Santa Clara County Office of Education

**ADDENDUM 1**

**FOR**

**B 02_25_26 – RIDDER PARK NORTH & SOUTH BUILDING BACKUP GENERATOR**

**DATED SEPTEMBER 12, 2025**

This addendum is issued as part of the bid documents for the referenced project and serves to amend, clarify, or otherwise modify the original project specifications as outlined below.

Bidders are required to acknowledge receipt of this Addendum in their bid submission. Failure to acknowledge this Addendum may result in disqualification of the bid.

1. **Additional file as attached:**
   - SCCOE Ridder Park Backup Generator Technical Specifications_250814

+++ END OF ADDENDUM 1 +++

# TECHNICAL SPECIFICATIONS

## B 02_25_26 - RIDDER PARK NORTH & SOUTH BUILDING BACK UP GENERATOR

1290 RIDDER PARK DR,
SAN JOSE, CA 95131

SCCOE BACK UP GENERATOR RE-BID

AUGUST 14, 2025

## SANTA CLARA COUNTY OFFICE OF EDUCATION

PREPARED BY:
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**PROJECT # 06451**
**SJ CITY APPLICATION # 22-681986 CI**

SIGNATURE SHEET

FOR

# SCCOE BACKUP GENERATOR RE-BID

**1290 RIDDER PARK DR,**
**SAN JOSE, CA 95131**

SANTA CLARA COUNTY
OFFICE OF EDUCATION

Project Number: 06451


**ARTIK ART & ARCHITECTURE**
Architect

**DOCUMENT 00 01 10**

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# SECTION 015001 – TEMPORARY POWER

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This section includes requirements for providing temporary electrical power for construction at both Bldg #1 and Bldg #3. Also included is providing temporary power to keep all electrical equipment in all buildings up and running during the replacement of the main switchboards for Bldg #1 and Bldg #3.

B. The maximum time allowed for a power shutdown is 4 hours. Contractor shall coordinate his work with the Owner and PG&E to minimize shutdown times.

C. Coordinate the switchover with PG&E so that the power is switched off and switched on as needed.

D. Provide all cable extensions needed.

E. The new generators shall be used for temporary power since they will be delivered and installed long before the new switchboards will be delivered.

F. The existing switchboards may be used for temporary power.

G. The existing 300 kW generator currently used to back up the Data Center in Bldg #3 shall also be used for temporary power.

H. Temporary power shall conform to all applicable requirements of authorities having jurisdiction and serving utility companies and agencies, including the following:

1. Cal OSHA
2. California Building Code (CBC) requirements
3. Health and safety regulations
4. Utility agency and company regulations
5. Police, Fire Department and Rescue Squad rules
6. Environmental protection regulations

I. Contractor shall arrange for services and pay all fees and service charges for temporary power as necessary for the Work. Contractor shall apply for and obtain

permits for temporary utilities, including permits for temporary generators, from authorities having jurisdiction.

1.2 REFERENCES

A. NFPA Document 241 - Building Construction and Demolition Activities

B. ANSI A10 Series - Safety Requirements for Construction and Demolition

C. NECA Electrical Design Library - Temporary Electrical Facilities

D. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with California Electrical Code (CEC)

1.3 RELATED SECTIONS

A. Section 262413 Switchboards

B. Section 260622 Engine Generator

1.4 PROJECT CONDITIONS

A. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on the site.

B. Temporary power conduit, raceways, fittings, conductors, panels, connections, disconnects, overcurrent protection, shall comply with requirements of the serving electric utility, California Electrical Code (CEC) and requirements of authorities having jurisdiction.

C. Service Disruptions: When necessary for energizing and de-energizing temporary electric power systems, minimize disruption of service to those served. Schedule transfers at times convenient to SCCOE and to occupants. Shutdown times must be limited to 4 hours.

1.5 SUBMITTALS

A. Submit proposed plan for providing temporary power for construction and for providing power during switchboard replacement.

1.6 MEASUREMENT AND PAYMENT

A. Full compensation for furnishing all labor, materials, tools, equipment and conforming to the requirements of this section for providing temporary power shall be considered as included in the allowance paid for Temporary Power and no additional compensation shall be allowed therefore.

PART 2 - PRODUCTS

2.1 POWER DISTRIBUTION EQUIPMENT

A. Provide conduit, cables, panels, connectors, and fuel for the generator as needed.

PART 3 - EXECUTION

3.1 PROVIDING TEMPORARY POWER

A. The first order of work is to order all electrical equipment needed for this project including the new switchboards and manual transfer switch. Submittals for all new electrical equipment shall be processed expeditiously. Obtain the proposed delivery date from the switchboard manufacturer to assist in planning for switchover from the existing switchboards to the new switchboards.

B. The new Owner-Furnished, Contractor-Installed generators were delivered and placed on site. The new Manual Transfer Switch (MTS) will take about 6 months. That equipment will be delivered before the new switchboards which has a lead time of approximately 1-year. Therefore, the generator, MTS and all possible electrical work shall be done before the new switchboards are delivered.

C. Plan to do the replacement of the switchboards sequentially instead of concurrently.

D. Conduct switchover work so that switchover for Bldg #1 is on one weekend and switchover for Bldg #3 is on another weekend.

1. The Contractor shall prepare for the switchovers by doing all possible work before the switchovers, ensuring that the new generators are tested and ready to run and ensuring that all equipment and tools necessary for the work are available.

2. PG&E can be scheduled to disconnect their service, say, close of business on Friday. The Contractor will disconnect and remove the existing switchboard and connect the existing feeders to the new generators for temporary power.

3. Just before PG&E is scheduled to reconnect power the Contractor shall disconnect the temporary power and install the new switchboard and reconnect the existing feeders.

E. Final startup and testing of the generator and other electrical equipment shall be done after the project is completed to confirm that the complete electrical system is operating as intended.

END OF SECTION 015001

SECTION 015639

TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Furnish all labor, materials, equipment, facilities, transportation and services to complete tree protection and related work as shown on the drawings and/or specified herein.

B. Description of Work:

1. Protection of existing trees and vegetation to remain.
2. Trimming of existing trees.
3. Maintenance of existing trees and vegetation during construction.
4. Removal of existing trees and other vegetation.
5. Contractor shall retain the services of a certified arborist to perform routine visits and oversee the protection of the existing trees within the project area during demolition, construction and maintenance and to especially review and recommend treatment when roots are encountered and to perform routine maintenance during the construction phase.

C. Traffic:

1. Do not interfere with or close public ways without permission of the Owner’s Representative.
2. Do not interfere with adjacent private properties without permission of the Owner’s Representative.

D. Site Utilities:

1. Advise utility companies of excavation activities before starting excavations.
2. Locate and identify underground utilities passing through work area before starting work.
3. In event unidentified underground utilities are encountered during work, advise utility owner immediately before proceeding. Add any new utility information to project record drawings for actual location.
4. Protect all existing-to-remain utilities.

5. Do not interrupt existing utilities without advance notice to and approval from the District.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified arborist and tree service firm.

B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work and for removal and re-installation of existing trees.

D. Existing Conditions: Documentation of existing trees and plantings indicated to remain and/or relocate, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1. Use sufficiently detailed photographs.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.4 QUALITY ASSURANCE

A. Contractor shall be liable for the loss in value to damaged trees and for all repair costs resulting as determined by the Owner's Representative. Due to the irreplaceable nature of many existing trees, the liability to the General Contractor shall be set at $500.00 minimum per tree. The Trunk Formula method for Northern California established by the International Society of Arboriculture must be used to compute the actual value.

B. Arborist Qualifications: Certified Arborist as certified by the International Society of Arboriculture (ISA) and having performed similar services for a minimum of five (5) years.

1. Contractor shall retain the services of a Certified Arborist when any of the following conditions occur for existing to remain tree(s) within the project construction area that are over six (6) inches in diameter measured three (3) feet above finish grade:
   a. Grading, excavation, trenching or any other similar work is required that may disturb roots of existing to remain trees.
   b. Pruning is required on branches more than two (2) inches in diameter..

1.5 PROJECT CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.

7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

1.6 SUBMITTALS

A. In the event work is required within the dripline of existing to remain trees and vegetation, Contractor shall retain the services of a Certified Arborist for the preservation of the tree(s) and submit written recommendations from Arborist to Owner's Representative for review prior to implementation. Contractor shall follow recommendations of Arborist and contact Arborist for further review and recommendations if the tree(s) begin to decline in health.

1.7 Definitions

A. Caliper: Caliper on young trees are taken six (6) inches above the soil level and measured by a diameter across the tree trunk. For a tree exceeding a four (4) inch caliper, the diameter measurement is then taken at twelve (12) inches above the soil level. For a mature tree, the caliper is taken at chest height, generally 4-1/2 to 5 feet above the soil level. The measurement is taken using a tree caliper, a utensil in the shape of an "F" with an adjustable cross arm to slide and rest up against the trunk to measure the precise distance of the trunk width.

C. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, unless indicated otherwise on Drawings.

D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by a circle concentric with each tree with a radius equal to the diameter of the drip line unless indicated otherwise on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

PART 2 - PRODUCTS

2.1 TREE PROTECTION PROTECTIVE FENCE

A. Existing vegetation and/or trees to remain on the site shall be protected with a five (5) feet high orange plastic snow fence. Fence shall be mounted on wooden lodgepole posts driven into the ground every six (6) feet to a depth of at least two (2) feet. Fence shall be erected and installed around the perimeter dripline (area directly under the outer circumference of the branches) of each shrub, tree or groups of shrubs or trees to remain.

B. Snow Fence: Orange, UV resistance, .3 inch thickness, 60 inches in width, oval mesh, extruded thermal plastic polymer, Tenax or equal, fence fabric.

C. During planting and irrigation operations, protective fencing is not required beneath existing to remain trees and shrubs that fall within the newly landscaped and/or irrigation area.

2.2 ORGANIC MULCH

A. Refer to Specification Section 32 90 00 “Planting” and match organic mulch material to use in non-bio-retention planting areas.

B. If Specification Section 32 90 00 “Planting” is not issued as part of this project, organic mulch to be Pro-Chip decorative mulch, mahogany in color and available from Pacific Landscape Supply (209) 593-1199, www.pacificlandscapesupply.com.

2.3 LODGEPOLE FENCE POSTS

A. Rough-sawn, sound, new hardwood, redwood, or pressure-preservative-treated Douglas Fir or lodgepole pine, free of knots, holes, cross grain, and other defects, two (2) inches in diameter by length required, and pointed at one end.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. For the record, prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.1 PREPARATION

A. Inspections: Engage a qualified arborist to direct plant protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain, to over-see removal and re-installation of existing plant material and to prepare inspection reports.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain. Tie a 1-inch blue-vinyl tape around each tree trunk at 54 inches above the ground.

C. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

D. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas if indicated within Drawings.

1. Apply 3-inch minimum thickness of organic mulch. Do not place mulch within 6 inches of tree trunks.

3.2 PROTECTIVE FENCE INSTALLATION

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin. Install fencing in a manner that will prevent people from easily entering protected area

except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

1. Plastic Protection Zone Fencing: Neatly install protection zone plastic fabric by securing to posts with plastic bands or steel wires, a minimum of two per post, additionally if required to withstand typical construction activity.
2. Posts: Set or drive posts into ground at least two (2) feet without concrete footings and no more than six (6) feet on center spacing. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Owner's Representative.
3. Access Gates: Install as necessary; adjust to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Owner's Representative. Install one sign spaced approximately every 50 feet on protection-zone fencing, but no fewer than two signs with each facing a different direction.

C. Maintain protection zones free of weeds and trash.

D. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by the Owner's Representative.

E. Maintain protection-zone fencing and signage in good condition as acceptable to Owner's Representative and remove when construction operations are complete and equipment has been removed from the site.

1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.
3. Temporary access is permitted for landscape irrigation and planting operations.

## 3.3 ARBORIST SUPERVISION

A. For construction within ten (10) horizontal feet of a tree and/or shrub to remain, with a trunk diameter of twelve (12) inches or larger measured three (3) feet above original finish grade, Contractor shall retain the services of a reputable Arborist certified by the International Society of Arboriculture (ISA) to review the tree(s) and/or shrubs(s), the work to be performed and provide written recommendations to minimize the impact on existing trees and/or shrubs to remain. Submit recommendations to Owner's Representative for review.

B. Contractor shall implement Arborist recommendations.

C. Contractor shall consult Arborist for further recommendations if tree(s) and/or shrub(s) appear in failing health until final completion and acceptance of landscape work.

3.4 EXCAVATION

A. General: Excavation and trenching shall be performed at a minimum, in accordance with these specifications and per Drawings and Details and in accordance with recommendations from project Arborist retained by Contractor.

B. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.

C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches (75 mm) back from new construction and as required for root pruning.

D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.

1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.

C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

D. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with topsoil

3.6 ROOT PRUNING

A. Prune roots that are affected by temporary and permanent construction. Prune roots as follows:

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Cut Ends: Coat cut ends of roots more than 1-1/2 inches in diameter with an emulsified asphalt or other coating formulated for use on damaged plant tissues and that is acceptable to arborist.
3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
4. Cover exposed roots with burlap and water regularly.
5. Backfill as soon as possible.

B. Root Pruning at Edge of Protection Zone: Prune roots flush with the edge of the protection zone, by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Avoid cutting trenches within shrub and/or tree protection zone. If trenching is unavoidable, cut trenches with an air spade tool to expose roots without cutting them. Roots encountered smaller than two (2) inches in diameter may be cut, not torn for removal. Cleanly cut roots as close as possible to excavation. Roots larger than two (2) inches in diameter shall remain.

## 3.7 CANOPY PRUNING

A. General Pruning Procedures:
1. Prune trees according to ANSI A300 (Part 1)**.**
2. Cut branches with sharp pruning instruments; do not break or chop.
3. Do not apply pruning paint to wounds.

B. Pruning Goals (Prune as follows and under the direction of Certified Arborist):
1. Prune trees to remain to compensate for root loss caused by construction damage. Provide subsequent maintenance during landscape irrigation and planting maintenance period and until “final completion” as recommended by Certified Arborist.
2. Prune to remove dead wood, promote proper structure, thin and open canopy, and for general health for the specific tree species.
3. Prune for clearance from structures, pathways and driveways and streets and for a balanced canopy.

C. Cleaning: Chip removed branches and dispose of off-site.

## 3.8 IRRIGATION

A. Irrigate existing vegetation and/or trees to remain and those relocated during hot and/or dry periods and as required to maintain material in a healthy, vigorous condition.

## 3.9 REMOVE AND RE-INSTALL EXISTING TREES

A. Plant material noted on Drawing to be transplanted shall be carefully removed from planting area and planted in new location indicated on Planting Plan. Removal shall consist of digging around the dripline of each plant to be transplanted and to the depth where roots are present. Plant and rootball shall be carefully moved to new planting pit.

B. Re-install transplanted plant material to location indicated on Drawing as follows:

1. Excavate circular pits with sides sloped inward. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation. Excavate approximately planting pit sizes twice the width of the planting pot and equal to the depth of the planting pot.
2. Carefully install root ball without damaging root ball or plant.
3. Set rootball onto compacted native soil so the rootball sits one (1) inch above adjacent finish grade.
4. Amend backfill soil per tree planting detail and landscape planting specifications.
5. Place planting soil around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil.
6. Stake tree(s) per tree planting detail.

## 3.10 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by the Owner’s Representative.

1. Submit details of proposed root cutting and tree and shrub repairs.
2. Have arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
3. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
4. Perform repairs within 24 hours.
5. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by the Owner’s Representative.

B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition before the end of the maintenance period or are damaged during construction operations that the Owner’s Representative determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size and species as those being replaced for each tree that measures three (3) inches or smaller in caliper size.

2. Provide new trees of 48” box size and species as those being replaced for each tree that measures greater than three (3) inches. In addition, the liability to the General Contractor shall be set at $500.00 minimum per tree. The Trunk Formula method for Northern California established by the International Society of Arboriculture must be used to compute the actual value.
3. Plant and maintain new trees as specified in Section 32 90 00 "Planting."

C. Soil Aeration: Where directed by the Owner’s Representative, aerate surface soil compacted during construction. Aerate 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill two (2) inch diameter holes a minimum of 12 inches (300 mm) deep at 24 inches o.c. Backfill holes with an equal mix of augured soil and sand.

3.11 REMOVAL OF EXISTING TREES:

A. Contractor shall remove and demolish from the site trees and vegetation indicated on the Drawings. Additonal trees and vegetation conflicting with work require written approval by Owner’s Representative.

B. Tree removal shall include branches, leaves, roots, stumps and stump grindings to a minimum depth of 18” below proposed subgrade. Exact depth shall be determined in accordance with and as required for building and hardscape work included under this contract.

C. Contractor shall fill depressions caused by tree removal with topsoil or site soil.

D. Properly dispose of any vegetation debris in a legal and acceptable manner off project/site property.

END OF SECTION

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# SECTION 02 41 13 - SELECTIVE SITE DEMOLITION

## 1.00 GENERAL

### 1.01 RELATED DOCUMENTS

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

### 1.02 SUMMARY

A. This Section requires the selective removal and subsequent off-site disposal of, but not limited to, the following:

1. Portions of site improvements indicated on drawings and as required to accommodate new construction.

2. Removal and protection of existing fixtures, materials, and equipment items indicated "salvage."

### 1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Schedule indicating proposed sequence of operations for selective demolition work to Architect for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection.

1. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations, if any.

2. Coordinate with Owner's continuing occupation, if any, of portions of existing building and with Owner's partial occupancy, if any, of completed new addition.

C. Photographs of existing conditions of structure surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to removal operations. File with Architect prior to start of work.

### 1.04 JOB CONDITIONS

A. Occupancy: Owner will occupy portions of the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize

need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of demolition activities that will affect Owner's normal operations.

B. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.

1. Conditions existing at time of inspection for bidding purposes will be maintained by Owner insofar as practicable. However, minor variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.

C. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

1. Storage or sale of removed items on site will not be permitted.

D. Environmental Controls: Comply with governing regulations pertaining to environmental protection.

1. Lead in Construction: All contractors shall comply with Title 8, California Code of Regulations (CCR), Section 1532.1, when abating lead relating to demolition of remodel activity in all public buildings. Workers must be trained by the Department of Health Services (DHS) accredited trainer provider and certified by DHS. Exposure assessment (air monitoring) must be performed in all workplaces where employees may be exposed to lead. Exposure assessment is an eight hour period when air monitoring takes place to determine permissible exposure limit for each activity taken.

E. Protections: Provide temporary barricades and other forms of protection to protect Owner's personnel and general public from injury due to selective demolition work.

1. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to occupied portions of building.

2. Erect temporary covered passageways as required by authorities having jurisdiction.

3. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or work to remain.

4. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

5. Protect floors with suitable coverings when necessary.

6. Construct temporary insulated dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dust proof doors and security locks.

7. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.

8. Remove protections at completion of work.

F. Damages: Promptly repair damages caused to adjacent facilities by demolition work.

G. Traffic: Conduct selective demolition operations and debris removal to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

1. Do not close, block, or otherwise obstruct streets, walks, or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

H. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, such as interior of ducts and pipe spaces, verify condition of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.

I. UtilityServices: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.

1. Do not interrupt utilities serving occupied or used facilities, except when authorized in writing by Owner/Occupant. Provide temporary services during interruptions of existing utilities, as acceptable to governing authorities.

2. Maintain fire protection services during selective demolition operations.

J. Dust Control: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection.

1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

2.00 PRODUCTS (Not Applicable)

3.00 EXECUTION

3.01 PREPARATION

A. General: Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of areas to be demolished and adjacent facilities to remain.

1. Cease operations and notify Architect immediately if safety of structures, or improvements to remain appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
2. Cover and protect furniture, equipment, and fixtures from soilage or damage when demolition work is performed in areas where such items have not been removed.
3. Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes to occupied portions of the building.

    a. Where selective demolition occurs immediately adjacent to occupied portions of the building, construct dust-proof partitions of minimum 4-inch studs, 5/8-inch drywall Uointstaped) on occupied side,1/2-inch fire-retardant plywood, or equivalent, on demolition side and fill partition cavity with sound-deadening insulation, or as otherwise directed.
    b. Provide weatherproof closures for exterior openings resulting from demolition work.

4. Locate, identify, stub off, and disconnect utility services that are not indicated to remain.

    a. Provide bypass connections as necessary to maintain continuity of service to occupied areas of building.

3.02 DEMOLITION

A. General: Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.

1. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.
2. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors, or framing.

3. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.

4. Demolish foundation walls to a depth of not less than 12 inches below lowest foundation level. Demolish and remove below-grade wood or metal construction. Break up below-grade concrete slabs.

5. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.

B. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the

conflict. Submit report to Architect in written, accurate detail. Pending receipt of directive from Architect, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.

3.03 SALVAGED MATERIALS

A. Salvaged Items: Where indicated on Drawings as "Salvage - Deliver to Owner," carefully remove indicated items, clean, store, and turn over to Owner and obtain receipt.

1. Historic artifacts, including cornerstones and their contents, commemorative plaques and tablets, antiques, and other articles of historic significance, remain property of Owner. Notify Architect if such items are encountered and obtain acceptance regarding method of removal and salvage for Owner.

2. Carefully remove, clean, and deliver to Owner the following items:

a. As indicated on the Construction Documents.

3.04 DISPOSAL OF DEMOLISHEDMATERIALS

A. Remove from building site debris, rubbish, and other materials resulting from demolition operations. Transport and legally dispose off site.

B. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

1. Burning of removed materials is not permitted on project site.

3.05 CLEANUPAND REPAIR

A. **General:** Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean.

B. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

**END OF SECTION 02 41 13**

# SECTION 06 10 53 - ROUGH CARPENTRY

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section. If there is a conflict between City of Mountain View General and Special Provisions and Division 1, the City of Mountain View General and Special Provisions shall govern.

B. Rough Carpentry work includes walls and roofs.

C. Provide all labor, materials, equipment and service necessary for completion of the rough carpentry work shown on the drawings.

### 1.2 QUALITY ASSURANCE

A. Lumber shall conform to the following grading rules:

1. Douglas Fir Lumber: Standard Grading and Dressing Rules, latest edition, of the West Coast Lumber Inspection Bureau.

2. Redwood Lumber: Standard Specifications for Grades of California Redwood Lumber of the Redwood Inspection Service.

3. Plywood: Product Standard PS 1-83.

B. All lumber and plywood shall have the grade mark of the governing association.

C. All work shall conform to the 2010 California Building Code, Title 24, Part 2.

### 1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Immediately upon delivery to job site, place materials in area protected from weather or cover with waterproof covering.

B. Store materials a minimum of six (6) inches above ground on blocking.

C. Protect all materials from corner breakage and surface damage.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. All framing lumber shall be Coast Region Douglas Fir.

B. Conform to the following grades, unless noted otherwise:

| Member | Grade |
|---|---|
| 2x4 Studs, Plates, Bridging & Blocking: | Construction Grade |
| 2x6 Studs and Blocking: | No.2 |
| 3x & 4x, 6" & deeper Beams, Headers, Ledgers: | No.1 |
| 6x & wider Beams & Headers: | No.1 |
| Posts: | No.1 |
| Sole plates on concrete: | No.2 pressure treated |

C. All solid sawn lumber shall have a moisture content of not greater than 19% at the time of installation.

D. Plywood sheathing shall be APA rated Sheathing with exterior glue.

1. Wall sheathing shall be 15/32" thick with a span rating of 24/0.

E. Building paper shall be Asphalt-saturated asbestos felt conforming to ASTM D250, 15 lbs., non-perforated.

F. Timber connectors, bolts, lag screws, nails and staples shall conform to the building code.

G. Bolts set against wood shall have cut washers.

1. Anchor bolts for wall sole plates shall have 2"x2"x3/16" plate washers at top of sole plate.

2. Hot-dip galvanized or stainless steel for exterior use.

3. Hot-dip galvanized or stainless steel for use in preservative treated wood.

H. Nails shall be Common type.

1. Hot-dip galvanized or stainless steel for exterior use.

2. Hot-dip galvanized or stainless steel for use in preservative treated wood.

3. Box nails shall not be used without specific approval of the Engineer.

I. Joist hangers, post caps, holdowns, etc. as manufactured by the Simpson Company or approved equal. Any request for substitution shall be submitted to the Engineer with current ICC-ES approval report.

1. Hot-dip galvanized or stainless steel for exterior use.

2. Hot-dip galvanized or stainless steel for use in contact with preservative treated wood..

J. Powder driven fasteners shall be Hilti, size shown on drawings, installed per manufacturer's recommendations. Any request for substitution shall be submitted to the Engineer with current ICC-ES approval report.

K. Expansion anchors shall be Wedge Anchors for concrete or masonry anchorage, size as per drawings, unless specifically shown otherwise on the drawings.

1. Hot-dip galvanized or stainless steel for exterior use.

2. Hot-dip galvanized or stainless steel for use in preservative treated wood..

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Sole Plates:

1. Set level to 1/16 in. in 6 ft.

2. Anchor bolt holes shall be not more than 1/8" larger than anchor bolt size.

B. Stud wall framing:

1. 2 in. thick studs @ 16" o.c. unless noted otherwise.

2. Provide studs in continuous lengths without splices.

3. Provide triple studs at corners and intersections so that no wall material can extend from one room to another, unless shown otherwise.

4. Firestop blocking shall be 2" material installed in accordance with CBC Section 708.

5. Openings shall be framed with headers where more than one stud is cut.

6. Locate blocking for backing for other trades, i.e., finishing materials, fixtures, specialty items and trim.

C. Horizontal framing:

1. Install with crown edge up.

2. Support ends of each member with a minimum of 1-1/2" of bearing on support.

3. Notch (birdsmouth) rafters to fit wall plates.

4. Place rafters directly opposite each other at ridges.

5. At hips and valleys bevel ends of rafters for full bearing against hip & valley members.

6. Provide solid blocking, at 8'-0" intervals, between all floor joist, and roof joist 8" and deeper.

D. Cutting, notching or boring of members shall not be done except as shown on the drawings.

E. Decking:

1. Install random length pieces continuous over three spans with end joints in adjacent rows a minimum of 24" apart.

2. Drive decking members tight using short block, do not hammer tongue.

3. Nail each member at support with one 20d blind nail and one 20d face nail for 2x decking; one 30d blind nail and one 30d face nail for 3x decking.

4. Toe nail grove to tongue at 45 degrees, 1-1/4" from edge, with 8d nails at 30" o.c.

F. Plywood Sheathing:

1. Allow a minimum of 1/16" between edge joints and 1/8" between end joints.

2. Floor sheathing shall be glued using 1/4" bead of B.F. Goodrich PL-400 adhesive at all supports and grooved edges. Nail immediately after gluing each piece.

3. Install floor plywood with face grain perpendicular to supports; roof plywood as shown on the drawings and wall plywood with face grain parallel to studs.

4. Plywood short nails may be used if the following penetration into the supporting member is maintained:

| Nail Size | Penetration |
|---|---|
| 6d | 1-1/4" |
| 8d | 1-1/2" |
| 10d | 1-5/8" |

5. Where gun nailing is used, care shall be taken not to overdrive nails. Where face ply is broken, renailing is required. Any nails that miss the supporting members shall be removed and renailed.

G. Wall Sheathing Board:

1. Apply sheathing with long dimension parallel to the studs.

2. Allow 1/8" space between sheets.

3. Attach sheathing using staples a minimum of 1-3/8" long spaced at 3" o.c. at edges and 6" o.c. at intermediate supports; or 6d nails spaced at 4" o.c. at edges and 8" o.c. at intermediate supports.

H. Connectors:

1. Minimum nail spacing shall be 1/2 their length, minimum edge distance shall be 1/4 their length. Pre-drill holes for nails wherever necessary to prevent splitting.

2. Wood screws and lag screws shall be turned into place, not driven. Drill holes in the same depth and diameter as the shank and the diameter of the thread base for the threaded portion.

3. Bolt holes shall be drilled 1/16" larger than the bolt diameter.

4. Joist hangers, tie straps, etc., shall have the number and size of connectors recommended by the manufacturer.

END OF SECTION

SECTION 03 10 00

# CONCRETE FORMWORK

## PART 1 − GENERAL

### 1.1 SUMMARY

A. This Section includes all labor, materials, equipment, operations, or methods listed, mentioned or scheduled on the plans and/or herein specified, including all incidentals necessary and required for completion of work under this Section.

B. Provide and install formwork for cast-in-place concrete, with shoring, bracing and anchorage.

B. Form accessories.

C. Stripping forms.

### 1.2 RELATED SECTIONS

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Special Conditions and Division 1 of these Contract Documents.

B. Document 03 20 00 – Reinforcing Steel

C. Section 03 30 00 - Cast in Place Concrete

### 1.3 SYSTEM DESCRIPTION

A. Design, engineer, and construct formwork, shoring, and bracing to meet design and code requirements, so that resultant concrete conforms to required shapes, lines, and dimensions.

B. Contractor shall be responsible for strength of forms. In general, deflection of finished surface shall not exceed that produced by 5/8 inch plywood against studs set on 12 inch centers.

### 1.4 QUALITY ASSURANCE

A. Construct and erect concrete formwork in accordance with ACI and 2019 CBC.

### 1.5 PRODUCT HANDLING

A. Protection: Protect formwork materials before, during and after installation and protect the installed work and materials of other trades.

B. Replacements: In the event of damage, immediately make repairs and replacements necessary to the acceptance of the Architect and Structural Engineer at no additional cost to the Owner.

## 1.6 SEQUENCING AND SCHEDULING

A. Obtain information from other trades and suppliers in sample time to schedule and coordinate the installation of items furnished by them to be embedded in concrete.

## PART 2 − PRODUCTS

## 2 .1 FORM MATERIALS

A. Earth Forms: Acceptable for grade beams, footings and similar below grade structures provided the following:

1. Structural Drawings do not require and indicate otherwise;
2. Vertical excavated material will stand without caving;
3. Minimum reinforcing steel clearances are maintained;
4. Suitable provisions are taken to prevent raveling on top edges of excavation;
5. Suitable provisions are taken to prevent sloughing of loose material from walls of excavation;
6. Excavation is neatly cut;
7. Concrete which is exposed to view is poured against wood or metal forms to a minimum depth of 6 inches below finished grade;

B. Wood Forms for Exposed Concrete Not Otherwise Noted and Specified:

1. All wood forms shall be FSC.
2. DFPA graded HDO (High Density Overlaid) Plyform, Class I or II (as per strength and tolerance requirements), exterior, each piece grade marked.

## 2 .2 FORMWORK ACCESSORIES

A. Form Ties: Snap-off metal of fixed length; cone type; 1 inch break back dimension; free of defects that will leave holes no larger than 1 inch diameter in concrete surface.

B. Fillets for Chamfered Corners: Wood strips type; ~ ¾” in size; maximum possible lengths.

C. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required; of strength and character to maintain formwork in place while placing concrete.

## PART 3 − EXECUTION

## 3.1 EXAMINATION

A. Verify lines, levels, and measurements before proceeding with formwork.

## 3. 2 EARTH FORMS

A. Hand trim sides and bottoms of earth forms. Increase dimensions shown on drawings 1-1/2 inches for each form surface omitted.

B. Forms must be free of any debris, loose soil, and must not have standing water prior to placing concrete.

## 3.3 CONSTRUCTION OF FORMS

A. Rigidly support and substantially construct forms; erect plumb, straight and true to line, shape, and dimensions, and in precise position to form the lines and designs indicated, suitable for removal without prying against concrete.

B. Make forms tight without cracks and holes to prevent loss of fine particles from the concrete.

C. Construction joints shall be in accordance with requirements of Cast-In-Place Concrete, Division 3. Provide a surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints. Prior to subsequent pour, remove strip and tighten forms. Construction joints shall show no "overlapping" and off setting of concrete surfaces and shall, as closely as possible, present the same appearance as butted plywood joints. Joints in a continuous line shall be straight and true.

D. Provide fillet strips on external corners of beams and columns.

E. Provide forms for slabs, with removable leveling screeds for flat work.

F. Remove wood spreaders from forms prior to pour. No wood shall remain inside forms.

G. Form lumber from this project may be reused for concealed framing, providing lumber at the time of reuse meets the framing grade requirements specified; is in good condition, thoroughly clean, with nails removed.

## 3.4 INSERTS AND EMBEDDED ITEMS

A. Provide proper and adequate means for accurate positioning and securing bolts, hold-downs, reinforcing, and inserts in concrete.

B. Securely place embedded items, sleeves, and pockets, as indicated. Coordinate work of other sections. Use templates where necessary.

C. Do not cut reinforcing for embedded items and inserts unless specifically indicated on Drawings.

D. Do not embed piping in concrete, unless specifically authorized by Architect and indicated on Drawings.

E. Do not embed electrical conduit in concrete without specific written authorization from Architect and Structural Engineer. Locate conduit so as to keep the concrete at its maximum structural strength. In slabs on grade the outside diameter of

conduit shall not exceed 30 percent of the concrete thickness and shall be located at the centerline of slab. Conduits can be grouped in pairs, but minimum clear distance between single conduits or pairs shall be 6 inches.

## 3. 5 FORMWORK TOLERANCES

A. Wall Centerline Location: +/- 1/4 inch.

B. Slab on Grade Thickness: +/- 1/2 inch.

C. Other: +/- 1/4 inch.

## 3 .6 REMOVAL OF FORMS

A. Remove forms and falsework so as to ensure the complete safety of the structure. Do not remove supports until members have sufficient strength to safely support their own weight and superimposed loading with proper factor of safety. Do not remove forms and shoring without the authorization of the Architect and Structural Engineer. Authorization by the Architect and Structural Engineer of form removal shall not relieve the Contractor from responsibility for damage due to faulty construction or materials.

B. Remove forms for exposed concrete surfaces so as to preclude damage to finish. Do not use pinch bars and similar tools for prying against exposed surfaces.

C. Do not remove forms and shoring until the following minimum times have elapsed after concrete is placed:

1. Vertical Forms (Walls, Columns, Beam Sides): 7 days.
2. Side Forms (Footings, Slabs on Grade): 4 days.

D. Remove bolts, wires, clamps, rods, spreader ties, and other embedded items not necessary to the work to a minimum of 1 inch from the surface. Take precautions to eliminate danger of rust stains from form tie materials or other unprotected ferrous materials embedded in and adjacent to exposed concrete surfaces.

**END OF SECTION**

SECTION 03 20 00

# CONCRETE REINFORCEMENT

## PART 1 − GENERAL

### 1.1 SUMMARY

A. This Section includes all labor, materials, equipment, operations, or methods listed, mentioned or scheduled on the plans and/or herein specified, including all incidentals necessary and required for completion of work under this Section.

B. Provide and install Reinforcing steel bars, welded steel wire fabric fabricated steel bar or rod mats for cast-in-place and precast/tilt-up concrete.

C. Support chairs, bolsters, bar supports, spacers, for supporting reinforcement.

### 1.2 RELATED SECTIONS

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Special Conditions and Division 1 of these Contract Documents.

B. Section 03 30 00 - Cast in Place Concrete

### 1.3 SUBMITTALS

A. Submit under provisions of Document 01 30 00. B. Shop Drawings:

1. Submit fully detailed shop drawings, including bending schedules and bending diagrams. Indicate placing details and size location of reinforcing steel. Shop drawings shall be of such detail and completeness that fabrication and placement at the site can be accomplished without the use of contract drawings for reference.
2. Do not fabricate and place reinforcing steel before the shop drawings review has been completed by the Architect and Structural Engineer and returned to the Contractor. Review of shop drawings by the Architect and Structural Engineer will not relieve the Contractor of responsibility for errors or for failure in accuracy and complete placing of the work.

### 1.4 QUALITY ASSURANCE

A. Perform concrete reinforcement work in accordance with CRSI, Manual of Standard Practice.

B. Conform to ACI, and 2019 CBC.

C. Submit certified mill test reports (tensile and bending) for each heat or melt of steel prior to delivery of material to the job site. Where reinforcing is required to be welded, mill test reports shall verify the weld ability of the steel.

## 1.5 COORDINATION

A. Check architectural, structural, mechanical and electrical drawings for anchor bolt schedules and locations, anchors, inserts, conduits, sleeves, and any other items which are required to be cast in concrete. Make necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.

## 1.6 PRODUCT HANDLING

A. Bundle reinforcement and tag with suitable identification to facilitate shoring, placing and transport.

B. Keep a sufficient supply of tested and approved reinforcement on the site to avoid delaying the work.

C. Take means necessary to protect reinforcing steel before, during, and after installation and to protect the work and materials of other trades.

D. Store reinforcing steel in a manner to prevent damage, excessive rusting, and fouling with dirt, grease and other bond-breaking coatings.

E. Take necessary precautions to maintain identification after the bundles of reinforcing steel have been broken.

F. In the event of damage, immediately make repairs and replacements necessary to the acceptance of the Architect and at no additional cost to the owner.

# PART 2 − PRODUCTS

## 2.1 REINFORCING STEEL

A. Reinforcing Bars: New, free of loose rust. 1. Billet-Steel Bars: ASTM A615, Grade 60. Welded reinforcing bars shall be grade 60 conforming to ASTM A706.

B. Welded Wire Fabric: ASTM A185; flat sheets.

C. Tie Wire: 16 gauge minimum, black and annealed.

D. Accessories: Metal or plastic spacers, supports, ties, as required for spacing assembling and supporting reinforcing in place. Supports shall comply with CRSI, Manual of Standard Practice.

## 2.2 FABRICATION

A. Shop fabricate reinforcement in accordance with details on Drawings and 2019 CBC. Where specific details are not shown or noted, fabricate in conformance with ACI and CRSI.

B. Clean bars of loose rust, loose mill scale and substances which may decrease bond.

C. Bend bars cold and accurately to details on final reviewed shop drawings.

## 2.3 SOURCE QUALITY CONTROL

A. Tests shall be made in accordance with the 2019 CBC. The testing laboratory will select samples for physical tests of reinforcing steel from material at the place of distribution, test the reinforcing steel and submit results of tests to the Architect for review prior to fabrication.

1. Identified Reinforcing Steel: One tensile test and one bend test shall be made from a specimen from each 10 tons or fraction thereof of each size of reinforcing steel, if reinforcing is taken from bundles identified with heat number, is accompanied by mill analysis and mill test reports, and is properly tagged with an identification certificate.
2. Unidentified Reinforcing Steel: One tensile and one bend test will be made for each 2-1/2 tons of fractions thereof of each size of reinforcing steel.

B. Costs of tests to determine if unidentified steel complies with specified standards will be deducted by the District from the Contract Sum by Change Order.

# PART 3 − EXECUTION

## 3.1 EXAMINATION

A. Carefully examine the installed work of other trades prior to installing reinforcing steel and verify that such work is complete to the point where work of this section may commence.

B. Ensure that reinforcing steel is installed in strict accordance with pertinent codes and regulations, the final reviewed shop drawings and original design.

C. In the event of discrepancy, immediately notify the Architect and Structural Engineer. Do not proceed with installation in areas of discrepancy until discrepancies have been fully resolved.

## 3.2 PLACING REINFORCING STEEL

A. Place reinforcing steel in accordance with the Drawings, final reviewed shop drawings and the CRSI Manual of Standard Practice. Install reinforcement accurately and secure against movement, particularly under the weight of workers and the placement of concrete.

B. Locate reinforcement accurately in the forms and hold in place by means of supports adequate to prevent displacement and to maintain reinforcement at proper distances from form face. Place supports in accordance with CRSI Manual of Standard Practice. Use of wood supports and spacers inside the forms is not permitted.

C. Support reinforcement for slabs in precast concrete blocks or chairs spaced 4'-0" on center (maximum) both ways, staggered. Size blocks or chairs so the

reinforcing is maintained at the proper elevation in the slab.

D. Wherever conduits, piping, inserts, sleeves, and other embedded items interfere with placing of reinforcing steel, obtain Architect's approval of methods of procedure before concrete is placed. Bending of bars around openings and sleeves is not permitted.

E. Tie reinforcing rigidly and securely with steel tie wire at splices, at crossing points and at intersections in the position shown on Drawings. After cutting, bed tie wire in such a manner that concrete placement will not force the wire ends to surface of concrete.

F. Make splices only at those locations shown on the Drawings or as authorized by the Architect and Structural Engineer. Stagger splices in adjacent bars per Class "B" (50 percent within required lap length).

G. Place welded wire fabric in as long lengths as practicable. Wire laps. Lap edges a minimum of 2 inches center to center of selvage wires with laps a minimum of 2 inches greater than transverse wire spacing; offset end laps in adjacent widths.

H. Tie dowels securely in place before concrete is deposited. In the event there are no bars in position to which dowels may be tied, add #3 bars (minimum) to provide proper support and anchorage. Do not bend dowels after placement of concrete.

## 3.3 FIELD QUALITY CONTROL

A. Installation and placement of reinforcing steel will be inspected by an authorized inspector prior to concrete pour.

**END OF SECTION**

SECTION 03 30 00

# CAST-IN-PLACE CONCRETE

## 1.1 PART 1 − GENERAL

## 1.2 SUMMARY

A. This Section includes all labor, materials, equipment, operations, or methods listed, mentioned or scheduled on the plans and/or herein specified, including all incidentals necessary and required for completion of work under this Section.

B. Provide and install Portland cement concrete site work complete, including the following principal items:

1. Concrete foundation
2. Concrete curbs
3. Concrete slab

## 1.2 RELATED SECTIONS

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Special Conditions and Division 1 of these Contract Documents.

B. Division 31 – Earthwork.

C. Document 03 10 00 - Concrete Formwork

D. Document 03 20 00 – Reinforcing Steel

## 1.3 SUBMITTALS FOR REVIEW

A. The Contractor's Testing Laboratory's certificate of compliance.

B. The Contractor shall submit:

1. Certified copies of mix designs for each concrete class specified including compressive strength test reports. Mix design shall be signed by California Registered Civil Engineering to verify compliance with CBC Chapter 19A.
2. Certification that materials meet requirements specified.
3. Certification from vendor that samples originate from and are representative of each lot proposed for use.
4. Submit location of construction joints and cold joints when different from that shown on the drawings.

C. The Districts Testing Agency will submit reports on tests and inspections performed to the SCCOE, the Architect, Structural Engineer, and the Contractor.

D. Schedule of placing for the Construction Manager’s review before starting Work.

E. Keep record at the job site showing time and place of each pour of concrete together with transit mix delivery slip certifying contents of the pour per CBC 1705A.3. Make records available to architect and SCCOE upon request.

## 1.4 QUALITY ASSURANCE

A. Reference and Standards:

1. Perform work in accordance with all applicable laws, codes and regulations required by the State of California.
2. Reference to "Standard Specifications" shall mean the current Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, CALTRANS.
3. The American Concrete Institute (ACI): "Manual of Concrete Practice," Parts 1, 2 and 3.
4. California Code of Regulations. Title 24, 2019 edition, provisions also known as California Building Code (CBC).
5. American Society for Testing and Materials (ASTM).

B. Stipulations:

1. The Contractor shall be responsible for quality of concrete in place and shall bear burden of proof that concrete meets minimum requirements. Use the same mix design for all exposed concrete.

2. Placing of concrete by means of pumping will be an acceptable method of placement providing that the Contractor can demonstrate that, with the proposed additives, the specified concrete strengths and slump will be met.

## 1.5 FIELD SAMPLES AND TESTS

A. SCCOE or the SCCOE’s representative will select a qualified testing laboratory to take samples for testing during the course of the work as considered necessary. SCCOE will pay costs for such tests. Contractor shall cooperate in making tests and shall be responsible for notifying the designated laboratory in sufficient time to allow taking of samples at time of pour.

B. Should tests show that concrete is below specified strength, Contractor shall remove all such concrete, as directed by the Project Inspector. Full cost of removal of low strength concrete, its replacement with concrete of proper specified strength and testing, shall be borne by Contractor.

C. The Testing Laboratory Qualifications: The Testing Laboratory shall be acceptable to authorities having jurisdiction and under direction of a Civil Engineer registered in the State of California, shall have operated successfully for four years prior to this work, and shall conform to requirements of ASTM E329.

D. All samples and testing shall conform with CBC Sections- 1903, 1905 and 1916.

## 1.6 COORDINATION

A. Coordinate items of other trades. Contractor shall be responsible for the proper installation of all accessories embedded in the concrete and for the provision of holes, openings, etc., necessary to the execution of the work of the trades.

## 1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Supply ready mixed concrete throughout. Batch, mix and transport in accordance with ASTM C-94, "Specifications for Ready Mixed Concrete."

B. Mix and deliver concrete in quantities that will permit immediate use only.

C. Indiscriminate addition of water for any reason will be cause for rejection of the load.

D. Ensure storage facilities are weather tight and dry.

E. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.

F. Store bulk cement in bins capable of preventing exposure to moisture.

G. Use sacked cement in chronological order of delivery. Store each shipment so that it may be readily distinguishable from other shipments.

## PART 2 − PRODUCTS

## 2.1 CONCRETE CLASSES

| USES | STRENGTH | AGGREGATE | WEIGHT | SLUMP |
|---|---|---|---|---|
| Footings | 3000 psi | ¾Maximum | 145 pcf | 4” +/- 1” |
| Slab on Grade/Curbs | 3,000 psi | ¾ Maximum | 145 pcf | 4” +/- 1” |
| Non Structural and miscellaneous concrete | 2,500 psi | ¾ Maximum | 145 pcf | 4” +/- 1” |
| | | | | |

A. Class: Identifies all concrete as specified.

B. Strength: Compressive strength in psi after 28-days when tested in accordance with ASTM C39. All concrete shall develop compression strength specified in 28-days. To meet above requirements, mix shall be designed such that average compressive strength will exceed specified 28-day strength by an amount as specified by ACI 318.

C. Aggregate: Maximum size in inches.

D. Weight: Pounds per cubic foot, air dry.

E. Slump: In inches when tested in accordance with ASTM C143.

F. Concrete mixes shall be in accordance with CalTrans Standard Specifications Section 90.

## 2.2 CONCRETE MATERIALS

A. General Requirements:
1. All materials shall be Local/Regional Materials.
2. Cement and aggregates shall have proven history of successful use with one another. Sources of cement and aggregate shall remain unchanged throughout work unless the Architect and Structural Engineer approves request for change made at least 10-days prior to anticipated date of casting.
3. Ready-mixed concrete shall meet requirements of ASTM C94.
4. Deviations in properties of materials tested by the Testing Agency shall be cause for their rejection pending additional test results and redesign of mix.
5. No frozen aggregates will be permitted.

B. Cements:

1. ASTM C150, Type II. Use one brand of cement throughout project unless otherwise acceptable to Architect and Structural Engineer.
2. Maximum water/cement ratio of 0.5 for all cast-in-place concrete.

C. Fly Ash: ASTM C618, Type F; 15% (as percentage replacement of cement) and per CBC 1903A.6

D. Aggregates:

1. Coarse: ASTM C33. Coarse aggregate shall consist of a clean, hard, fine grained, sound crushed rock, or washed gravel or a combination of both. It shall be free from oil, organic matter or other deleterious substances and shall not contain more than two percent by weight of shale or cherty material. "Cleanness value shall not be less than 75 when tested per MM Test Method, 227 and conforming to CBC Section 1903A.6.
2. Fines: ASTM C33. Sand equivalent shall be not less than 75 when tested as per ASTM D2419.
3. Provide aggregates from a single source for exposed concrete.

E. Water: Clean and potable, free from impurities detrimental to concrete and free from deleterious amounts of acids, alkalis, scale, or organic materials per ACI 318 and ASTM C1602.

F. Water-Reducing Admixture: Must be compatible with color pigments where required. ASTM C494, Type A, that does not contain non-lignini sulfonate. Same as Grace Construction Materials' "WRDA" with hycol or Master Builders "Pozzolith" 322N.

G. High-Range Water-Reducing Admixture: Must be compatible with color pigments where required. ASTM C 494, Type F, BASF Corporation “MasterRheobuild 1000” (formerly"RHEOBUILD 1000") or W. R. Grace’s “Daracem” or “ADVA” Series.

H. Other Admixtures: Only as accepted by the Architect and Structural Engineer.

I. Non-Shrink Grout: 5000 PSI compressive strength non-shrink grout as manufactured by Sakrete.

J. Curing Materials: Curing Compound: ASTM C309. Water loss – not more than 0.55 kg/m2 in 72 hours; Light Reflectance – not less than 60%. Same as Grace Construction Materials' "Horn Clear Seal"; Grimes Co.'s "Sealcrete"; Master Builders' "Masterseal W", or approved equal product.

K. Concrete Slab Vapor Barrier: ASTM E1745 Class A, B & C– Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs. 15 mil. Stego Wrap by Stego Industries LLC or approved equal product.

L. Capillary Break: The gravel layer below concrete slabs shall be 6" of class 2 aggregate base rock

## 2.3 ANCILLARY MATERIALS

A. Concrete Sealer: BASF "Kure 1315", NoxCrete "Cure and Seal 100-300E" or approve equal.

## 2.4 MIXES

A. General Requirements:

1. Certified copies of mix designs for each concrete class specified including compressive strength test reports. Mix design shall be signed by California Registered Civil Engineering to verify compliance with CBC Chapter 19 and the project specifications for each concrete class.
2. Mix design shall include compression strength test reports per ACI 318, section 5.3 indicating conformance with specifications.
3. Mix shall be designed, tested, and adjusted, if necessary, in ample time before first concrete is scheduled to be placed. Laboratory data and strength test results for revised mix design shall be submitted to Architect and Structural Engineer prior to using in project.
4. The Contractor's mix designs shall be subject to review by the Architect, Structural Engineer and by SCCOE's Testing Agency.
5. The Contractor shall instruct Laboratory to base mix design on use of materials tested and approved by SCCOE's Testing Agency.
6. Introduction of calcium chloride will not be permitted
7. Unspecified admixtures will not be permitted, unless signed by California Registered Civil Engineering to verify compliance with CBC Chapter 19, reviewed and approved by the Architect, Structural Engineer and by SCCOE's Testing Agency.
8.

B. Slab-on-Grade and Curb Mix requirements:

1. Maximum water/cement ratio: 0.5.
2. Slump: 4" +/- 1" Maximum
3. Fly ash content: 15 percent (as percentage replacement of cement).
4. Do not use air entrainment additives.

5. Use of Water-Reducing admixture is required. Use High Range Water-Reducing admixture (super plasticizer) when required to maintain workability and pumpability.

C. Patching Mortar: Mix in proportions by volume of one part cement to two parts fine sand.

D. Non-Shrink Grout: Follow approved manufacturer's printed instructions and recommendations.

## 2.5 MIXING

A. Batching Plant Conditions:

1. Ensure equipment and plant will afford accurate weighing, minimize segregation and will efficiently handle all materials to satisfaction of the Architect, Structural Engineer and SCCOE's Testing Agency.
2. Replace at no additional expense equipment the Architect, Structural Engineer and SCCOE's Testing Agency deem inadequate or unsuitable.
3. Use approved moisture meter capable of determining moisture content of sand.

B. General Requirements:

1. Thoroughly clean concrete equipment before use for Architectural concrete mixes to avoid contamination.
2. Mix cement, fine and coarse aggregates, admixtures and water to exact proportions of mix designs. Method of mixing shall comply with ACI 318 Section 5.3.
3. Measure fine and coarse aggregates separately according to approved method which provides accurate control and easy checking.
4. Adjust grading to improve workability; do not add water unless otherwise directed.
5. Maintain proportions, values, or factors of approved mixes throughout work.
6. Mix concrete in transit mixers five minutes immediately prior to discharge in addition to mixing as called for by ACI 304 and ASTM C94.

C. Admixtures: Use automatic metering dispenser to introduce admixture into mix. Dispenser shall be recommended and calibrated by admixture manufacturer.

## 2.6 SOURCE QUALITY CONTROL

A. The District's Testing Agency will:

1. Review mix designs, certificates of compliance, and samples of materials the Contractor proposes to use.
2. Test and inspect materials, as necessary, in accordance with ACI 318, section 5.6-5.11 and CBC Sections 1903 and 1913 for compliance with requirements.
3. Take samples as required from the Contractor's designated sources.

1. Take one grab sample for each 100 tons of Portland cement except that, when used in bulk loading ready-mix plants where separate bins for pre-tested

cement are not available, take grab samples for each shipment of cement placed in bin with not less than one sample being taken for each day's pour and subsequently test such samples if required by the Architect and Structural Engineer.

2. Test both coarse and fine aggregate by use of solution of sodium or magnesium sulfate, or both whenever in the judgment of the Architect and Structural Engineer such tests are necessary to determine quality of material. Perform such tests in accordance with ASTM C88. Loss shall not exceed 6-percent of either fine or coarse aggregate. Aggregate failing to comply with this requirement may be used in the Work provided it contains less than 2-percent of shale and other deleterious particles and shows a loss in soundness test of not more than 10-percent when tested in the sodium sulphate solution. Test aggregates as required by CBC Section 1903.6.

3. Test for sand equivalent of fine aggregate in accordance with California Test 217.

4. Test for cleanness value of coarse aggregate in accordance with California Test 227.

8. Inspect plant prior to any work to verify following:
   a. Plant is equipped with approved metering devices for determining moisture content of fine aggregate.
   b. Other plant quality controls are adequate.
9. Continuously inspect quality and quantity of materials used in transit mixed concrete, in batched aggregates and ready-mixed concrete at mixing plant or other location per CBC Section 1913 where other materials are measured.

B. Waiver of Batch Plant Inspection:

1. The concrete supplier shall furnish to the Architect, Structural Engineer and SCCOE's Testing Agency certification that the cement proposed conforms to the requirements of CBC section 1913.1:
   a. Waiver to be only applied when approved by the Architect, Structural Engineer and SCCOE's Testing Agency
   b. Testing Agency shall check the first batching at the start of work and furnish mix proportions to the licensed Weighmaster.
   c. Licensed Weighmaster shall identify material quantities and certify each load by a ticket.
   d. Project Inspector shall collect truck mix tickets with load identification and maintain a daily record of placement. Trucks without a load ticket identifying the mix shall be rejected. Copies of daily placement record shall be submitted to the Architect, Structural Engineer and SCCOE's Testing Agency.
   e. At the end of the project, the Weighmaster shall submit an affidavit to the Architect, Structural Engineer and SCCOE's Testing Agency certifying that all concrete supplied conforms to proportions established by mix designs.

## PART 3 − EXECUTION

### 3.1 GENERAL REQUIREMENTS

A. Install all concrete work true to line and grade as indicated on the drawings. Installation shall conform with the standards and requirements of ACI 117-06-Specifications for Tolerance for concrete construction and materials.

B. Correct irregularities to the satisfaction of the Architect and Structural Engineer.

## 3.2 PREPARATION

A. Take every precaution to obtain a subgrade of uniform bearing power by compaction to provide a firm base.

B. Subgrade shall be kept moist and shall not be allowed to dry out before placement of concrete. Place no material on muddy subgrade.

C. Obtain acceptance of the subgrade from the Project Soils Engineer prior to placement of capillary break, moisture barrier and sand.

D. Obtain acceptance of subgrade from Project Inspector prior to placing steel and concrete.

## 3.3 PLACING CONCRETE

A. The Architect, Structural Engineer, and SCCOE's Testing Laboratory shall be notified at least 48 hours before placing concrete.

B. Place concrete in accordance with ACI 318, section 5.10.

C. Place concrete in cycles as a continuous operation to permit proper and thorough integration and to complete scheduled placement. Place no concrete where sun, wind, heat, or facilities prevent proper finishing and curing.

D. Convey concrete as rapidly and directly as practicable to preserve quality and to prevent separation from rehandling and flowing; do not deposit concrete initially set. Cast concrete within ninety (90) minutes after adding water unless otherwise noted. Retempering of concrete which has partially set will not be permitted.

E. Take precautions to avoid damage to under-slab moisture barrier and displacement of reinforcement and formwork.

F. Deposit concrete vertically in its final position. Avoid free falls in excess of four feet where reinforcement will cause segregation and in typical conditions unless the Architect and the Structural Engineer approves otherwise.

G. Keep forms and reinforcement clean above pour line by removing clinging concrete with wire brush before casting next lift. Also remove leakage through forms.

H. Interruption in casting longer than 60-minutes shall be cause for discontinuing casting for remainder of day. In this event, cut back concrete and provide construction joints as directed by the Structural Engineer; clean forms and reinforcement as necessary to receive concrete at a later time.

I. Hot Weather Concreting: Conform to ACI 305R and following requirements when mean daily temperature rises above 75 degrees Fahrenheit.

1. An upper temperature limit of concrete mixes shall be established by the Contractor for each class of concrete. Concrete temperature during placing shall not be so high as to cause difficulty from loss of slump, flash set, or cold joints, and shall not exceed 90°F. Other project climatic conditions detrimental to concrete quality such as relative humidity, wind velocity, and solar radiation shall also be considered.
2. Trial batches of concrete for each mix design shall be made at the limiting mix temperature selected. In lieu of trial batches, compression strength test reports (20 minimum) at the limiting temperature for each proposed mix shall be submitted to SCCOE's testing laboratory for review.
3. Practices to maintain concrete below maximum limiting temperature shall be in accordance with ACI 305. Concrete ingredients may be cooled before mixing, or flake ice or well-crushed ice of a size that will melt completely during mixing may be substituted for part of the mixing water.
4. Practices to avoid the potential problems of hot weather concreting shall be employed by the Contractor in accordance with ACI 305.
5. When the temperature of the reinforcing steel or steel deck forms is greater than 120°F, reinforcing and forms shall be sprayed with water just prior to placing the concrete.

J. Cold Weather Concreting:

1. No placement of concrete will be allowed at temperatures below 20 degrees Fahrenheit or if mean daily temperature for curing period is anticipated to be below 20 degrees Fahrenheit.
2. No concrete placement will be allowed on frozen subgrade.
3. Conform to ACI 306 and following requirements when mean daily temperature falls below 40 degrees Fahrenheit.
   a. Reinforcement, forms or ground to receive concrete shall be completely free from frost.
   b. Concrete at time of placement for footings shall have temperature no lower than 50 degrees Fahrenheit, for all other concrete this minimum temperature at time of placement shall be 60 degrees Fahrenheit. Maximum temperature shall be 90 degrees Fahrenheit.
   c. Concrete shall be maintained at temperature no lower than 50 degrees Fahrenheit for minimum 7-day period after placement by means of blanket insulation, heaters, or other methods as approved by the Architect and Structural Engineer.
   d. Use of calcium chloride or admixtures containing calcium chloride as accelerators will not be permitted.
   e. The Contractor shall keep a record of concrete surface temperature for first 7-days after each pour. This record shall be open to inspection by the Inspector.

K. Consolidating:

1. Use vibrators for thorough consolidation of concrete.
2. Provide vibrators for each location during simultaneous placing to ensure timely consolidation around reinforcement, embedded items and into corners of forms; ensure availability of spare vibrators in case of failures. Vibrate through full depth of freshly placed concrete.
3. Do not place vibrators against reinforcement, attach to forms, or use to spread concrete.
4. Exposed Concrete: Vibrate with rubber type heads and, in addition, spade

along forms with flat strap or plate.

L. Construction Joints:

1. Verify location and conformance with typical details; provide only where designated or approved by the Architect and Structural Engineer. Comply with ACI 318, section 6.4.
2. All horizontal and vertical construction joints to be thoroughly sandblasted to clean and roughen entire surface to minimum 1/4-inch relief exposing clean coarse aggregate solidly embedded in mortar matrix.
3. Just prior to depositing concrete, the surface of the construction joint shall be thoroughly wetted.

M. Walls and Other Formed Elements:

1. Space points of deposit to eliminate need for lateral flow. Placing procedures of concrete in forms permitting escape of mortar, or flow of concrete itself, will not be permitted.
2. Level top surface upon stopping work.
3. Take special care to fill each part of the forms by depositing concrete directly as near final position as possible, and to force concrete under and around reinforcement, embedded items, without displacement.
4. After concrete has taken its initial set, care shall be exercised to avoid jarring forms or placing any strain on ends of projecting reinforcement.
5. Where backfill is placed against a wall, it shall be adequately shored until it has attained design strength. All shoring shall be designed by a structural engineer licensed in the State of California. Signed calculations and shoring drawings shall be submitted to the EOR for review.

## 3.3 CURING

A. General Requirements:

1. Take curing measures immediately after casting and for measures other than application of curing compound, extend for seven days. The Architect and Structural Engineer may recommend longer periods based upon prevailing temperature, wind and relative humidity. Comply with ACI 318, section 5.11.
2. Avoid alternate wetting and drying and fluctuations of concrete temperature.
3. Protect fresh concrete from direct rays of sun, rain, freezing, drying winds, soiling, and damage.
4. Do not permit curing method to affect adversely finishes or treatments applied to finish concrete.

B. Curing Method, Typical: Obtain the Architect’s and Structural Engineer's approval of alternate measures.

1. Keep forms and concrete surfaces moist during period forms are required to remain in place.

C. Cure exposed concrete in accordance with CalTrans Standard Specifications Section 90.

D. Only water shall be used for curing concrete.

## 3.5 FIELD QUALITY CONTROL

A. The Testing Laboratory will sample and test cast-in-place concrete as required by the authorities having jurisdiction. Tests, if required, will be made in accordance with ACI 318, section 5.4-5.11, and CBC Section 1903.

1. Review concrete mix designs.
2. Inspect concrete and grout placement continuously.
3. Test concrete to control slumps according to ASTM C143.
4. Continuously monitor concrete temperature as it arrives on the site.
5. Test concrete for required compressive strength in accordance with ACI 318, section 5.6.2 through 5.6.5:
    a. Make and cure three specimen cylinders according to ASTM C31 for each 50 cubic yards, or fraction thereof, of each class poured at site each day.
    b. Retain one cylinder for 7-day test and two for the 28-day test.
    c. Number each cylinder 1A, 1B, 1C, 2A, 2B, 2C, etc; date each set; and keep accurate record of pour each set represents.
    d. Transport specimen cylinders from job to laboratory after cylinders have cured for 24-hours on site. Cylinders shall be covered and kept at air temperatures between 60 and 80 degrees Fahrenheit.
    e. Test specimen cylinders at age 7-days and age 28-days for specified strength according to ASTM C39.
    f. Base strength value on average of two cylinders taken for 28-day test.
6. Test and inspect materials, as necessary, in accordance with ACI 318, MM Test Method 227 (Coarse Aggregates) and MM Test Method 217 (Fine Aggregates), for compliance with requirements specified in this Section.

B. The Contractor shall:

1. Submit ticket for each batch of concrete delivered to job site. Ticket shall bear the following information:
    a. Design mix number.
    b. Signature or initials of ready mix representative.
    c. Time of batching.
    d. Weight of cement, aggregates, water and admixtures in each batch with maximum aggregate size.
    e. Total volume of concrete in each batch.
    f. Notation to indicate equipment was checked for contaminants prior to batching.
2. Pay the SCCOE’s Testing Agency for taking core specimens of hardened structure and testing specimen according to ASTM C88 and C42 when laboratory tests of specimen cylinders show compressive strengths below specified minimum.

## 3.6 CLEANING, PATCHING AND DEFECTIVE WORK

A. Where concrete is under strength, out of line, level or plumb, or shows objectionable cracks, honeycombing, rock pockets, voids, spalling, exposed reinforcement, signs of freezing or is otherwise defective, and, in the Architect's and Structural Engineer’s judgment, these defects impair proper strength or appearance of the work, the Architect and Structural Engineer will require its removal and replacement at the Contractor's expense.

B. Immediately after stripping and before concrete is thoroughly dry, patch minor defects, form-tie holes, honeycombed areas, etc., with patching mortar. Patch shall match finish of adjacent surface unless otherwise noted. Remove ledges and bulges.

C. Compact mortar into place and neatly file defective surfaces to produce level, true planes. After initial set, dress surfaces of patches mechanically or manually to obtain same texture as surrounding surfaces.

D. Rock Pockets:
1. Cut out to full solid surface and form key.
2. Thoroughly wet before casting mortar.
3. Where the Architect and Structural Engineer deems rock pocket too large for satisfactory mortar patching as described, cut out defective section to solid surface, key and pack solid with concrete to produce firm bond and match adjacent surface.

E. Cleaning

1. Insure removal of bituminous materials, form release agents, bond breakers, curing compounds if permitted and other materials employed in work of concreting which would otherwise prevent proper application of sealants, liquid waterproofing, and other delayed finishes and treatments.

2. Where cleaning is required, take care not to damage surrounding surfaces or leave residue from cleaning agents.

## 3.7 PROTECTION

A. Protect concrete from injurious action of the elements and defacement of any nature during construction operations.

B. Protect exposed corners of concrete from traffic or use which will damage them in any way.

C. Make provisions to keep all exposed concrete free from laitance caused by spillage or leaking forms or other contaminants. Do not allow laitance to penetrate, stain, or harden on surfaces which have been textured.

D. Remove and replace pavement that does not comply with requirements in this Section.

E. Protect pavement from damage. Do not permit construction traffic on concrete pavement. Exclude other traffic from pavement for at least 28 days after placement.

F. Maintain pavement free of stains, discoloration, dirt, and other foreign material. Sweep pavement not more than two days before date scheduled for Substantial Completion inspections.

## 3.8 DEFECTIVE CONCRETE

A. If any concrete work is not formed as indicated, is under strength concrete, is concrete is out of line, level or plumb, or showing objectionable cracks, honeycomb, rock pockets, voids, spalling or exposed reinforcing, it shall be removed, repaired or replaced as directed by the Project Inspector.

## 3.9 CLEANING

A. During construction, wash off work as quickly as possible when stains or splotches are unavoidable.

B. Upon completion, clean exposed surfaces carefully. Brushing and cleaning solution, if used, must be preceded and followed with a through rinsing of clear water. No sandblasting will be allowed to clean surfaces.

C. Remove from premises; equipment, debris and surplus material needed for, or resulting from, this work. Remove all concrete waste from planting areas and legally dispose of it.

D. All work shall be left in a condition satisfactory to the Project Inspector.

E. Perform Work under this Document to keep affected portions of building site neat, clean, and orderly. Remove, immediately upon completion of Work under this Section, surplus materials, rubbish, and equipment associated with or used in performance. Be aware that failure to perform clean-up operations within 24 hours of notice by Architect and Structural Engineer will be considered adequate grounds for having work done by others at no added expense to the SCCOE

**END OF SECTION**

SECTION 05 12 00

# STRUCTURAL STEEL

## PART 1 − GENERAL

### 1.1 SUMMARY

A. This Section includes all labor, materials, equipment, operations, or methods listed, mentioned or scheduled on the plans and/or herein specified, including all incidentals necessary and required for completion of work under this Section.

B. Provide and install structural steel work as indicated on the project Drawings and as specified herein, including, but not limited to:

1. All structural steel beams, columns, plates, fabricated connections and elevator rail, rail supports and hoist beam.
2. Erection of all structural steel and temporary bracing.

C. Testing Laboratory for specified tests and inspections.

D. Retesting or re-inspecting due to defective materials or workmanship will be back charged to the Contractor.

### 1.2 RELATED SECTIONS

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Special Conditions and Division 1 of these Contract Documents.

B. Cast-in-place Concrete: Section 03 30 00, CAST-IN-PLACE CONCRETE

C. Painting: Section 09 91 00, PAINTING.

### 1.3 SUBMITTALS

A. Shop and Erection Drawings:

1. Include complete details, schedules, procedures, and diagrams to allow fabrication, assembly, and erection of structural steel without reference to the contract drawings. Include profiles, sizes, spacing, lengths and locations of structural members, indicating stiffener and continuity plates, bots, fasteners, welds and attachments. The steel detailer shall generate all shop drawing fabrication and installation details from the drawings and specifications. The use of reproductions of photocopies of the contract drawings shall not be permitted.
2. Show shop and erection details, including details of cuts, copes,

connections, holes, threaded fasteners, bolts and welds in accordance with AWS welding symbols (distinguishing between shop and field welds), and in accordance with AISC standards. Include all dimensional and geometric information. Weld access hole dimensions shall be provided along with surface profile and finish requirements.

3. Shop and erection drawings shall include connection material specifications and sizes. Erection drawings shall indicate the locations of all slip-critical bolts.
4. Shop and erection drawings shall identify any non-destructive testing to be performed by the fabricator, if any.
5. Provide setting drawings, templates. and directions for installation of anchor bolts and other anchorage.
6. Erection drawings shall identify those joints, or groups of joints, in which a specific assembly order, welding sequence, or other special precautions are required.

B. Welding:

1. Welding Procedures: Submit written welding procedure specifications (WPS's) conforming with AWS D1.1 (and AISC 341 Appendix W if applicable) for review prior to performing any welding. Include an index of all WPS's and identify in the index whether the procedure will be used in the shop, field, or both. The WPS variables shall be within the parameters established by the filler-metal manufacturer. Filler metal manufacturer and manufacturer's electrode identification shall be considered essential variables and shall be identified on each WPS. Include electrode manufacturer's data sheet with each WPS showing recommended ranges and demonstrating that electrodes and electrode-flux combinations meet the requirements for H16 as tested in accordance with AWS A4.3. Do not include welding procedures that do not apply to welds on the project. Submittals containing welding procedures not intended for use on the project will be rejected.
2. Welding Procedure Qualification Records: Where WPS's are not prequalified by AWS D1.1, submit procedure qualification records with WPS's.

C. Manufacturer's Proofs of Compliance for Materials:

1. Certification that materials meet requirements specified. Steel must be identified by the mill using the appropriate ASTM designation. Certified manufacturer's mill analyses and test reports covering chemical and mechanical properties shall be submitted.
2. Steel not properly identified shall be tested to meet the minimum chemical and mechanical requirements of the ASTM standard appropriate for the steel specified.
3. Provide material test reports for bolts, nuts, washers, and shear connectors.

D. Samples: Provide as requested by SCCOE's Testing Agency.

## 1.4 QUALITY ASSURANCE

A. All work shall conform to the 2019 California Building Code.

B. Fabricator and Erector shall have been regularly engaged at least 3 years in the fabrication and erection of structural steel.

C. A certified copy of the mill test on each heat of steel to be supplied shall be submitted to the Project Inspector and reviewed by the Testing Laboratory prior to fabrication. All steel must be identified and accompanied by a certified mill certificate, or testing will be required. The contractor will be responsible for the testing to determine mechanical properties of all structural steel lacking mill test certificates.

D. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Division 1 General Requirements of these Specifications.

## 1.5 PRODUCT DELIVERY STORAGE AND HANDLING

A. Delivery of materials to be installed under other Sections.

1. Anchor bolts and other anchorage devices which are embedded in cast-in-place, precast/tilt-up concrete, or masonry construction shall be delivered to the project site in time to be installed before the start of cast-in-place concrete or masonry work.
2. Provide setting drawings, templates, and directions for the installation of the anchor bolts and other devices.

B. Storage Materials:

1. Structural steel members which are stored at the project site shall be above ground on platforms, skids or other supports.
2. Steel shall be protected from corrosion.
3. Other materials shall be stored in a weather tight and dry place, until ready for use in the work.
4. Packaged materials shall be stored in their original unbroken package or container.

# PART 2 − PRODUCTS

## 2.1 MATERIALS

A. Steel plates and miscellaneous metals shall conform to ASTM A36, Fy=36 ksi typical except where noted as ASTM A572, Fy=50 ksi.

B. Steel Angles shall conform to ASTM A36, Fy=36 ksi typical except where noted as ASTM A572, Fy=50 ksi.

C. Steel Channels shall conform to ASTM A36, Fy=36 ksi typical except where noted as ASTM A572, Fy=50 ksi.

D. Steel Pipe shall conform to ASTM A53, Type E or S, Grade B, With Sulfur not Exceeding .05%, Fy-35 ksi.

E. Hollow Structural Steel and Tube Steel shall conform to ASTM A500, Grade B, Fy=46ksi.

F. Steel Wide Flange shall conform to ASTM A992, Fy=50 ksi

G. Machine Bolts shall conform to ASTM A307 typical except where noted as ASTM A325-N, ASTM A325-X, ASTM A325-SC, or ASTM A490-X.

H. Threaded Rods shall conform to ASTM F1554, Grade A36 typical except where noted as ASTM A193, Grade B7 or ASTM A449.

I. Nuts and Washers

1. A307 Bolts and ASTM F1554 Threaded Rods – Nuts shall conform to ASTM A563, Grade A and Washers shall conform to ASTM F844.
2. A325 Bolts and ASTM A193 or ASTM A449 Threaded Rods – Nuts shall conform to ASTM A563 Grade DH and Washers shall conform to ASTM F436.
3. A490 Bolts – Nuts shall conform to ASTM A563 Grade DH and Washers shall conform to ASTM F436.

J. Welded Studs shall Nelson H4L welded studs conforming to ASTM A108 or approved equal.

K. Welding Electrodes shall be E70 series.

L. Primer conforming with Federal Specification TT-P-645A.

M. Hot dip and cold process galvanizing ASTM A123 and ASTM A780.

## 2.2 SOURCE QUALITY CONTROL

A. Testing Agency shall perform the following:

1. Review mill test certificates and verify that material to be supplied matches the mill certificates and complies with the requirements of CBC Section 2203.1.
2. All steel must be identified and accompanied by a manufacturer’s certified

mill certificate, or testing will be required. The contractor will be responsible for the testing to determine mechanical properties of all structural steel lacking mill test certificates.

3. All bolts, nuts, washers, and treaded rods and other fasteners must be identified and accompanied by a manufacturer's certified mill certificate, or testing will be required. The contractor will be responsible for the testing to determine mechanical properties of all fasteners lacking mill test certificates.

## PART 3 − EXECUTION

### 3.1 INSPECTION

A. Survey the base structure before proceeding with erection foundations to support construction and verify the following:

1. Correct location and elevation of bearings and anchor bolts.
2. Absence of other conditions to adversely affect erection of steel.

B. Do not begin erection before corrective measures for unsatisfactory conditions have been agreed upon with the Architect, the corrective measures have been implemented, and the Erector is fully satisfied for correctness.

C. Survey the final erected structural steel frame prior to the application of any other work, reporting any discrepancies from the Contract Documents to the Architect.

### 3.2 PREPARATION

A. Provide column anchor rods, plate washers, and setting templates for setting anchor bolts as required. Provide 1/8 inch minimum steel plate setting templates for anchor bolts.

B. Supervise setting of anchor bolts and other embedded items required for erection of structural steel. Be responsible for correct bearing of steel and correct location of anchor bolts. Provide necessary shim plates, etc, for levelness.

### 3.3 ERECTION

A. General Requirements:

1. Erect structural steel in accordance with the CBC and the AISC Specifications for Structural Steel Buildings, and the AISC Code of Standard Practice for Steel Buildings and Bridges.
2. Protect all materials from corrosion and keep free of dirt, grease, and other foreign matter.
3. Ensure steel is plumb, level and in accurate alignment before making final connections.

4. Field corrections of major members will not be permitted without the Engineer's prior approval
5. Provide temporary shoring and bracing members with connections of sufficient strength and stiffness to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds. Structural frame is not considered self-supporting until completion of structural work, including casting of concrete floor slabs.

B. Column Bases and Bearing Plates:

1. Attached Column Bases and Bearing Plates: Align with wedges or shims.
2. Loose Column Bases and Bearing Plates: Where too heavy to be placed without derrick or crane, set, wedge and shim.
3. Grouting: Grout in accordance with requirements of Concrete, Cast-In-Place Section.

C. Field Assembly:

1. Control all erection procedures and sequences including but not limited to temperature differentials and weld shrinkage.
2. Clean bearing surfaces and surface to be in permanent contact before assembling members.
3. Accurately assemble frames to lines and elevations indicated, within erection tolerances noted. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
4. Ensure assembly is plumb, level and aligned before final connecting.
5. Install all beams and girders with cambers up (except cantilevers).
6. Do not fasten splices of compression members before abutting surfaces comply with AISC bearing requirements.
7. Establish leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
8. Promptly grout beneath column base plates after the structural steel frame or portion has been plumbed and before casting of any slab concrete on metal decks.

D. Bolting:

1. As erection progresses, bolt up work to take care of all dead loads, construction live loads, lateral and wind forces and erection stresses.
2. Unless otherwise noted, erection bolts used in welded construction may be either tightened securely and left in place or removed and the holes filled with plug welds.
3. High Strength Bolting:

a. Shall be performed in accordance with AISC 360.
b. Contact surfaces shall be free of oil, paint, lacquer or other coatings.
c. Install hardened washers per AISC 360 and referenced standards.
d. Tighten all nuts of slip critical connections using (1) properly calibrated wrenches, (2) by the "Turn-of-Nut" method, or (3) by the use of a Direct Tension Indicator. Minimum bolt tension as per AISC 360 for each bolt size used. Check wrenches for accuracy of calibration at least once each day.
e. When slip critical bolts have been completely tightened, mark with identifying symbol.
f. Tighten nuts of bolts not designated as slip critical to snug tight condition and ensure all plys of connection are brought into snug contact.

D. Welding

1. Conform to AISC and AWS D1.1 for the details of joints, the technique of welding employed, the appearance and quality of welds made, and the methods used in correcting defective work.
2. Perform welding in accordance with a written WPS which has been reviewed. Provide welders and inspectors with reviewed WPS for the joint being welded.

a. Use equipment that supplies proper current, voltage, etc. and provide suitable meters and means of adjustment for current and voltage.
b. Clean surfaces for rust, paint, and foreign matter of any kind. Remove scale by wire brush, chipping or hammering as required. Before welding thermal cut edges, chip clean and grind to bright metal. Clamp members as required and space and alternate welds to prevent warping or misalignment.
c. For weld joint profiles, meet dimensional requirements and maximum tolerances specified by AWS D1.1 or as specified in approved PQR's. Correct joint fit-up that does not comply using approved procedures and obtain approval by the inspector before welding proceeds.
c. Ensure welds present a uniform surface, free of defects as defined by AWS, and without undercutting or overlapping and free of excessive oxides, gas pockets, and non-metallic inclusions. Make welds with the proper number of beads or passes to secure sound, thoroughly fused joints. Do not exceed maximum layer height and bead width specified in AWS
D1.1. Clean each pass by chipping and wire brushing to remove scale and slag before placing any additional weld material.
e. For highly restrained connections and/or welds, design the welding

sequence to minimize distortion of the members and to minimize the build up of internal stresses.

F. Temporary Bracing: Introduce wherever necessary to provide for all loads to which structure is subjected including erection equipment and its operation. Leave in place until no longer required for safety. Make proper provisions for construction loads, piles of materials, equipment, etc., carried by structural frame during erection. Contractor shall be solely responsible for frame during erection.

G. Touch-Up Painting:

1. Immediately after steel erection, clean filed welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
2. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

## 3.4 CLEANUP

A. After erection thoroughly clean surface of foreign or deleterious matter such as dirt, mud, oil or grease that would impair bonding of fireproofing or concrete.

## 3.5 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A780.

## 3.6 QUALITY CONTROL

A. SCCOE's Testing Agency will test and inspect in accordance with the AISC requirements and as required, and as follows:

1. Bolting: High strength bolted connections shall be inspected and tested. The inspector shall check the materials, equipment, details of construction, and installation procedure. For slip-critical connections, check bolt tightness on not less than ten percent of bolts selected at random in each high strength bolt connection with a minimum of two bolts per connection. Connections that are not designated slip-critical need not be inspected for bolt tension other than to ensure that the plies of the connected elements have been brought into snug contact. Inspection procedure will be as described in AISC 360.
2. Welding Inspection: Visual inspection by a qualified welding inspector is required for all welding performed in the shop and field, including installation of automatic end-welded shear stud connectors. The minimum requirements for a qualified welding inspector are those for an AWS associate welding inspector (AWI) or senior welding inspector (SWI), as defined in the provisions of AWS B5.1 Standard Qualification of Welding

Inspectors, except AWIs may be used under the direct supervision of WIs, on site and available when weld inspection is being conducted. In addition to inspecting the welds, the welding inspector shall check the material (certificates of compliance), welding equipment, details of construction (including fit-up), welder qualifications (Verify welder certifications are valid for process, position, and thickness to be welded), storage of electrodes, and adherence to the WPS. The welding inspector shall maintain a record of welds inspected, name of welder who performed weld, defects found, and disposition of each defect. Defective welds shall be repaired and the cost of restoring defective welds shall be borne by the contractor.

3. Welding Tests: Test complete and partial groove penetration welded connection of column to column, column to girder, or beam to girder by ultrasonic or other approved non-destructive tests. Test fillet welds by magnetic particle testing where indicated on the drawings.

    a. Ultrasonic testing and magnetic particle testing will be performed by a specially trained, qualified technician, who will operate the equipment, examine welds and maintain a record of welds examined, defects found and disposition of each defect. Qualifications on NOT technicians shall be per AISC 341 Appendix W Section W3.3. Defective welds shall be repaired and the cost of retesting of defective welds shall be borne by the Contractor.
    b. Initially, welds requiring ultrasonic testing will be tested at the rate of 100 percent in order to establish qualifications of each individual welder. After 40 welds have been completed by an individual welder, if rejectable defects occur in less than five percent of the welds tested, the frequency of testing may be reduced to 25 percent. If the rate of rejectable defect increases to five percent or more, 100 percent testing will be reestablished until the rate is reduced to less than five percent. Percentage will be calculated for each welder independently.
    c. When ultrasonic indications arising from the weld root can be interpreted as either a weld defect or the backing strip, the backing strip shall be removed at the expense of the Contractor, and if no root defect is visible, weld shall be retested. If no defect is indicated on this retest and no significant amount of the base and weld metal have been removed, the joint need no further repair or welding. If a defect is indicated, it shall be repaired by the Contractor at no expense to the Owner.
    d. Questionable root indications that prove not to be defects will not count against the welder to increase test rate.
    e. Ultrasonic instrumentation will be calibrated by technician to evaluate the quality of the welds in accordance with AWS 01.1, Appendix C.
    f. Other methods of inspection, for example, x-rays, magnetic

particle, or dye penetrant, may be used on welds if deemed necessary by the inspection agency with the cooperation of the Contractor.

g. Welded Studs: End welded studs shall be sampled, and tested per the requirements of AWS D1.1.

4. Inspection and Test Reports: The inspector shall furnish the architect, structural engineer, and building official with a report stating that the work has been completed in compliance with AWS 01.1 and the approved project plans and specifications.

B. The Contractor shall:

1. Make no extra charge for any handling of steel required for complete four-sided inspections of members at Engineer's request. It is not anticipated that complete four-sided inspection of all members will be undertaken. Such inspection will be necessary in case of dispute or uncertainty regarding adherence to Drawings and Specifications.
2. Repair defective welds or flaws, lamellar tearing, and replace defective studs.
3. Pay for retesting of repaired defective welds flaws and studs.
4. Cooperate to the fullest extent to accommodate inspection agency personnel with the on site testing and inspection procedures.
5. Assume full responsibility and pay for all corrective work.

**END OF SECTION**

SECTION 05 4000

# COLD-FORMED METAL FRAMING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section includes all labor, materials, equipment, operations, or methods listed, mentioned or scheduled on the plans and/or herein specified, including all incidentals necessary and required for completion of work under this Section.

B. Provide and install metal-framing work as indicated on the project Drawings and specified herein, including, but not limited to:
1. All light gauge cold formed steel headers, joists, columns, rafters, studs, plates, fabricated connections, light gage blocking bracing and backing.
2. Erection of all metal framing and temporary bracing.

C. Testing Laboratory for specified tests and inspections.

D. Retesting or reinspecting due to defective materials or workmanship will be back charged to the Contractor.

### 1.2 RELATED SECTIONS

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Special Conditions and Division 1 of these Contract Documents.

### 1.3 SUBMITTALS

A. Comply with provisions of Section 01 33 00, Submittal Procedures.

### 1.4 QUALITY ASSURANCE

A. All work shall conform to the 2019 California Building Code.

B. Manufacturer shall have been regularly engaged at least five years in the manufacture of cold-formed metal framing products.

C. Installer shall have been regularly engaged at least 3 years in the fabrication and erection of scold-formed metal framing.

D. Welders shall be qualified in accordance with AWS D1.4.

E. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Division 1 General Requirements of these Specifications.

### 1.5 PRODUCT DELIVERY, STORAGE, HANDLING

A. Storage Materials:
1. Framing members that are stored at the project site shall be above ground on platforms, skids or other supports.
2. Framing shall be protected from corrosion.

3. Other materials shall be stored in a weather tight and dry place, until ready for use in the work.
4. Packaged materials shall be stored in their original unbroken package or container.

## PART 2 - PRODUCTS

### 2.1 MATERIALS:

A. All cold form metal framing shall be as follows;
1. All materials shall be fabricated locally.
2. Studs: ASTM A 653-653M steel G60 galvanized, channel shaped with lipped fringes, punched web, size thickness and grade as shown on Structural Drawings.
3. Tracks: ASTM A 653/653M steel, same designation, coating and thickness as studs except as otherwise noted, channel shaped, solid web, depth compatible with studs, size, thickness and grade as shown on Drawings.
4. Ceiling Joists and soffit joists: ASTM A 653/653M steel, G60 galvanized, channel shaped with lipped flanges, solid web, size as shown on Drawings, thickness and grade as shown on Drawings.

### 2.2 SOURCE QUALITY CONTROL

A. A certified copy of the mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and galvanized-coating thickness shall be submitted to the Project Inspector and reviewed by the Testing Laboratory prior to installation of any framing. All framing materials must be identified and accompanied by a certified mill certificate, or testing will be required. The contractor will be responsible for the testing to determine mechanical properties of all structural steel lacking mill test certificates.

B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

## PART 3 - EXECUTION

### 3.1 FABRICATION

A. Fabricate cold formed steel framing in accordance with the AISI Specifications and Code of Standard Practice.

### 3.2 INSTALLATION

A. Install cold-formed metal framing plumb, square, true to line and securely fastened as shown on Drawings.

B. Follow manufacturer's installation instructions. If installation instructions conflict with these specifications or Drawings, adhere to specifications or Drawings.

C. Cut members by shearing or sawing.

D. Install members in single-piece lengths except that track may be spliced, butt-welded, or each length anchored to a common building frame element.

E. Repairs and Touch-up: Clean damaged surfaces and coatings. Touch up field welds and damaged galvanized surfaces with galvanizing repair compound.

F. Tolerances:
   1. Variation from plumb, level, and true to line: 1/8 inch in 10 feet (1:960).
   2. Member Spacing: Not more than 1/8 inch (3mm) plus or minus from spacing indicated.

END OF SECTION

# SECTION 06 10 53 - ROUGH CARPENTRY

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section. If there is a conflict between City of Mountain View General and Special Provisions and Division 1, the City of Mountain View General and Special Provisions shall govern.

B. Rough Carpentry work includes walls and roofs.

C. Provide all labor, materials, equipment and service necessary for completion of the rough carpentry work shown on the drawings.

### 1.2 QUALITY ASSURANCE

A. Lumber shall conform to the following grading rules:

1. Douglas Fir Lumber: Standard Grading and Dressing Rules, latest edition, of the West Coast Lumber Inspection Bureau.

2. Redwood Lumber: Standard Specifications for Grades of California Redwood Lumber of the Redwood Inspection Service.

3. Plywood: Product Standard PS 1-83.

B. All lumber and plywood shall have the grade mark of the governing association.

C. All work shall conform to the 2010 California Building Code, Title 24, Part 2.

### 1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Immediately upon delivery to job site, place materials in area protected from weather or cover with waterproof covering.

B. Store materials a minimum of six (6) inches above ground on blocking.

C. Protect all materials from corner breakage and surface damage.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. All framing lumber shall be Coast Region Douglas Fir.

B. Conform to the following grades, unless noted otherwise:

| Member | Grade |
|---|---|
| 2x4 Studs, Plates, Bridging & Blocking: | Construction Grade |
| 2x6 Studs and Blocking: | No.2 |
| 3x & 4x, 6" & deeper Beams, Headers, Ledgers: | No.1 |
| 6x & wider Beams & Headers: | No.1 |
| Posts: | No.1 |
| Sole plates on concrete: | No.2 pressure treated |

C. All solid sawn lumber shall have a moisture content of not greater than 19% at the time of installation.

D. Plywood sheathing shall be APA rated Sheathing with exterior glue.

1. Wall sheathing shall be 15/32" thick with a span rating of 24/0.

E. Building paper shall be Asphalt-saturated asbestos felt conforming to ASTM D250, 15 lbs., non-perforated.

F. Timber connectors, bolts, lag screws, nails and staples shall conform to the building code.

G. Bolts set against wood shall have cut washers.

1. Anchor bolts for wall sole plates shall have 2"x2"x3/16" plate washers at top of sole plate.

2. Hot-dip galvanized or stainless steel for exterior use.

3. Hot-dip galvanized or stainless steel for use in preservative treated wood.

H. Nails shall be Common type.

1. Hot-dip galvanized or stainless steel for exterior use.

2. Hot-dip galvanized or stainless steel for use in preservative treated wood.

3. Box nails shall not be used without specific approval of the Engineer.

I. Joist hangers, post caps, holdowns, etc. as manufactured by the Simpson Company or approved equal. Any request for substitution shall be submitted to the Engineer with current ICC-ES approval report.

1. Hot-dip galvanized or stainless steel for exterior use.

2. Hot-dip galvanized or stainless steel for use in contact with preservative treated wood..

J. Powder driven fasteners shall be Hilti, size shown on drawings, installed per manufacturer's recommendations. Any request for substitution shall be submitted to the Engineer with current ICC-ES approval report.

K. Expansion anchors shall be Wedge Anchors for concrete or masonry anchorage, size as per drawings, unless specifically shown otherwise on the drawings.

1. Hot-dip galvanized or stainless steel for exterior use.

2. Hot-dip galvanized or stainless steel for use in preservative treated wood..

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Sole Plates:

1. Set level to 1/16 in. in 6 ft.

2. Anchor bolt holes shall be not more than 1/8" larger than anchor bolt size.

B. Stud wall framing:

1. 2 in. thick studs @ 16" o.c. unless noted otherwise.

2. Provide studs in continuous lengths without splices.

3. Provide triple studs at corners and intersections so that no wall material can extend from one room to another, unless shown otherwise.

4. Firestop blocking shall be 2" material installed in accordance with CBC Section 708.

5. Openings shall be framed with headers where more than one stud is cut.

6. Locate blocking for backing for other trades, i.e., finishing materials, fixtures, specialty items and trim.

C. Horizontal framing:

1. Install with crown edge up.

2. Support ends of each member with a minimum of 1-1/2" of bearing on support.

3. Notch (birdsmouth) rafters to fit wall plates.

4. Place rafters directly opposite each other at ridges.

5. At hips and valleys bevel ends of rafters for full bearing against hip & valley members.

6. Provide solid blocking, at 8'-0" intervals, between all floor joist, and roof joist 8" and deeper.

D. Cutting, notching or boring of members shall not be done except as shown on the drawings.

E. Decking:

1. Install random length pieces continuous over three spans with end joints in adjacent rows a minimum of 24" apart.

2. Drive decking members tight using short block, do not hammer tongue.

3. Nail each member at support with one 20d blind nail and one 20d face nail for 2x decking; one 30d blind nail and one 30d face nail for 3x decking.

4. Toe nail grove to tongue at 45 degrees, 1-1/4" from edge, with 8d nails at 30" o.c.

F. Plywood Sheathing:

1. Allow a minimum of 1/16" between edge joints and 1/8" between end joints.

2. Floor sheathing shall be glued using 1/4" bead of B.F. Goodrich PL-400 adhesive at all supports and grooved edges. Nail immediately after gluing each piece.

3. Install floor plywood with face grain perpendicular to supports; roof plywood as shown on the drawings and wall plywood with face grain parallel to studs.

4. Plywood short nails may be used if the following penetration into the supporting member is maintained:

| Nail Size | Penetration |
|---|---|
| 6d | 1-1/4" |
| 8d | 1-1/2" |
| 10d | 1-5/8" |

5. Where gun nailing is used, care shall be taken not to overdrive nails. Where face ply is broken, renailing is required. Any nails that miss the supporting members shall be removed and renailed.

G. Wall Sheathing Board:

1. Apply sheathing with long dimension parallel to the studs.

2. Allow 1/8" space between sheets.

3. Attach sheathing using staples a minimum of 1-3/8" long spaced at 3" o.c. at edges and 6" o.c. at intermediate supports; or 6d nails spaced at 4" o.c. at edges and 8" o.c. at intermediate supports.

H. Connectors:

1. Minimum nail spacing shall be 1/2 their length, minimum edge distance shall be 1/4 their length. Pre-drill holes for nails wherever necessary to prevent splitting.

2. Wood screws and lag screws shall be turned into place, not driven. Drill holes in the same depth and diameter as the shank and the diameter of the thread base for the threaded portion.

3. Bolt holes shall be drilled 1/16" larger than the bolt diameter.

4. Joist hangers, tie straps, etc., shall have the number and size of connectors recommended by the manufacturer.

END OF SECTION

# SECTION 07 13 26 - SELF-ADHERING SHEET WATERPROOFING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Membrane waterproofing.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

### 1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For special warranties.

### 1.4 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

### 1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MEMBRANE WATERPROOFING

A. Membrane Waterproofing: Consisting of a 0.9 mm black colored rubberized asphalt adhesive integrally bonded to a 0.1 mm cross-laminated polyethylene film to provide a 1.0 mm (40 mil)

thick membrane. Membrane shall be interleaved with silicone-coated release paper until installed.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Grace Construction Products; W.R. Grace & Co. -- Conn.; Vycor V40 or a comparable product by one of the following:

   a. Or equal.

2. Physical Properties:

   a. Meets or exceeds the requirements set forth in AAMA 711-13 voluntary specification for self-adhered flashing Level 3 requirement for elevated temperature exposure.
   b. Meets or exceeds the requirements set forth in ASTM E2112 for Flashing Exterior Windows and Doors
   c. Water Penetration around Nails: ASTM D1970 Section 7.9, modified per section 5.2.1 of AAMA 711 voluntary specification – Pass 1.2 in head of water
   d. Tensile Strength: ASTM D412, Die C Modified – Min. 985 kPa (143 psi)
   e. Thickness: ASTM 3652 – Min 40 mils

B. Mastic, Adhesives, and Detail Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

## 2.2 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by sheet-waterproofing material manufacturer.

# PART 3 - EXECUTION

## 3.1 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

C. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

## 3.2 MEMBRANE SHEET-WATERPROOFING APPLICATION

A. General: Install waterproofing to dry surfaces at air and surface temperatures of -4ºC (25ºF) and above in accordance with manufacturer's recommendations at locations indicated on Construction Documents. Primer is not required for most wood substrates including plywood and OSB provided they are clean and dry. On concrete, masonry, and DensGlass Gold apply Perm-A-Barrier WB Primer prior to flashing.

B. Flexible Wall Flashing:

1. Precut pieces of flashing to easily handled lengths for each location.
2. Remove silicone-coated release paper and position flashing carefully before placing it against the surface.
3. When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
4. Overlap adjacent pieces 50 mm (2 in.) and roll all seams with a steel hand roller.
5. Trim bottom edge 13 mm (1⁄2 in.) back from exposed face of the wall. Flashing shall not be permanently exposed to sunlight.
6. At heads, sills and all flashing terminations turn up ends a minimum of 50 mm (2 in.) and make careful folds to form an end dam, with the seams sealed.
7. Do not expose flashing membrane to sunlight for more than one hundred and twenty days prior to enclosure.

C. Accessories: When required by dirty or dusty site conditions or by surfaces having irregular or rough texture, apply Perm-A-Barrier Primer Plus by air spray, brush or roller or apply Perm-A-Barrier WB Primer by brush or roller at the rate recommended by manufacturer, prior to flashing installation. Allow the primer to dry completely before flashing application..

## 3.3 PROTECTION, REPAIR, AND CLEANING

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

**END OF SECTION 07 13 26**

# SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Manufactured reglets with counterflashing.
2. Formed roof-drainage sheet metal fabrications.
3. Formed low-slope roof sheet metal fabrications.
4. Formed wall sheet metal fabrications.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches.

### 1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

2.2 SHEET METALS

A. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G60 coating designation.

1. Surface: Smooth, flat and mill phosphatized for field painting.

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.

2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Solder:

1. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead with maximum lead content of 0.2 percent.

D. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

## 2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with interlocking counterflashing on exterior face, of same metal as reglet.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Fry Reglet Corporation; STX Stucco Reglet or a comparable product by one of the following:

a. Or equal.

2. Material: Galvanized steel, 24 gage thick.
3. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
4. Finish: Mill.

## 2.6 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.

4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

## 2.7 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.

1. Gutter Profile: Style B according to cited sheet metal standard.
2. Expansion Joints: Butted with expansion space and 6-inch-wide, concealed backup plate.
3. Accessories: Wire-ball downspout strainer.
4. Gutters with Girth up to 15 Inches: Fabricate from the following materials:

    a. Galvanized Steel: 24 gage thick.

B. Downspouts: Fabricate round downspouts from Schedule 40 pipe to dimensions indicated, complete with mitered and welded elbows.

## 2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop): Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long sections. Furnish with 6-inch-wide, joint cover plates.

1. Joint Style: Butted with expansion space and 6-inch-wide, concealed backup plate.
2. Fabricate from the Following Materials:

    a. Galvanized Steel: 24 gage thick.

B. Copings: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support

edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, solder or weld watertight.

1. Joint Style: Butted with expansion space and 6-inch-wide, concealed backup plate.
2. Fabricate from the Following Materials:

    a. Galvanized Steel: 20 gage thick.

C. Roof, Roof-to-Wall Transition, and Roof-to-Roof Edge: Fabricate from the following materials:

1. Galvanized Steel: 22 gage thick.

D. Base Flashing, Counterflashing, and Roof-Penetration Flashing: Fabricate from the following materials:

1. Galvanized Steel: 24 gage thick.

## 2.9 WALL SHEET METAL FABRICATIONS

A. Opening Flashings in Frame Construction: Fabricate head, sill, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:

1. Galvanized Steel: 24 gage thick.

# PART 3 - EXECUTION

## 3.1 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

B. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

## 3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not use torches for soldering.
2. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

## 3.3 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Fasten gutter spacers to front and back of gutter.
2. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
3. Anchor gutter with gutter brackets spaced not more than 24 inches apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
4. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.

C. Downspouts: Join sections with mitered and welded joints.

1. Provide supports with fasteners designed to hold downspouts securely to walls as shown on Drawings.
2. Provide elbows at base of downspout to direct water away from building, or, where shown, connect downspouts to underground drainage system.

## 3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.

1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

## 3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Reglets: Install manufactured reglets and removable counterflashing according to manufacturer’s instructions and Drawings.

C. Opening Flashings in Frame Construction: Install continuous head, sill, and similar flashings to extend 4 inches beyond wall openings.

## 3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

## 3.7 CLEANING AND PROTECTION

A. Clean and neutralize flux materials. Clean off excess solder.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

# SECTION 07 92 00 - JOINT SEALANTS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Nonstaining silicone joint sealants.
2. Urethane joint sealants.
3. Mildew-resistant joint sealants.
4. Latex joint sealants.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. 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.

### 1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.

### 1.4 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

## 2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, 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. VOC Content: Sealants and sealant primers shall comply with the following:

1. Architectural sealants shall have a VOC content of 250 g/L or less.
2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.
4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

## 2.2 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; Dow Corning® 795 Silicone Building Sealant.
b. Sika Corporation; Joint Sealants; Sikasil WS-295.
c. Tremco Incorporated; Spectrem 2.
d. Or equal.

## 2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Corporation; Construction Systems; MasterSeal NP 1 (Pre-2014: Sonolastic NP1).
b. Sika Corporation; Joint Sealants; Sikaflex Textured Sealant.
c. Tremco Incorporated; Dymonic.

d. Or equal.

## 2.4 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Dow Corning Corporation; DOW CORNING® 786 SILICONE SEALANT -.
   b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
   c. Tremco Incorporated; Tremsil 200.
   d. Or equal.

## 2.5 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. May National Associates, Inc.; a subsidiary of Sika Corporation; Bondaflex 600.
   b. Sherwin-Williams Company (The); 850A Siliconized Acrylic Latex Caulk.
   c. Tremco Incorporated; Tremflex 834.
   d. Or equal.

## 2.6 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material 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.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

## 3.2 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support 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 sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place 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 Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below 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 sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

## 3.3 CLEANING

A. Clean off excess 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.

## 3.4 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage

or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

## 3.5 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Construction joints in cast-in-place concrete.
b. Joints between metal panels.
c. Joints between different materials listed above.
d. Perimeter joints between materials listed above and frames of doors, windows and louvers.
e. Control and expansion joints in ceilings and other overhead surfaces.

2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.

B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Vertical joints on exposed surfaces of concrete.

2. Joint Sealant: Urethane, S, NS, 25, NT.

C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.

1. Joint Locations:

a. Control joints on exposed interior surfaces of exterior walls.
b. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.

2. Joint Sealant: Acrylic latex.

D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.

2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.

**END OF SECTION 07 92 00**

# SECTION 09 24 00 – PORTLAND CEMENT PLASTERING

## 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. Exterior portland cement plasterwork (stucco) on metal lath.

B. Related Sections:

1. Section 06 10 00 "Rough Carpentry" for wood framing and furring included in portland cement plaster assemblies.
2. Section 07 21 00 "Thermal Insulation" for thermal insulations and vapor retarders included in portland cement plaster assemblies.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work.

C. Samples for Initial Selection: For each type of factory-prepared finish coat indicated.

D. Samples for Verification: For each type of colored and textured finish coat indicated; 24 by 24 inches, and prepared on rigid backing.

### 1.4 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Where indicated, provide portland cement plaster assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

B. Mockups: Before plastering, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install mockups for each type of finish indicated.
2. For interior plasterwork, simulate finished lighting conditions for review of mockups.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Preinstallation Conference: Conduct conference at Project site.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

## 1.6 PROJECT CONDITIONS

A. Comply with ASTM C 926 requirements.

B. Interior Plasterwork: Maintain room temperatures at greater than 40 deg F for at least 48 hours before plaster application, and continuously during and after application.

1. Avoid conditions that result in plaster drying out during curing period. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
2. Ventilate building spaces as required to remove water in excess of that required for hydrating plaster in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

C. Exterior Plasterwork:

1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
2. Apply plaster when ambient temperature is greater than 40 deg F.
3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

D. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

# PART 2 - PRODUCTS

## 2.1 METAL LATH

A. Expanded-Metal Lath: ASTM C 847 with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
b. CEMCO.
c. Clark Western Building Systems.
d. Dietrich Metal Framing; a Worthington Industries company.
e. MarinoWARE.
f. Phillips Manufacturing Co.

2. Diamond-Mesh Lath: Self-furring, 3.4 lb/sq. yd..
3. 3/8-Inch Rib Lath: 3.4 lb/sq. yd..

## 2.2 ACCESSORIES

A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. CEMCO.
b. Clark Western Building Systems.
c. Dietrich Metal Framing; a Worthington Industries company.

2. Foundation Weep Screed: Fabricated from hot-dip galvanized-steel sheet, ASTM A 653/A 653M, G60 zinc coating.
3. Cornerite: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
4. External-Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
5. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.

a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
b. Small nose cornerbead with perforated flanges; use on curved corners.

6. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
7. Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
8. Expansion Joints: Fabricated from zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.

## 2.3 MISCELLANEOUS MATERIALS

A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminants, manufactured for use in portland cement plaster.

C. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.

D. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.

E. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter, unless otherwise indicated.

## 2.4 PLASTER MATERIALS

A. Portland Cement: ASTM C 150, Type I.

1. Color for Finish Coats: White.

B. Colorants for Job-Mixed Finish Coats: Colorfast mineral pigments that produce finish plaster color to match Architect's sample.

C. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.

D. Sand Aggregate: ASTM C 897.

1. Color for Job-Mixed Finish Coats: In color matching Architect's sample.

E. Ready-Mixed Finish-Coat Plaster: Mill-mixed portland cement, aggregates, coloring agents, and proprietary ingredients.

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. California Stucco Products Corp.; Conventional Portland Cement Stucco.
b. El Rey Stucco Company, Inc., a brand of ParexLaHabra, Inc.; Premium Stucco Finish.
c. LaHabra, a brand of ParexLaHabra, Inc.; Exterior Stucco Color Coat.
d. QUIKCRETE; QUIKCRETE Finish Coat Stucco, No. 1201.

2. Color: Match Architect's samples.

## 2.5 PLASTER MIXES

A. General: Comply with ASTM C 926 for applications indicated.

1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. of cementitious materials.

B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:

1. Portland Cement Mixes:

a. Scratch Coat: For cementitious material, mix 1 part portland cement and 0 to ¾ parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
b. Brown Coat: For cementitious material, mix 1 part portland cement and 0 to ¾ parts lime. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.

C. Factory-Prepared Finish-Coat Mixes: For ready-mixed finish-coat plasters, comply with manufacturer's written instructions.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

B. Prepare solid substrates for plaster that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

### 3.3 INSTALLATION, GENERAL

A. Lathing and Plastering materials shall conform to the standards listed in Table 2507.2 and Chapter 35 of 2016 California Building Code.

B. Fire-Resistance-Rated Assemblies:

1. Rated assemblies shall conform to Chapter 7 of 2016 California Building Code.
2. Install components according to requirements for design designations from listing organization and publication indicated on Drawings.

C. Lath attachment to horizontal wood supports shall conform to 2016 California Building Code, section 25 07 .3.

## 3.4 INSTALLING METAL LATH

A. Expanded-Metal Lath: Install according to ASTM C 1063.

1. Partition Framing and Vertical Furring: Install flat diamond-mesh lath.
2. Flat-Ceiling and Horizontal Framing: Install 3/8-inch rib lath lath.
3. Curved-Ceiling Framing: Install flat diamond-mesh lath.
4. On Solid Surfaces, Not Otherwise Furred: Install self-furring, diamond-mesh lath.

## 3.5 INSTALLING ACCESSORIES

A. Install according to ASTM C 1063 and at locations indicated on Drawings.

B. Reinforcement for External Corners:

1. Install lath-type, external-corner reinforcement at exterior locations.

C. Control Joints: Install control joints at locations indicated on Drawings.

## 3.6 PLASTER APPLICATION

A. General: Comply with ASTM C 926.

1. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed on surface.
2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

B. Walls; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork, 3/4-inch thickness.

1. Portland cement mixes.

C. Ceilings; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 3/4 inch thick.

1. Portland cement mixes.

D. Plaster Finish Coats: Apply to provide finish to match adjacent buildings.

E. Concealed Exterior Plasterwork: Where plaster application will be used as a base for adhered finishes, omit finish coat.

3.7 PLASTER REPAIRS

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, effloresence, sweat outs, and similar defects and where bond to substrate has failed.

3.8 PROTECTION

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

**END OF SECTION 09 24 00**

# SECTION 09 91 13 - EXTERIOR PAINTING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on exterior substrates.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Sustainable Design Submittals:

1. Product Data: For paints and coatings, indicating VOC content.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

### 1.3 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.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

### 1.4 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

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

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide products from Dunn-Edwards Paints for the paint category indicated, or a comparable product by one of the following:

1. Or equal.

## 2.2 PAINT, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. VOC Content: For field applications, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 50 g/L.
3. Dry-Fog Coatings: 150 g/L.
4. Primers, Sealers, and Undercoaters: 100 g/L.
5. Rust-Preventive Coatings: 100 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
7. Pretreatment Wash Primers: 420 g/L.

C. Colors: Three color scheme as selected by Architect from manufacturer's full range.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Wood: 15 percent.
3. Portland Cement Plaster: 12 percent.

C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

## 3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:

1. SSPC-SP 2.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Wood Substrates:

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

## 3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. The number of coats scheduled is the minimum number of coats required. Additional coats shall be applied, at no additional cost to the Owner, to completely hide base material, provide uniform color, and to produce satisfactory finish results.

3. Apply coatings without thinning except as specifically required by label directions, or required by these specifications. In such cases, thinning shall be the minimum reduction permitted.
4. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
5. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
6. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
7. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:

a. Equipment, including panelboards and switch gear.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Tanks that do not have factory-applied final finishes.

## 3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

## 3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, 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 painted surfaces.

## 3.6 EXTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Latex System:

a. Prime Coat: Primer, alkali resistant, water based, 247 ACRY-SHIELD, MPI#3.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, semi-gloss, 1250 ACRY-SHIELD (MPI Gloss Level 5), MPI #11, 163.

B. Steel and Iron Substrates:

1. Water-Based Architectural Coating System:

a. Prime Coat: Primer, rust inhibitive, water based, 1710 KEL-GUARD, MPI #107.
b. Intermediate Coat: Architectural coating, exterior, water based, matching topcoat.
c. Topcoat: Latex, exterior semi-gloss, 1250 ACRY-SHIELD (MPI Gloss Level 5), MPI #11, 163.

C. Galvanized-Metal Substrates:

1. Latex System:

a. Prime Coat: Primer, galvanized, water based, 1440 DEVCRYL, MPI #134.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior semi-gloss, 1250 ACRY-SHIELD (MPI Gloss Level 5), MPI #11, 163.

D. Wood Substrates: Glued-laminated construction.

1. Latex System:

a. Prime Coat: Primer, latex for exterior wood, 255 ACRY-SHIELD, MPI #6.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior semi-gloss, 1250 ACRY-SHIELD (MPI Gloss Level 5), MPI #11, 163.

E. Portland Cement Plaster Substrates:

1. Latex System:

a. Prime Coat: Primer, alkali resistant, water based, 247 ACRY-SHIELD, MPI #3.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior semi-gloss, 1250 ACRY-SHIELD (MPI Gloss Level 5), MPI #11, 16

END OF SECTION 09 91 13

# SECTION 260500 - GENERAL ELECTRICAL REQUIREMENTS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Work Included:
   1. Provide all required labor, project equipment and materials, tools, construction equipment, safety equipment, transportation, and test equipment, and satisfactorily complete all electrical work shown on the Drawings, included in these Specifications, or required for a complete and fully operating facility. In addition, provide wiring and connections to existing equipment.

B. Safety: Conduct operations in accordance with NFPA 70E, Standard for Electrical Safety Requirements for Employee Workspaces.

### 1.2 SUBMITTALS

A. Shop Drawings:
   1. General: Submit Product Review or Product information shop drawings for materials and equipment as required under each Specification section.
   2. For Product Review submittals, submit a single, complete submittal package for all equipment specified under Division 26. The submittal package shall be organized by Specification section. Include separators and tabs or other means of identifying each section of the submittal.

B. As-Built Shop Drawings: Revise manufacturer's shop drawings to show any construction changes. Prior to final acceptance, deliver one complete set to the Engineer for his favorable review. After such review, provide copies of all CAD produced drawings on magnetic media satisfactory to the Engineer in AutoCAD DWG format.

C. Manuals:
   1. Furnish manuals for equipment where Manuals are specified in the equipment Specifications.
   2. In each manual, include equipment descriptions, record shop drawings, operation and maintenance instructions, parts ordering data and ratings for the equipment furnished for this project.

D. Spare Parts: For each piece of equipment, submit a list of recommended spare parts. Include part numbers and the name, address, and telephone number of the supplier.

### 1.3 QUALITY ASSURANCE

A. Electrical equipment, materials, and installation methods shall conform to all applicable local and state codes as well as the editions of the following in effect on the date of issuance of the Contract Documents.

1. National Electrical Code (NEC)
2. National Electrical Safety Code (NESC)
3. Occupational Safety and Health Act (OSHA) standards
4. Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems, International Electrical Testing Association (NETA)

B. Variances: In instances where two or more codes are at variance, the most restrictive requirements shall apply.

C. Standards: Equipment shall conform to applicable standards of American National Standards Institute (ANSI), Electronics Industries Association (EIA), Institute of Electrical and Electronics Engineers (IEEE), and National Electrical Manufacturers Association (NEMA). The revisions of these standards in effect on the date of issuance of the Contract Documents shall apply.

D. Underwriters Laboratories (UL) listing is required for all equipment and materials where such listing is offered by the Underwriters Laboratories. Safety labeling and listing by other organizations, such as ETL Testing Laboratories, may be substituted for UL labeling and listing if acceptable to the authority having code enforcement jurisdiction. Provide service entrance labels for all equipment required by the NEC to have such labels.

E. Contractor's Expense: Obtain and pay for all required bonds, insurance, licenses, permits and inspections, and pay all taxes, fees and utility charges that will be required for the electrical construction work.

1.4 DRAWINGS

A. Drawings: The Electrical Drawings are diagrammatic; exact locations of electrical products shall be verified in the field with the Engineer. Except where special details are used to illustrate the method of installation of a particular piece or type of equipment or material, the requirements or descriptions in this Specification shall take precedence in the event of conflict.
   1. Locations of equipment, inserts, anchors, motors, panels, pull boxes, manholes, conduits, stub-ups, fittings, lighting fixtures, power and convenience outlets, exterior lighting units and ground wells are approximate unless dimensioned; verify locations with the Engineer prior to installation.
      Field verify scaled dimensions on Drawings.
   2. Review the Drawings and Specification Divisions of other trades and perform the electrical work that will be required for the installations.
3. Should there be a need to deviate from the Electrical Drawings and Specifications, submit written details and reasons for all changes to the Engineer for favorable review.

B. As-Built Drawings:

1. Maintain a complete and accurate record set of Drawings for the electrical construction work.
2. Record all work that is installed differently than shown on the Drawings.
3. Upon completion of the work, transfer all marked changes to a clean set of full-size Drawings with red ink. Mark the Drawings "AS-BUILT DRAWINGS" and submit them to the Engineer when the electrical work is completed.
4. Locate all underground conduits by accurate field-measured dimensions from walls and corners, etc., of surrounding structures.

1.5 FACTORY TESTS

A. Submit reports of factory tests and adjustments performed by equipment manufacturers to the Engineer prior to field testing and adjustment of the equipment. These reports shall identify the equipment and show dates, results of tests, measured values and final adjustment settings. Provide factory tests and adjustments for equipment where factory tests are specified in the equipment Specifications.

1.6 INSPECTIONS

A. The Engineer may inspect the fabricated equipment at the factory before shipment to job site. Provide the Engineer with sufficient prior notice so that an inspection can be arranged at the factory.

B. Inspection of the equipment at the factory by the Engineer will be made after the manufacturer has performed satisfactory checks, adjustments, tests and operations.

C. Favorable review of the equipment at the factory only allows the manufacturer to ship the equipment to the project site. The Contractor shall be responsible for the proper installation and satisfactory startup operation of the equipment to the satisfaction of the manufacturer and the Engineer.

1.7 COORDINATION

A. Coordinate the electrical work with the other trades, code authorities, utilities, and the Owner.

B. Where connections must be made to existing installations, properly schedule all the required work, including the power shutdown periods with the Owner well in advance. Schedule and carry out shutdowns so as to cause the least disruption to operation of the plant and privately owned facilities.

C. When two trades join together in an area, make certain that no electrical work is omitted.

1.8 JOB CONDITIONS

A. Operations:
   1. Keep all power shutdown periods to a minimum.
   2. Carry out shutdowns only after the schedule has been favorably reviewed by the Engineer.

B. Construction Power:
   1. Make all arrangements for the required construction power.
      2. When required, provide all equipment, materials and wiring in accordance with the applicable codes and regulations.
      3. Upon completion of the project, remove all temporary construction power equipment, material and wiring from the site as the property of the Contractor.

   C. Storage: Provide adequate storage for all equipment and materials which will become part of the completed facility so that it is protected from weather, dust, water, or construction operations.

1.9 DAMAGED PRODUCTS

A. Notify the Engineer in writing in the event that any equipment or material is damaged.

B. Obtain prior favorable review by the Engineer before making repairs to damaged products.

1.10 LOCATIONS

A. General: Use equipment, materials and wiring methods suitable for the types of locations in which they are located, as defined in Paragraph B. herein.

B. Definitions of Types of Locations:
   1. Dry Locations: All those indoor areas which do not fall within the definitions below for Wet, Damp, Hazardous, or Corrosive Locations and which are not otherwise designated on the Drawings.
   2. Wet Locations: All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Drawings.
   3. Hazardous Locations: All areas in which fire or explosion hazards may exist, normally or accidentally, due to flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or filings. These areas are shown on the Drawings, together with the Class and Division designations as defined in the NEC, determining the enclosure types and wiring methods required.

1.11 WARRANTY

A. Warranty the installation free from defects of workmanship and materials for a period of one year after Date of Certificate of final payment and promptly remedy any defects developing during this period without charge.

PART 2 - PRODUCTS

## 2.1 STANDARD OF QUALITY

A. Products that are specified by manufacturer, trade name or catalog number establish a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are favorably reviewed by the Engineer prior to installation.

B. It is the intent of these Specifications and Drawings to secure high quality in all materials and equipment in order to facilitate operation and maintenance of the facility. All equipment and materials shall be new and the products of reputable suppliers having adequate experience in the manufacture of these particular items. For uniformity, only one manufacturer will be accepted for each type of product. All equipment shall be designed for the service intended and shall be of rugged construction, of ample strength for all stresses, which may occur during fabrication, transportation, erection, and continuous or intermittent operation. All equipment shall be adequately stayed, braced and anchored and shall be installed in a neat and workmanlike manner. Appearance and safety, as well as utility, shall be given consideration in the design of details.

C. All components and devices installed shall be standard items of industrial grade, unless otherwise noted, and shall be of sturdy and durable construction suitable for long, trouble-free service. Light-duty, fragile and competitive grade devices of doubtful durability shall not be used.

## 2.2 NAMEPLATES

A. For each piece of electrical equipment, provide a manufacturer's nameplate showing its name, location, the pertinent ratings and the model designation.

B. Identify each piece of equipment and related controls with a rigid laminated engraved phenolic nameplate. Engrave nameplates with the inscriptions indicated on the Drawings and, if not so indicated, with the equipment name. Securely fasten nameplates in place using two stainless steel screws or, where favorably reviewed by the Engineer, with epoxy cement.

## 2.3 FASTENERS

A. Fasteners for securing equipment to walls, floors and the like shall be either hot-dip galvanized after fabrication or stainless steel. Provide stainless steel fasteners in Corrosive Locations. When fastening to existing walls, floors, and the like, provide capsule anchors, not expansion shields. Size capsule anchors to meet load requirements. Minimum size capsule anchor bolt is 3/16-inch.

## 2.4 PAINTING

A. Equipment: Refer to each electrical equipment section of these specifications for painting requirements of equipment enclosures. Repair any final paint finish, which has been damaged or is otherwise unsatisfactory, to the satisfaction of the Engineer.

B. Wiring System: Paint all exposed conduits, boxes and fittings to match the color of the surface to which they are affixed. Paint finishes shall include proper surface preparation, prime coat and a final finish coat.

2.5 ENCLOSURES

A. Unless otherwise noted, provide enclosures as follows:
   1. Dry Locations: NEMA Type 1
   2. Wet Locations: NEMA Type 3R, 4 or 4X
   3. Hazardous Locations: NEMA Type 7

PART 3 - EXECUTION

3.1 REQUIREMENTS

A. All electrical installations shall conform to the codes and standards outlined in this Section.

3.2 WORKMANSHIP

A. Assign a qualified representative who shall supervise the electrical construction work from beginning to completion and final acceptance.

B. Perform all labor using qualified craftsmen, who have had experience on similar projects. Provide first-class workmanship for all installations.

C. Ensure that all equipment and materials fit properly in their installations.

D. Perform any required work to correct improperly fit installations at no additional expense to the Owner.

3.3 EXCAVATION AND BACKFILL

A. Provide the excavations for electrical equipment foundations and trenches for conduits as shown on the Drawings.

B. Exercise caution during all excavation work and avoid damage to existing underground pipes. Exercise extreme caution when working near existing electrical conduits and facilities. Field verify the location of all electrical facilities before proceeding with any nearby work.

3.4 CONCRETE

A. Where shown on the Drawings or specified, provide the required concrete installations for conduit encasement and equipment foundations.

3.5 CONDUCTOR IDENTIFICATION

A. Identify all wires and cables in conformance with the requirements of Sections 260553. This requirement applies to all equipment provided under this

contract, regardless of Division, as well as to all conductors provided or worked on during this contract.

## 3.6 INSTALLING EQUIPMENT

A. Provide the required inserts, bolts and anchors, and securely attach all equipment and materials to their supports.

B. Install all floor-mounted equipment on reinforced concrete pads as shown on the Plans. The Contractor, suppliers, and fabricators shall take this requirement into consideration when designing, fabricating, and installing panels, motor control centers, and other enclosures so that height above the floor of the operating handles of electrical devices meets the requirements of these Specifications and applicable codes.

## 3.7 CUTTING, DRILLING, AND WELDING

A. Provide any cutting, drilling, and welding that is required for the electrical construction work.

B. Structural members shall not be cut or drilled, except when favorably reviewed by the Engineer. Use a core drill wherever it is necessary to drill through concrete or masonry.

C. Provide the required welding for equipment supports. Conduits and fittings shall not be welded to structural steel.

D. Perform patch work with the same materials as the surrounding area and finish to match.

## 3.8 FIELD TESTS

A. Give sufficient notice to the Engineer prior to any test to permit witnessing the test.

B. It is the intent of these tests to ensure that all electrical equipment is operational within industry and manufacturer's tolerances and is installed in accordance with the Contract Documents and manufacturer's instructions. The tests and inspections shall determine the suitability for energization.

C. Submit a test report which includes the following:
   1. Name of project, name of person performing test, and date of test
   2. Description of equipment tested
   3. Description of test
   4. List of test equipment used and calibration date
   5. Test results
   6. Conclusions and recommendations
   7. Appendix, including appropriate test forms

The test report shall be bound and its contents certified. Submit the completed report directly to the Engineer no later than thirty (30) days after completion of the test unless directed otherwise. Number of reports to be submitted for review shall be the same as the number required for shop drawing submittals.

D. Safety practices shall include, but are not limited to, the following requirements:
   1. Occupational Safety and Health Act of 1970, OSHA.
   2. Accident Prevention Manual for Industrial Operations, Seventh Edition, National Safety Council, Chapter 4.
   3. Applicable state and local safety operating procedures.

E. Retesting will be required for all unsatisfactory tests after the equipment or system has been repaired. Retest all related equipment and systems if required by the Engineer. Repair and retest equipment and systems, which have been satisfactorily tested but later, fail, until satisfactory performance is obtained.

F. Putting Equipment and Cables into Service: Submittal and favorable review of the specified factory and field tests shall occur before the Contractor is permitted to place the respective equipment or cable into service.

G. Miscellaneous Tests
   1. Insulation Resistance, Continuity, Rotation: Perform routine insulation resistance, continuity and rotation tests for all distribution and utilization equipment. All testing shall be performed in the presence of the Engineer. Any system material or workmanship that is found defective on the basis of acceptance tests shall be reported directly to the Engineer. Maintain a written record of all tests and upon completion of project, assemble and certify a final test report.
   2. Operational Tests: Operationally test all circuits to demonstrate that the circuits and equipment have been properly installed, adjusted and are ready for full-time service. Demonstrate the proper functioning of circuits in all modes of operation including alarm conditions, and demonstrate satisfactory interfacing with the data acquisition and alarm systems.

## 3.9 EQUIPMENT PROTECTION

A. Exercise care at all times after installation of equipment, motor control centers, etc., to keep out foreign matter, dust, dirt, debris, or moisture. Use protective sheet metal covers, canvas, heat lamps, etc., as needed to ensure equipment protection.

## 3.10 CLEANING EQUIPMENT

A. Thoroughly clean all soiled surfaces of installed equipment and materials.

B. Clean out and vacuum all construction debris from the bottom of all equipment.

C. Provide and touch-up to original condition any factory painting that has been marred or scratched during shipment or installation, using paint furnished by the equipment manufacturer.

3.11 CLEANUP

A. Upon completion of the electrical work, remove all surplus materials, rubbish, and debris that accumulated during the construction work. Leave the entire area neat, clean, and acceptable to the Engineer.

END OF SECTION 260500

# SECTION 260519 – CONDUCTORS AND CABLES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Conductors and cables and associated connectors, splices, and terminations for wiring systems shall be rated for 600 V, unless otherwise noted.

B. Underground cables shall be rated for wet location with type THW or XHHW insulation.

C. Interior cables shall be equipped with type THHN/THWN insulation.

D. Minimum size of conductors shall be #12 AWG for interior installation and #10 AWG for exterior installation, unless otherwise noted.

### 1.2 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with CEC.

### 1.3 SUBMITTALS

A. Submit a list of all equipment and materials, and product data sheets of all materials for use to the Engineer for approval prior to start of work.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### 2.2 CONDUCTORS AND CABLES

A. Manufacturers:

1. Alcan Aluminum Corporation; Alcan Cable Div.

2. American Insulated Wire Corp.; a Leviton Company.

3. General Cable Corporation.

4. Senator Wire & Cable Company.

5. Southwire Company.

B. General: All conductors shall be copper. Wire or cable not specifically shown on the Drawings or specified, but required, shall be of the type and size required for the application and in conformance with the applicable code. All insulated conductors shall be identified with printing colored to contrast with the insulation color.

C. Refer to "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

D. Conductor Material: Copper complying with NEMA WC 5 or 7; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

E. Conductor Insulation Types: Type THW, THHN-THWN or XHHW complying with NEMA WC 5.

## 2.3 CONNECTORS AND SPLICES

A. Manufacturers:

1. AFC Cable Systems, Inc.

2. AMP Incorporated/Tyco International.

3. Hubbell/Anderson.

4. O-Z/Gedney; EGS Electrical Group LLC.

5. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

## 2.4 TERMINATIONS

A. Crimp type terminals shall be UL listed, self-insulating sleeve type, with ring or rectangular type tongue, suitable for the size and material of the wire to be terminated, and for use with either solid or stranded conductors.

B. Terminal lugs shall be UL listed and of the split bolt or bolted split sleeve type in which the bolt or set screw does not bear directly on the conductor. Tongues shall have NEMA standard drilling.

C. Crimp with manufacturer recommended ratchet-type tool with calibrated dies. Hand crimping tools are not acceptable.

## 2.5 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance or underground: Type THW or XHHW single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: Type THHN-THWN, single conductors in raceway.

E. Exposed Branch Circuits, including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway

G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.

I. Fire Alarm Circuits: Type THHN-THWN, in raceway.

J. Class 1 Control Circuits: Type THHN-THWN, in raceway.

K. Class 2 Control Circuits: Type THHN-THWN, in raceway.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

F. Seal around cables penetrating fire-rated elements.

G. Color Coding: Provide color coding for all circuit conductors. Insulation color shall be white for neutrals and green for grounding conductors. An isolated ground conductor shall be identified with an orange tracer in the green body. Ungrounded conductor colors shall be as follows:

1. 120/208 Volt, 3 Phase: Red, black and blue.

2. 277/480 Volt, 3 Phase: Yellow, brown and orange.

3. 120/240 Volt, 1 Phase: Red and black.

H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

I. Provide an equipment grounding conductor, whether or not it is shown on the Drawings, in any flexible conduit or any raceway in which all or any portion of a run consists of non-metallic duct or conduit. For flexible conduit, an external bonding jumper is an acceptable alternative.

J. In panels, bundle incoming wire and cables, No. 6 AWG and smaller, lace at intervals not greater than 6 inches, neatly spread into trees and connect to their respective terminals. Allow sufficient slack in cables for alterations in terminal connections. Perform lacing with plastic cable ties or linen lacing twine. Where plastic panel wiring duct is provided for cable runs, lacing is not necessary when the cable is properly installed in the duct.

K. Identify each wire or cable at each termination and in each pullbox, junction box, handhole, and manhole using numbered and lettered wire markers. All electrically common conductors shall have the same number. Each electrically different conductor shall be uniquely numbered. Identify panelboard circuits using the panelboard identification and circuit number. Identify motor control circuits using the equipment identification number assigned to the control unit by the motor control center manufacturer and the motor control unit terminal number. Identify other circuits as shown in the circuit schedule or as favorably reviewed by the Engineer.

## 3.2 FIELD QUALITY CONTROL

A. Testing: Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.

C. Test results that comply with requirements.

1. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

# SECTION 260520 – RACEWAYS AND BOXES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Provide raceways, fittings, boxes, enclosures, and cabinets for electrical wiring. Exposed wiring is not permitted, unless otherwise noted.

B. Minimum size of raceway shall be ¾" diameter, unless otherwise noted.

### 1.2 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with CEC.

### 1.3 SUBMITTALS

A. Submit a list of all equipment and materials, and product data sheets of all materials for use to the Engineer for approval prior to start of work.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### 2.2 METAL CONDUIT AND TUBING

A. Manufacturers:

1. AFC Cable Systems, Inc.

2. Alflex Inc.

3. Anamet Electrical, Inc.; Anaconda Metal Hose.

4. Electri-Flex Co.

5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. LTV Steel Tubular Products Company.
7. Manhattan/CDT/Cole-Flex.
8. O-Z Gedney; Unit of General Signal.
9. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. EMT and Fittings: ANSI C80.3.

1. Fittings: Set-screw or compression type.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

## 2.3 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corp.
4. Cantex Inc.
5. Certainteed Corp.; Pipe & Plastics Group.
6. Condux International.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; Division of Hubbell, Inc.
12. Spiralduct, Inc./AFC Cable Systems, Inc.
13. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.

2. Emerson/General Signal; Appleton Electric Company.

3. Erickson Electrical Equipment Co.

4. Hoffman.

5. Hubbell, Inc.; Killark Electric Manufacturing Co.

6. O-Z/Gedney; Unit of General Signal.

7. RACO; Division of Hubbell, Inc.

8. Robroy Industries, Inc.; Enclosure Division.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Floor Boxes: Cast metal, fully adjustable, rectangular.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

I. Precast Pull Boxes: Precast concrete pull boxes shall be provided as shown on the Drawings and shall be Christy or approved equal. Provide precast concrete extensions as required. Covers shall be precast concrete marked to identify the service as indicated.

J. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panel-

boards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.5 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

2.6 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid steel or IMC.

2. Concealed: Rigid steel or IMC.

3. Underground, Single Run: RNC.

4. Underground, Grouped: RNC.

5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

6. Boxes and Enclosures: NEMA 250, Type 3R.

B. Indoors:

1. Exposed: EMT where not subject to damage.

2. Concealed: EMT.

3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.

4. Damp or Wet Locations: Rigid steel conduit.

5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:

a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

3. Bushings:

   a. Bushings shall be the insulated type.

   b. Bushings for rigid steel shall be hot dip galvanized insulated grounding type, 0-Z Gedney Type HBLG, Appleton Type GIB, or equal.

4. Union couplings for conduits shall be the Erickson type and shall be Appleton Type EC, O-Z Gedney 3-piece Series 4, or equal. Threadless couplings shall not be used.

5. Conduit seals shall have zinc electroplate and shall be Crouse-Hinds Type EYS or EZS; Appleton Type EYS, ESU, or EY series; or equal.

D. Supports:

1. Supports for individual conduits shall be galvanized malleable iron one-hole type with conduit back spacer.

2. Supports for multiple conduits shall be hot-dip galvanized Unistrut or Superstrut channels, or equal. All associated hardware shall be hot-dip galvanized.

3. All channels, strut, threaded rods, nuts and clamps in corrosive areas shall be of epoxy resin reinforced fiberglass material. Provide Robroy, Superstrut, or equal.

E. Do not install aluminum conduits embedded in or in contact with concrete.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway or cable runs so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal single raceways with separate, malleable-iron pipe hangers or clamps except use spring-steel fasteners for 1-1/2-inch and smaller single raceways above suspended ceilings and for fastening raceways to slotted channel and angle supports.

F. Install temporary closures to prevent foreign matter from entering raceways.

G. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.

H. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.

I. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

J. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

2. Space raceways laterally to prevent voids in concrete.

3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.

4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.

K. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.

2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

L. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors on all raceways 2” and larger.

M. Tighten set screws of threadless fittings with suitable tools.

N. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.

2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nip-

ples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

O. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

P. Install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

Q. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations.

2. Where otherwise required by CEC.

R. Stub-up Connections: Extend conduits through concrete floor for connection to free-standing equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

S. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

1. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

T. Set floor boxes level and flush with finished floor surface.

U. Junction Boxes and Pull Boxes:

1. Boxes shall be installed where required and where indicated on the Drawings.

2. Boxes shall be readily accessible.

3. Boxes shall not be installed in finished areas.

4. Pull boxes shall be provided at least every 150 feet on long straight conduit runs. Spacing shall be reduced by 50 feet for each 90 degree bend.

5. Box dimensions shall be in accordance with size and quantity of conductors and conduits entering and leaving box per NEC Article 370 requirements.

V. Precast concrete pull boxes shall be installed in excavations as shown on the Drawings and as required. Precast concrete pull boxes and manhole installation shall conform to the following requirements:

1. Pull box shall be placed on six inches, minimum, of crushed rock or compacted sand.

2. Ground conductor shall be looped around the entire circumference of the pull box. Install above all insulated cables.

3. Covers shall be installed on all pull boxes.

4. Precast pull boxes shall be installed level and flush with surrounding surfacing in paved areas and 1-1/2 inch above final grade in unpaved areas.

W. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

## 3.2 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260520

# SECTION 260526 – GROUNDING AND BONDING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Provide separate insulated equipment grounding on all new feeder and branch circuits.

B. Existing service grounding electrode system shall remain.

### 1.2 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled under UL 467 as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Boggs, Inc.
2. Copperweld Corp.
3. Dossert Corp.
4. Erico Inc.; Electrical Products Group.
5. Galvan Industries, Inc.
6. Harger Lightning Protection, Inc.
7. Hastings Fiber Glass Products, Inc.
8. Heary Brothers Lightning Protection Co.
9. ILSCO.
10. Kearney/Cooper Power Systems.
11. Korns, C. C. Co.; Division of Robroy Industries.
12. Lightning Master Corp.

13. Lyncole XIT Grounding.

14. O-Z/Gedney Co.; a business of the EGS Electrical Group.

15. Robbins Lightning, Inc.

16. Salisbury, W. H. & Co.

17. Superior Grounding Systems, Inc.

18. Thomas & Betts, Electrical.

## 2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."

B. Equipment Grounding Conductors: Insulated with green-colored insulation.

C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

D. Grounding Electrode Conductors: Stranded cable.

E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

F. Bare, Solid-Copper Conductors: ASTM B 3.

G. Assembly of Bare, Stranded-Copper Conductors: ASTM B 8.

H. Bare, Tinned-Copper Conductors: ASTM B 33.

I. Copper Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.

J. Copper Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

K. Tinned-Copper Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

L. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulated spacer.

M. Connectors: Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items. Exothermic-welded type, in kit form, selected per manufacturer's written instructions.

## 2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel.

1. Size: 3/4 inch in diameter by 10 feet long.

2.4 GROUND ROD BOXES:

A. Boxes shall be a 9-inch diameter precast concrete unit with cast iron traffic covers. Units shall be 12-inches deep. Covers shall be embossed with the wording "Ground Rod."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.

D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.

2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the indicated height above the floor.

E. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

F. Equipment Grounding Conductors: Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

1. Install insulated equipment grounding conductors in feeders.

2. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

3. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

G. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except as otherwise indicated. Make connections without exposing steel or damaging copper coating.

3. Install ground rod in a ground rod box. Ground rod box shall be installed flushed to grade.

H. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

I. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers or supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

J. Effectively bond structural steel for buildings to the grounding system using exothermic welds.

K. Connections: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.

2. Make connections with clean, bare metal at points of contact.

3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.

5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

6. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

7. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

8. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

9. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

10. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

11. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

## 3.2 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

12. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

13. Test completed grounding system at each location where a maximum ground-resistance level is indicated and at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

14. Provide drawings locating each ground rod, ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenome-

na that may affect test results. Describe measures taken to improve test results. Nominal maximum values are as follows:

a. Equipment Rated 500 kVA and Less: 10 ohms.

b. Equipment Rated 500 to 1000 kVA: 5 ohms.

c. Equipment Rated More Than 1000 kVA: 3 ohms.

d. Substations and Pad-Mounted Switching Equipment: 5 ohms.

e. Manhole Grounds: 10 ohms.

END OF SECTION 260526

# SECTION 260529 – SEISMIC CONTROLS FOR ELECTRICAL WORK

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Provide seismic restraints and other earthquake-damage-reduction measures for electrical components installed under this project. It applies to and complements optional seismic-restraint requirements in the various electrical component Sections of these Specifications.

### 1.2 DEFINITIONS

A. Seismic Restraint: A fixed device (a seismic brace, an anchor bolt or stud, or a fastening assembly) used to prevent vertical or horizontal movement, or both vertical and horizontal movement, of an electrical system component during an earthquake.

B. Mobile Structural Element: A part of the building structure such as a slab, floor structure, roof structure, or wall that may move independently of other structural elements during an earthquake.

### 1.3 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in California Building Code, unless requirements in this Section are more stringent.

B. Testing Agency Qualifications: An independent testing and inspection agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the inspection indicated.

### 1.4 PROJECT CONDITIONS

A. Project Seismic Zone and Zone Factor as Defined in CBC: Zone 4.

B. Occupancy Category as Defined in CBC: III

C. Acceleration Factor as Defined in CBC, BOCA, or SBC: 0.75 G

### 1.5 COORDINATION

A. Coordinate layout and installation of seismic bracing with building structure, architectural features, and mechanical, fire-protection, electrical, and other building systems.

B. Coordinate concrete bases with building structural system.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amber/Booth Company, Inc.
2. B-Line Systems, Inc.
3. Erico, Inc.
4. Mason Industries, Inc,
5. Powerstrut.
6. Thomas & Betts Corp.
7. Unistrut Corporation.

### 2.2 MATERIALS

A. Use the following materials for restraints:

1. Indoor Dry Locations: Steel, zinc plated.
2. Outdoors and Damp Locations: Galvanized steel.
3. Corrosive Locations: Stainless steel.

### 2.3 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

A. Strength: Defined in reports by ICBO Evaluation Service or another agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Strength in tension and shear of components shall be at least twice the maximum seismic forces for which they are required to be designed.

B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type.

C. Concrete Inserts: Steel-channel type.

D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.

E. Welding Lugs: Comply with MSS SP-69, Type 57.

F. Beam Clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.

G. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to the type and size of anchor bolts and studs used.

H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.

## 2.4 SEISMIC-BRACING COMPONENTS

A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inch- thick steel, with 9/16-by-7/8-inch slots at a maximum of 2 inches o.c. in webs, and flange edges turned toward web.

1. Materials for Channel: ASTM A 570, GR 33.

2. Materials for Fittings and Accessories: ASTM A 575, ASTM A 576, or ASTM A 36.

3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.

4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.

B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.

C. Hanger Rod Stiffeners: Slotted steel channels, installed vertically, with internally bolted connections to hanger rod.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Install seismic restraints according to applicable codes and regulations and as approved by authorities having jurisdiction, unless more stringent requirements are indicated.

B. Install structural attachments as follows:

1. Use bolted connections with steel brackets, slotted channel, and slotted-channel fittings to spread structural loads and reduce stresses.

2. Attachments to New Concrete: Bolt to channel-type concrete inserts or use expansion anchors.

3. Attachments to Existing Concrete: Use expansion anchors.

4. Holes for Expansion Anchors in Concrete: Drill at locations and to depths that avoid reinforcing bars.

5. Attachments to Solid Concrete Masonry Unit Walls: Use expansion anchors.

6. Attachments to Hollow Walls: Bolt to slotted steel channels fastened to wall with expansion anchors.

7. Attachments to Wood Structural Members: Install bolts through members.

8. Attachments to Steel: Bolt to clamps on flanges of beams or on upper truss chords of bar joists.

C. Install electrical equipment anchorage as follows:

1. Anchor panelboards, motor-control centers, motor controls, switchboards, transformers, fused power-circuit devices, control, and distribution units as follows:

a. Anchor equipment rigidly to a single mobile structural element or to a concrete base that is structurally tied to a single mobile structural element.

b. Size concrete bases so expansion anchors will be a minimum of 10 bolt diameters from the edge of the concrete base.

c. Bushings for Floor-Mounted Equipment Anchors: Install to allow for resilient media between anchor bolt or stud and mounting hole in concrete.

d. Anchor Bolt Bushing Assemblies for Wall-Mounted Equipment: Install to allow for resilient media where equipment or equipment-mounting channels are attached to wall.

e. Torque bolts and nuts on studs to values recommended by equipment manufacturer.

f. Submit schedule for drilled-in anchors in concrete to allow for Owner's testing lab to test the installation.

C. Install seismic bracing as follows:

1. Install bracing according to spacings and strengths indicated by approved analysis.

2. Expansion and Contraction: Install to allow for thermal movement of braced components.

3. Attachment to Structure: If specific attachment is not indicated, anchor bracing to the structure at flanges of beams, upper truss chords of bar joists, or at concrete members.

D. Accommodation of Differential Seismic Motion: Make flexible connections in raceways, cables, wireway, cable trays, and busway where they cross expansion- and seismic-control joints, where adjacent sections or branches are supported by different structural elements, and where they terminate at electrical equipment anchored to a different mobile structural element from the one supporting them.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing and inspection agency to inspect seismic-control installation for compliance with indicated requirements.

B. Reinspection: Correct deficiencies and verify by reinspection that work complies with requirements.

C. Provide written report of tests and inspections.

END OF SECTION 260529

# SECTION 260533 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section includes the following:

   A. Identification of all electrical equipment and devices.

### 1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for Identification of materials and method.

C. Samples: One for each type of materials specified.

### 1.3 QUALITY ASSURANCE

A. All identification material and methods, engraved labels, conductor numbers, branch circuit schedules, relay panel schedules, identification for circuit breakers and underground utility markers shall meet Code requirements and industry standards.

B. Comply with NFPA 70.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. For Engraved Labels: Lamicoid

B. For Conductor Numbers: Brady

C. For Underground Utilities Ribbon: Allen Systems, Inc.

### 2.2 IDENTIFICATION MATERIALS AND METHODS

A. Coordinate names, abbreviations and other designations with equipment specified in this or other Divisions of the Specification.

B. Conform to requirements of the CEC, latest adopted version with amendments by local AHJs including warning labeling and identification on existing equipment.

C. Furnish products listed by UL or other testing firm acceptable to AHJ.

### 2.3. ENGRAVED LABELS

A. Melamine plastic laminate, white with black core, 1/16-inch thick.

B. Dymo tape labels are not acceptable.

2.4 CONDUCTOR NUMBERS

A. Manufacturers standard vinyl-cloth self-adhesive cable and conductor markers of the wraparound type. Preprinted black numbers on yellow field.

2.5 BRANCH CIRCUIT SCHEDULES

A. Provide branch circuit identification schedules, typewritten, clearly filled out, to identify load connected to each circuit and location of load. Numbers to correspond to numbers assigned to each circuit breaker pole position.

B. Provide two columns, odd numbers in left column, even numbers in right column, with 3-inch-wide line for typing connected load information.

2.6 IDENTIFICATION FOR CIRCUIT NUMBERS

A. Provide permanent identification number in or on panelboard dead-front adjacent to each circuit breaker pole position. Square D adhesive is approved, other adhesives by specific prior approval only.

B. Horizontal centerline of engraved numbers to correspond with centerline of circuit breaker pole position.

C. Detectable plastic ribbon, 6-inch wide by 4 mil thick.

2.7 UNDERGROUND UTILITY MARKERS

A. Color code as recommended by APWA. Safety Red for electric power distribution. Safety Alert Orange for telephone, signal, data and cable TV.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten labels to equipment in a secure and permanent manner.

B. Mark underground utilities in conformance with APWA.

C. Where signs are to be applied to surfaces which require finish, install identification after completion of painting.

D. Engravers standard letter style, minimum 3/16-inch high capital letters.

E. Drill or punch labels for mechanical fastening except where adhesive mounting is necessary because of substrate. Use self tapping stainless steel screws.

F. Install an engraved label on each major unit of electrical equipment indicating both equipment name and circuit serving equipment (e.g. "EF-1, CKT. 2P1-1,3,5), including but not limited to the following items:

1. Disconnect switches, identify item of equipment controlled.
2. Automatic Transfer switch.
3. Service disconnect and distribution switches, identify connected load.
4. Branch circuit panelboards.

G. Install engraved on the inside of flush panels, visible when door is opened. Install label on outside of surface panel.

H. Apply markers on each conductor for power, control, signaling and communications circuits where wires of more than one circuit are present.

I. Match conductor identification used in panelboards, shop drawings, contract documents and similar previously established identification for division 26 work.

J. Provide branch circuit identification schedules, typewritten, clearly filled out, to identify load connected to each circuit and location of load. Numbers to correspond to numbers assigned to each circuit breaker pole position.

K. Provide two columns, odd numbers in left column, even numbers in right column, with 3-inch-wide line for typing connected load information.

L. Provide typewritten schedule to identify the incoming circuit, the controlled load, and the controlling devices for each relay.
   1. Imprint over entire length of ribbon in permanent black letters, the system description, selected from manufacturer's standard legend which most accurately identifies the subgrade system.
   2. Install continuous tape, 6 to 8 inches below finish grade, for each exterior underground raceway.
   3. Where multiple small lines are buried in a common trench and do not exceed an overall width of 16 inches, install a single marker. Over 16 inch width of lines, install multiple tapes not over 10 inches apart (edge to edge) over the entire group of lines.

END OF SECTION 260553

# SECTION 260573 – POWER SYSTEM STUDY

## PART 1 - GENERAL

### 1.1 WORK INCLUDED

#### A. GENERAL

1. Provide a complete arc flash hazard study to help protect individuals working on this facility from electrical arc flash injuries. These individuals may include any workers who inspect, maintain or operate energized electrical equipment. Include all equipment 480 volts and higher and 208 Volt served by a 125 kVA or larger transformer.
2. All references to codes, standards, and published material below apply to latest applicable edition.
3. The study is needed for compliance with the applicable standards for the complete electrical system (California Electrical Code, CEC 110.16) and for worker safety in operating facilities (OSHA 29 CFR 1910, NFPA 70E).
4. Provide Arc Flash Hazard Warning Labels on all electrical equipment including the service switchboard and all electrical panelboards. These labels are intended to assist technicians and others in the selection of proper Personal Protective Equipment when working around exposed and energized conductors.

#### B. SCOPE

1. Accurate electrical system single-line diagram as required by NFPA 70E, “Standard for Electrical Safety in the Workplace”, as referenced in OSHA 29 CFR 1910 Subpart S, Appendix A. Include the following on the single line diagram.
   a. Nameplate data for electrical components (e.g. transformers, medium voltage switchgear, panelboards, switchboards, motor control centers, etc.)
   b. Cable sizes, types and lengths between electrical equipment components.
   c. Unique characteristics of the equipment installation which may impact the magnitude of the potential hazard (e.g. open space versus enclosure).
   d. Verified overcurrent device settings.
2. Short Circuit Study in accordance with ANSI standard C37 and IEEE standard 141 (Red Book).
3. Coordination Study in accordance with IEEE 242 “Buff” to determine the proper overcurrent device settings that will balance system reliability through selective coordination while minimizing the magnitude of an electrical arc flash hazard incident.
4. Incident Energy Study in accordance with the IEEE 1584 “IEEE Guide for Performing Arc Flash Hazard Calculations” as referenced in NFPA 70, “Standard for Electrical Safety in the Workplace”, in order to quantify the

hazard for selection of personal protective equipment (PPE). Tables that assume fault current levels and clearing time for proper PPE selection are not acceptable.

1.2 SUBMITTALS

A. Comprehensive report that includes:

1. Report summary with analysis methodology, findings and recommendations.

2. Summary of input data for utility source, equipment and cables.

3. Available fault current at each equipment location with comparison to equipment rating.
4. Overcurrent device settings (e.g. pick-up, time delay, curve).
5. Incident energy level (calories/cm2) for each equipment location and recommended PPE.
6. Overcurrent device coordination curves including related section of the single-line diagram.

B. LABELS

1. Install warning labels (orange <40 cal/cm2) or danger label (red > 40 cal/cm2c) in accordance with ANSI Z535.4. The label must be readable in both indoor and outdoor environments for at least 3 years and contain the following information (see sample label, attached);
   a. Arc hazard boundary (inches).
   b. Working distance (inches).
   c. Arc flash energy at the working distance (calories/cm2).
   d. PPE category with reference to NFPA 70E definitions.
   e. Voltage rating of the equipment.
   f. Limited approach distance (inches).
   g. Restricted approach distance (inches)
   h. Prohibited approach distance (inches)
   i. Equipment/bus name.
   j. Date prepared.

PART 2 - EXECUTION

2.01 QUALITY ASSURANCE

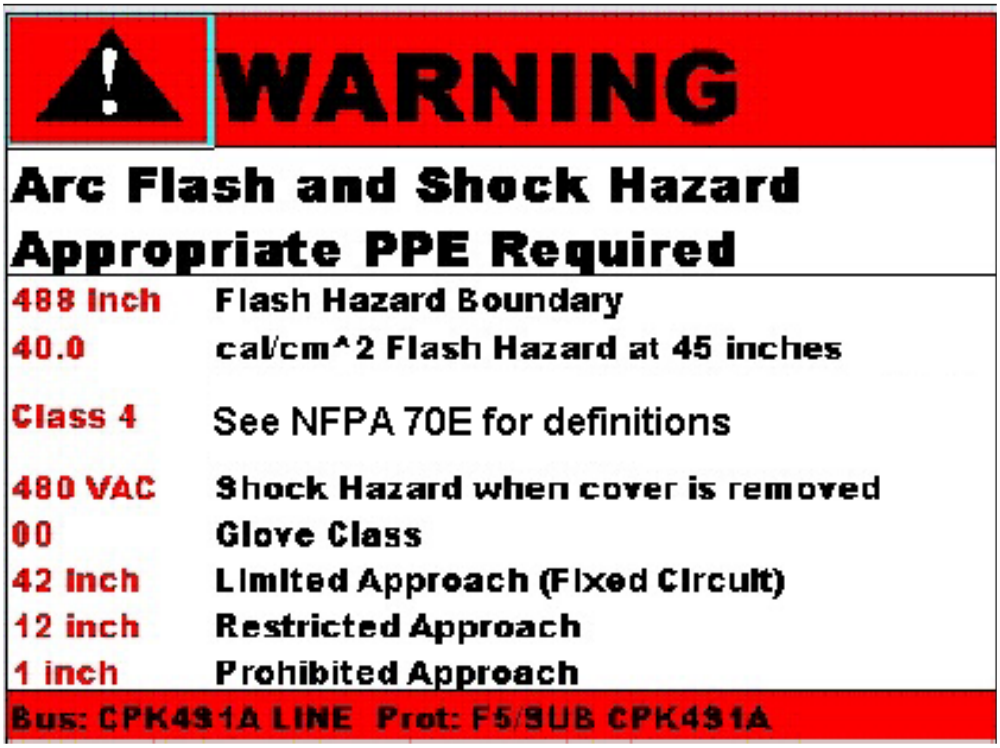
1. Power System study and startup and commissioning of the switchboards shall be performed by the switchboard manufacturer.

2. Provide all necessary material, equipment, labor, and technical supervision to perform the arc flash hazard analysis.

3. Utilize engineers and technicians that are experienced and regularly perform electrical power system testing.

4. Personnel performing the arch flash analysis shall be trained and experienced in accordance with NETA Training Specifications concerning the apparatus and systems being evaluated.

2.02 LABELS: (SAMPLE)




END OF SECTION 260573

# SECTION 260622 - ENGINE GENERATOR

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Owner Furnished Contractor Installed (OFCI) Engine Generators ~~– Provide materials, equipment, fabrication, delivery, coordination of~~ are already on-site awaiting installation ~~with~~ by the installing Contractor. ~~installation and testing for~~ There are two identical generators in sound attenuated enclosures on a sub-base fuel tank located in San Jose, CA. One generator is located near the South Building #1. The second generator is located near the North Building #3. The generators shall be in conformity with these specifications, related drawings, applicable codes, standards, and authorities having jurisdiction, for the following:

1. Diesel fueled emergency power engine generators
2. Emission controls for Tier 2
3. NFPA 110 level 1 type 10 compliant
4. Listed for NEC 700 emergency power
5. Noise attenuated housing - 73 dBA at 7 meters (Level 2)
6. UL listed generator (UL 2200)
7. Main power connections
8. Main 4-pole circuit breaker
9. Cooling and exhaust provisions
10. Fabrication to CBC requirements
11. Base tank mounting of engine-generator with vibration isolators
12. Base tank with PV vent
13. UL 142 fuel base tank
14. Remote Annunciator
15. Automated fuel filtration
16. Base tank ports
17. Lube oil systems
18. Combined air and exhaust discharge on enclosure roof
19. Communication interface for equipment status and alarm conditions
20. BACnet TCP/IP Ethernet LAN connectivity
21. Factory and on-site testing

B. ~~The engine-generator supplier~~ The Owner furnished generator manufacturer is Kohler. The local representative for the generators is Bay City Electric Works. They will be responsible for coordinating installation and for conducting final equipment and system testing and commissioning.

C. Furnish an engine generator system as described in the specification capable of starting and performing to rated output at rated load under the following environmental conditions:

1. Altitude (level above mean level elevation): +/-100’
2. Ambient temperature (outside of enclosure): -30 to 110 degrees F.
3. Ambient Humidity: 0 to 100 percent

D. Derating of engine generator set for either elevation or ambient temperature is not permitted.

E. Comply with all local and state emissions regulations. The BAAQMD has already issued the “Authority to Construct” the new generators. It expires April 22, 2026. Assist GES, Groundwater and Environmental Services, in preparing the “Startup Notification” before the “Authority to Construct” expires.

F. Equipment to physically fit within space indicated to meet all applicable codes.

1.2 RELATED DOCUMENTS

~~A. Request for Proposal, RFP #07-21-22, Ridder Park Generators.~~

B. Electrical Site Plan.

1.3 STANDARDS

A. Published specifications, standards, tests or recommended methods of trade, industry or governmental organizations apply to work of this Section where cited by abbreviations noted below.

1. ANSI – American National Standards Institute.
2. IEEE – Institute of Electrical and Electronic Engineers.
3. NEMA – National Electrical Manufacturers Association.
4. NFPA – National fire Protection Association (Level 1 emergency system)
5. UL – Underwriters Laboratories, Inc.

a. UL 1236 – Battery chargers
b. UL 508 – Industrial Control Panels

1.4 QUALITY ASSURANCE

A. OEM (OFCI) contract requirement:

1. Start-up
2. Commissioning support

B. Provide UL 2200 generator listing. Provide field evaluation if required by AHJ for all other engine-generator systems and housing.

C. Assume responsibility for all code approvals related to furnished equipment and housing.

D. All wiring and equipment installation to comply with the requirements of the NEC and requirement of local AHJ for access, clearance, material including but not limited to panelboards, circuit breakers, lighting systems, and grounding.

E. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture.

F. Supply all equipment and accessories new, free from defects, and listed by Underwriters Laboratories, Inc., or bearing its label.

G. Supply all equipment and accessories in compliance with the applicable standards listed in Article 1.3 of this Section and with all applicable national, state, and local codes.

H. Comply with NFPA 70, Part 445 and NFPA 70, Part 240.21(G).

I. All items of a given type to be the products of the same manufacturer.

J. Single manufacturer to assume responsibility for standby power plant system as specified under this Section.

K. Output Performance Requirements;

1. 480/277 volts, 3 phase, 4-wire, 60 Hertz.
2. 600 KW/750 kVA, 0.8 PF, stand by power duty
3. Motor starting capability: 2,429 SkVA; submit SkVA data and test report for 30% voltage dip
4. Voltage harmonics:

    a. No 3rd harmonic or multiples

5. Voltage regulation: Plus, or minus .5 percent maximum deviation from rated generator terminal voltage between no load and full load, under steady state conditions.
6. Voltage stability: Plus, or minus .25 percent maximum deviation about rated generator terminal voltage at any constant load from no load to full load.
7. Voltage transient: to be determined by test
8. Frequency transient: to be determined by test
9. Frequency regulation: Isochronous from rated generator terminal frequency at any constant load from no load to full load.
10. Time lag from utility power failure to standby power, full voltage, and related frequency: maximum 10 seconds.

L. The engine-generator package set shall be capable of delivering 100% of the specified output ratings at full range of local site climate and altitude conditions.

M. Equipment is required to fit within the space allocated on the plan drawing

1.5 SUBMITTALS

~~A. Manufacturer to provide submittals and DE compliance document in Appendix G – DE Form in this RFP.~~

B. Certified factory test script

1. Submit factory test script, proposed data logging and documentation sheet
2. Verify steady-state stability

3. Verify full-load capability and unit performance on cold start with one-step full load at rated power factor.
4. Voltage and frequency readings taken during test to be permanently recorded by chart recorder or oscillograph of sufficient response and resolution to verify generator output characteristics specified.
5. Test documentation to include all pertinent engine-generator operating parameters, accessories and auxiliaries used, ambient temperature, elevation and location.
6. Submit certified test report prior to shipment
7. Seismic anchorage design and calculations: Indicate materials, and show designs and calculations signed and sealed by a Professional Structural Engineer.

C. Complete catalog data for all components including but not limited to the following:

1. Engine-generator
2. Exhaust silencers
3. Starting batteries
4. Battery system including jars; charger; heater kit with thermostat
5. Engine starting performance
6. Fuel oil system including primary and secondary fuel filters
7. Cooling system including air and water side components
8. All control panels
9. Housing components and materials

D. Detailed shop drawings and information including:

1. Generator thermal damage curve
2. Generator circuit breaker time-current curves
3. Generator capability curve
4. Complete electrical data including short circuit impedances
5. Performance characteristics
6. Point-to-point wiring diagrams.
7. Wiring diagram showing all site-specific field wiring terminations.
8. System block diagram (site specific) showing all field connections
9. Physical layout and dimensioning with complete section views
10. All pertinent data for structural engineering of the base to the concrete pad including weights, points of attachment, and center of gravity.
11. Acoustical data
12. Base tank details
13. Exhaust system details
14. Fuel oil system details.
15. Lube oil system
16. Vibration isolation with seismic certification and calculations
17. Housing elevation, plan, rigging diagram, installation diagrams, complete details.
18. Complete BACnet data register listing and description
19. For each alarm and status point: provide set point value and range.
20. Underground power cable entry details
21. Cooling System Performance Data

E. Generator Alarm and Monitoring Points List.

F. Noise Data:

1. Provide Measured Sound Performance (MSP) data, for the specific generator and enclosure to be provided for this project.

G. As-built documentation

1. At completion of project provide as-built documentation
2. Submit for approval prior to publication and issue

H. Operation and Maintenance Manuals (one electronic copy)

I. Submit System Operating Procedure (SOP)

J. Factory test script.

1. Include manufacturer's standard load testing.

K. Recommended field installation procedures, start-up, commissioning.

L. Installations, Testing Instructions and Field Test Procedures for:

1. Standby power plant.
2. Control panel.
3. Batteries.
4. List of manufacturer's recommended spare parts.

M. Manufacturer's generator load calculations considering the generators picking up the entire load in step one and the elevator load in step two.

1.6 EMISSION COMPLIANCE

A. Engine to comply with federal, state, and local emission limitations.

B. Coordinate with GES for submitting all permit documentation and source test data to confirm compliance with emission standards.

1.7 GENERATOR SPECIFICATIONS

A. Provide emissions data required for the BAAQMD including the following:

| | |
|---|---|
| Generator Power | 600kW |
| Engine Make | |
| Engine Model | |
| Building Numbers | Bldg #1 and Bldg #3 |
| SCR? | No |
| NOx Emissions (lb/hr) | |

| | |
|---|---|
| Stack Height (ft) | |
| Stack Inside Diameter (in) | |
| Temperature (°F) | |
| Exit Velocity (ft/s) | |
| Noise Level at 23 Feet (dBA) | 73 |

1.8 WARRANTY

A. Provide two (2) year warranty all parts and labor excluding starting batteries.

B. Add Alternate as above except with five (5) year warranty.

C. Date of warranty to begin from date of startup.

D. Include all equipment, labor, and travel for repairs at the jobsite. Include all parts.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Ship equipment in its original packages to prevent damaging or entrance of foreign matter.

B. All handling to be performed in accordance with manufacturer's recommendations.

C. Provide protective coverings during construction.

D. Supplier assumes full responsibility for delivery to the jobsite. Offloading will be provided by others. Repair and/or replace at Owners discretion, equipment, or materials damaged prior to jobsite acceptance.

1.10 PREVENTIVE MAINTENANCE (PM) SCHEDULE

A. Submit recommended preventive maintenance (PM) schedule for all equipment and systems.

B. Include item and system description

C. Identify recommended time interval

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Kohler, Cummins, Caterpillar or approved equal.

2.2 ENGINE

A. General

1. Fuel: ultra-low sulfur diesel #2.
2. 1800 rpm, 6 cylinder 4-stroke-cycle

3. Color: Manufacturer standard

B. Cooling System

1. Water-Cooled with unit mounted radiator and engine driven fan.
2. Low water level switch
3. Radiator mounted fuel oil cooler
4. Initial fill: 50% ethylene glycol

C. Fuel System

1. Engine Driven main fuel transfer pump.
2. Fuel priming pump
3. Flexible fuel connections.
4. Fuel filters:

    a. Provide support and anchorage for unit mounting to engine skid

5. Dual in-line fuel - water separator
6. Fuel injector for each cylinder.

D. Lube Oil System

1. Lube oil cooler and filters.
2. Lube oil pump: gear type with submerged screen, engine driven.

E. Jacket Water System

1. Circulating pump, engine driven.
2. Jacket water heater and thermostat

    a. Sized to maintain minimum 110-degree water temperature.
    b. 480-volt single phase

F. Engine Starting System:

1. 24-volt DC

G. Exhaust System

1. Dry exhaust manifold
2. Flanged faced outlets
3. Exhaust assembly: integral to housing

H. Governor:

1. As required to insure generator voltage, frequency and performance.
2. Automatic isochronous frequency regulation.
3. With backup protection or safety devices to prevent engine runaway.

I. Air Cleaners:

1. Single element canister type
2. Service indicator

J. Close-coupled to generator through flexible coupling mounted on common structural steel base.

2.3 GENERATOR

A. Permanent magnet, brushless excitation.

B. Color to match engine frame.

C. Rating:

1. 480-volt, 3-phase, 4-wire wye connected, solidly grounded.
2. 600 kW/750 kVA at .8 power factor

D. Heavy duty, 4-pole 1800 rpm.

E. Coil pitch: 2/3

F. Solid-state static voltage regulator.

G. 105 deg C rise, Class H insulation.

1. Temperature rise based on non-linear load
2. Suitable for 12% THD (current)

H. Permanent magnet generator (PMG) for excitation power.

1. Capable of sustaining and regulating current supplied to a single or three phase fault
2. Suitable for approximate 300% rated current for 10 seconds.

I. Solidly grounded neutral. Provide windings braced for maximum line to ground fault

J. Maximum sub-transient reactance (direct or quadrature): 12%

K. Underground cable entry.

2.4 GENERATOR CIRCUIT BREAKER

A. Schneider Electric or approved equal, Electronic trip, 100% rated, PG frame size, Interrupting rating of 35kA minimum, as shown on the drawings.

1. Trip functions:

a. LSI
b. Long time/Short time/instantaneous
c. Ground fault monitoring

2. Auxiliary contact for supervision

B. Main circuit breaker enclosure and bussing:

1. Access to all anchor bolts securing breaker cover panels: not to require removal of any field wiring.
2. Provide adequate quantity and location of buss supports.
3. UL and NEMA compliant, 2-hole lug terminations. Quantity to equal required field cabling.

2.5 VOLTAGE REGULATOR

A. Automatic temperature compensated

B. Microprocessor-based, solid-state design.

C. True RMS 3-phase sensing.

D. Maintains output voltage control with up to 12% voltage THD current from non-linear loads

E. Response time: 10 msec maximum

F. Programmable volts/Hz regulation

G. Rotating diode monitor: loss of excitation protection

H. Adjustable under/over voltage protection.

2.6 BATTERIES

A. Oversized, heavy duty, sealed lead-acid

B. Polypropylene case.

C. Battery rack and intercell connectors

D. Amp-Hour Capacity:

1. Crank engine at constant firing speed.
2. Minimum of four cranking cycles at minimum ambient of 0 degrees F.

E. Fiberglass containment. Powerhouse Containers, Inc., or equal

2.7 AUTOMATIC BATTERY CHARGER

A. Solid state, temperature compensated, AC line compensated.

B. Stabilized output voltage.

C. LED display

D. Output current limited.

E. Auto boost: after power restoration or battery discharge, the charger operates at high-rate constant current mode until voltage rises to a preset level. Charger reverts to float voltage after charging amps decreases to approximate 70% of rating.

F. Alarm contacts:

1. AC failure
2. Low voltage
3. Charger failure
4. High voltage

G. Four-state charging mode:

1. Constant current charge.
2. High rate taper charge.
3. Finishing charge.
4. Maintenance (float) charge.

H. Ampere Rating: Approximately 5 percent of 20-hour ampere-hour rating of battery, 24VDC, 20 A output minimum.

I. LED output display with current/voltage selector switch.

J. Manufacturer: SENS (Stored Energy Systems) EnerGenius or equal.

2.8 EXHAUST SILENCER

A. Critical type with muffler companion flanges and flexible stainless-steel exhaust fittings.

B. As required by local noise abatement requirements.

C. Maxim, Harco, GT Exhaust, or equal.

2.9 FLEXIBLE CONNECTIONS

A. Flexible supply and return fuel lines

B. Synthetic rubber construction

C. Carbon steel wire braid reinforced with synthetic rubber covering.

2.10 EPO (EMERGENCY STOP)

A. Provide single point of connection for all control, alarm, and instrument volt wiring

B. Provide caged, lockable, emergency stop mushroom-head pushbutton switches as follows.

1. Mount emergency stop switch on the exterior of the enclosure.

2. Provide stop switch on engine generator enclosure.
3. Mount so emergency stop switches are accessible from grade level (stair access not required).
4. The nameplate for emergency stop switches shall read: “EMERGENCY STOP OF GENERATOR”

2.11 POWER AND GROUNDING CONNECTIONS

A. Generator power feeder cable entry will be underground cable entry.

B. Cable terminations: refer to drawings to minimum KCM conductor size and quantity required.

C. