slope as required for drainage or is not properly cured, will be deemed defective.
  - 1. General: Patch defective areas immediately following form removal. Remove defective concrete to a width and depth necessary for proper patching, but in no case less than 1 inch deep. Make the walls of the cut area perpendicular to the surface and do not feather out the edge. Dampen the patch area and the adjacent area 6 inches around the patch area.
  - 2. Exposed concrete: Prepare a patching mortar of one part Portland cement, adjusted to match the color of the surrounding concrete, and 2-1/2 parts sand with the least water required to produce a workable mass. Re-work this mortar until it is the stiffest consistency that will permit placing. Brush the patch area with a bond of neat cement and water paste and apply patching mortar when the water sheen is off the bond. Strike off the mortar slightly higher than the surrounding surface, let set for 1 hour and finish flush with the surrounding surface.

- B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.
- E. Comply with pigment manufacturer's instructions for patching integral colored concrete.

END OF SECTION

SECTION 321373  
CONCRETE JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Cold-applied joint sealants.
  2. Hot-applied joint sealants.

1.02 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers 8 samples of materials that will contact or affect joint sealants. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

1.03 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each kind and color of joint sealant required.
- C. Pavement-Joint-Sealant Schedule: Include the following information:
1. Joint-sealant application, joint location, and designation.
  2. Joint-sealant manufacturer and product name.
  3. Joint-sealant formulation.
  4. Joint-sealant color.
- D. Product certificates.
- E. Product test reports.
- F. Preconstruction compatibility and adhesion test reports.

1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021.

- B. Preinstallation Conference: Conduct conference at Project Site.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range of color.

### 2.02 COLD-APPLIED JOINT SEALANTS

- A. Single-Component, Nonsag, Silicone Joint Sealant for Concrete: ASTM D 5893, Type NS.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Crafcoc Inc., an ERGON company; RoadSaver Silicone.
    - b. Dow Corning Corporation; 888.
    - c. Pecora Corporation; 301 NS.
- B. Single-Component, Self-Leveling, Silicone Joint Sealant for Concrete: ASTM D 5893, Type SL.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Crafcoc Inc., an ERGON company; RoadSaver Silicone SL.
    - b. Dow Corning Corporation; 890-SL.
    - c. Pecora Corporation; 300 SL.
- C. Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant for Concrete: ASTM C 920, Type M, Grade P, Class 25, for Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pecora Corporation; Urexpan NR-200.

## 2.03 HOT-APPLIED JOINT SEALANTS

A. Hot-Applied, Single-Component Joint Sealant for Concrete: ASTM D 3406.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Crafcro Inc., an ERGON company; Superseal 444/777.

B. Hot-Applied, Single-Component Joint Sealant for Concrete and Asphalt: ASTM D 6690, Types I, II, and III.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Meadows, W. R., Inc.; Sealtight Hi-Spec or Sealtight 3405.

b. Right Pointe; D-3405 Hot Applied Sealant.

## 2.04 JOINT-SEALANT BACKER MATERIALS

A. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

B. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

## 2.05 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.



## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Cleaning of Joints: Clean out joints immediately before installing joint sealants.
- C. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- D. Install joint-sealant backings of kind indicated to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of joint-sealant backings.
  - 2. Do not stretch, twist, puncture, or tear joint-sealant backings.
  - 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place joint sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
  - 1. Remove excess joint sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- G. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

- H. Clean off excess joint sealant or sealant smears adjacent to joints as the Work progresses, by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION 321373

## SECTION 32 31 13

### CHAIN LINK FENCES AND GATES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Provisions of Division 01 apply to this section
- B. Section Includes:
  - 1. Chain link fences and gates as indicated.
- C. Related Sections:
  - 1. Section 03 10 00: Concrete Forms and Accessories
  - 2. Section 03 20 00: Concrete Reinforcement
  - 3. Section 31 20 00: Earth Moving
  - 4. Section 32 13 13: Concrete Paving

##### 1.2 SUBMITTALS

- A. Shop Drawings:
  - 1. Submit plans and details indicating extent of fences, locations of gates, and details of attachment and footings. Indicate means and methods for surface preparation and finishing.

##### 1.3 QUALITY ASSURANCE

- A. Comply with Standard Specifications for Public Works Construction, current edition.

#### PART 2 - PRODUCTS

##### 2.1 MATERIALS

- A. Concrete: Class 500-C-2500 concrete furnished as prescribed in Section 201-1 "Concrete, Mortar and Related Materials" of the Standard Specifications for Public Works Construction or may be provided in the following volumetric proportions:

Portland Cement	1 part
Fine Aggregate	2 parts
Coarse Aggregate (1/4 inch to 1-1/2 inches)	4 parts
Water	7-1/2 gallons, maximum per sack of cement

- B. Chain Link Fence Fabric: Conforming to ASTM A 392, Class C2 zinc coating, 2.00 ounces minimum per square foot of uncoated wire surface, hot-dipped galvanized after weaving, and top and bottom edges knuckled.
1. Fabric for perimeter fencing and interior fencing shall be 9 gauge woven wire with 1 inch mesh, unless otherwise specified. *Fencing to have 10% recycled content.*
  2. For perimeter fences 16 feet high, the upper 8 feet of fabric may be 11 gauge.
  3. Fences 12 feet high or less shall be furnished with single width fabric.
  4. Fabric for fencing on top of handball court shall be 9 gauge wire minimum with 1 inch mesh.
  5. Fabric for fencing of tennis courts shall be full height, single width, 9 gauge x 1-3/4 inches mesh chain link fabric.
  6. Installed fence fabric shall be free from barbs, icicles, or other projections and installed fence fabric with such defects will be deemed defective Work.
- C. Posts, Top Rails, Brace Rails and Gate Frames: Standard weight, galvanized, welded or seamless steel pipe conforming to ASTM A 53, with a minimum yield strength of 35,000 psi. Embed posts into footing 6 inches less than the depth of the footing unless noted otherwise on drawings.
- D. Schedule of Posts and Footings:

Item	Height	Nominal Pipe Size (inches)	Outside Diameter (inches)	Weight (pounds per foot)	Footings*	
					Diameter (inches)	Depth (inches)
Top Rail, Brace Rails and Transom Rails	Up to 10'-0"	1-1/4	1.660	2.27	N/A	N/A
	10'-1" to 16'-0"	1-1/2	1.900	2.72	N/A	N/A
Line Posts	Up to 6'-0"	2	2.375	3.66	12	36
	6'-1" to 8'-0"	2	2.375	3.66	14	42
	8'-1" to 10'-0"	2-1/2	2.875	5.79	14	48
	10'-1" to 16'-0"	3.5	4	9.12	14	60

Item	Height	Nominal Pipe Size (inches)	Outside Diameter (inches)	Weight (pounds per foot)	Footings*	
					Diameter (inches)	Depth (inches)
Terminal, Corner, Angle & Pull Posts	Up to 8'-0"	2-1/2	2.875	5.79	12	36
	8'-0" to 10'-0"	2-1/2	2.875	5.79	14	42
	10'-1" to 16'-0"	3	3.5	7.58	14	60
Pedestrian Gate Posts	Up to 8'-0"	3	3.5	7.58	18	48
Gate Frames	Up to 8'-0"	1-1/2	1.900	2.72	N/A	N/A
Driveway Double-Leaf Swing Gate Posts: Opening						
Up to 17'-3-1/2"	Up to 8'-0"	3 1/2	4	9.11	16	42
17'-4" to 20'-3-1/2"	Up to 8'-0"	3-1/2	4	9.11	16	42

- E. Post Caps: Malleable iron, ASTM A 47, Grade 32510, designed to fit snugly over posts with a minimum projection of 1-1/2 inches below top of posts. Post caps shall be manufactured with a curved top.
- F. Eye Tops: Malleable iron, ASTM A 47, Grade 32510, designed to fit over line posts, and for through passage of top rail.
- G. Expansion Sleeve Couplings for Top Rails: Steel, 6 inches long, designed to fit tightly on inside of rail, fitted with raised center.
- H. Rail Ends for Top Rails and Brace Rails: Malleable iron, ASTM A 47, Grade 32510, with holes to receive 3/8 inch bolts for securing to rail end bands.
- I. Tension Bands and Bands for Securing Rail Ends: Mild steel flats, at least 11 gage x one inch, tension bands in gates shall be 11 gage x 1 inch. Bolts for use with tension bands and rail end bands shall be 3/8 inch x 1-1/2 inches.
- J. Tension Bars: Mild steel flats at least 3/16 inch x 3/4 inch.
- K. Tension Wire for Installation at Bottom of Fabric: 6 gauge steel spring wire, conforming to requirements of AISI Steel Products Manual, Carbon Steel Wire, Section 16, merchant quality, galvanized, soft temper with Type I coating. Wavy type wire is not acceptable.
- L. Turnbuckles for installation with Tension Wires: Eye and hook type, drop forged steel, right and left hand threads, at least 3/8 inch screw diameter with at least 4-1/2 inches of take-up.
- M. Tie Wire: Aluminum ties 6 gauge for fastening fabric to posts, top rails and brace rails. At bottom tension wire 9 gauge galvanized hog rings shall be installed.

- N. Finish of Metal Parts: Post caps, couplings, rail ends, tension bands, tension bars, turnbuckles, rivets, bolts, and other metal parts and fittings shall be hot-dipped galvanized after fabrication, except bolts, which may be galvanized or cadmium-plated. Galvanizing shall conform to ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products, and ASTM A 47 Standard Specification for Ferritic Malleable Iron Castings.
- O. Paints for Refurbishing Existing Fence Posts, Rails, and Accessories: As required to provide the galvanized color of a new installation.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install fences to heights indicated on Drawings.
- B. Space fence posts at equal intervals between terminal, angle, corner, and gate posts, and not more than 10 feet apart measured from center to center of posts. In curved fence sections having a radius of 50 feet or less, space posts not more than 5 feet - 6 inches apart. Install posts so that top of eye of post caps are level with top of fabric.
- C. Install angle or corner posts at each change in direction of 15 degrees or more, at change of 5 percent or more in grade of fencing, and at the beginning and end of curved fence sections.
- D. Install terminal posts at ends of runs of fencing. Install gateposts on both sides of driveway and pedestrian gates. For double-leaf gates, net opening between gate posts shall be gate size as indicated on Drawings, plus 3-1/2 inches; for single leaf gates, net opening shall be gate size plus 2-1/2 inches.
- E. Where a fence is to be installed on a curb, construct footings with top of footing level with the lower finish grade. Align posts, set plumb and true before placing footings. Remove splattered concrete from exposed pipe surfaces while concrete is still soft. In bituminous surfaced areas, install seal coat on top of concrete footings.
- F. Install fences with top rail. Top rail shall pass through eye tops and be secured at ends with rail-end fittings and bands.
- G. Install fences over 10 feet in height, in addition to top rail, with a full length horizontal mid-rail set at mid-height of fence and rigidly secured to posts with rail end fittings and bands.
- H. In fences higher than 10 feet, install brace rails at angles, corners, and terminals at 1/4 and 3/4 of fence height. Provide one horizontal brace rail in panels adjacent to terminal, angle, corner, and gateposts, install at mid-height of fence and rigidly secured to posts with rail end fittings and bands. Provide horizontal brace rails, as

specified, in panels of curved sections having a radius of 50 feet or less. Brace rails are not required in fencing 4 feet or less in height.

- I. Provide a transom rail and fabric at top of pedestrian gate openings. Install transom rail 6 feet - 8 inches above high point of grade at gate opening. Ends of transom rails shall be pinned or riveted to rail end fittings with 1/4 inch mild steel rivets. Pin or rivet must go through rail and peen. Welding on rail ends is not permitted.
- J. Install bottom tension wire a minimum of 3 inches from grade for fencing, and provide a turnbuckle for each 150 feet of wire or fractional part thereof. Turnbuckles are not required in runs of 15 feet or less. Install ends of tension wires to posts in a manner to prevent slipping or loss of tension. Wrap should start from fence side of post. Turn end of wire around post tightly twisted at least 3 times around wire. At turnbuckles, wire through eye and tightly twist end at least 3 times around wire. Cut tail of bottom wire flush.
- K. Install fence fabric on outward facing side of posts, except for tennis courts. Install fence fabric with top edge projecting above top rail of fence.
- L. Install bottom of fence fabric to clear finish grades, except on bituminous surface install 3/4 inch above such surface. Locally shape and trench ground surfaces where necessary to provide uniform top and bottom alignment of fence.
- M. Tightly stretch fabric and at terminal, pull corner, angle, and gateposts, secure with tension bars extending full height of fence. Secure tension bars to posts with bolted tension bands spaced not more than 14 inches apart.
- N. Bands and Ties: Install bands and ties in accordance with following schedule:

15 bands on 16 feet fence	16 ties on 16 feet fence
11 bands on 12 feet fence	12 ties on 12 feet fence
7 bands on 8 feet fence	7 ties on 8 feet fence
6 bands on 6 feet fence	6 ties on 6 feet fence
4 bands on 4 feet fence	4 ties on 4 feet fence
- O. Fasten fabric to line posts with wire ties spaced not more than 16 inches apart. Where 6 gauge aluminum ties are furnished, hook the tie at both ends. Installation of hooked ties with links is not permitted.
- P. Fasten fabric to top rails, mid-rails, brace rails, with wire ties spaced not more than 18 inches apart. Bend back ends of tie wires so as not to be a hazard. At bottom tension wire, install hog rings spaced not more than 18 inches apart. Where 2 fabrics are furnished, lap the fabrics one mesh at mid-rail and tie both fabrics with 9 gauge wire or 6 gauge aluminum ties to midrails.
- Q. Grind all field welds smooth, clean off flux and spatter, damaged galvanizing removed, burrs and projections ground off, properly prepared, then heavily coated

with “Rust Bullet” as manufactured by Poliflex USA or equal product approved by Owner’s Office of Environmental Health and Safety. Install coating in accordance with written recommendations of manufacturer.

R. Fabrication of Gates:

1. Frames: Fabricate gate frames from steel pipe of size specified, with joints at corners miter cut and continuously welded to sides.
2. Fabric: Install fence fabric to side members with tension bars and tension bands as specified, spaced not more than 14 inches apart. Tension bars shall extend full height of gate. Install fence fabric to top and bottom members and to brace rail with wire ties as specified for top rails, spaced not more than 12 inches apart.
3. Latches: Gate latches and strikes will be furnished by the **Contractor**. Weld gate latches and strikes to gate posts and frames. Welding shall be performed before gate frames are galvanized, or welds shall be finished as specified for field welds. Refer to detail 10/A5.01
4. Hinges: Install and adjust hinges; burr or center punch threads of gate hinge bolts to prevent removal of nuts. Install 3 hinges on each post for swing gates more than 16 feet wide. Hinges provided by the **Gate manufacturer**.
5. Grind welds flush and smooth. Hot-dip galvanize fabricated parts after welding, or finish weld as specified for field welds.

3.3 FENCING ON TOP OF HANDBALL COURT WALLS

- A. Posts, rails, chain link fabric and accessories required for a complete installation shall be as specified, except that chain link fabric shall be 9 gauge wire minimum by 1 inch mesh.

3.9 COMPLETION

- A. Completed fencing shall form continuous units between points indicated with required parts, accessories, and fittings provided and installed. Clean exposed metal surfaces of cement, grout and other foreign substances.
- B. Fill in holes left by removal of existing fence footings, except in areas where grading Work is indicated or specified, to existing grade with clean earth thoroughly compacted to at least same density as adjoining soil.



3.10 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.11 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION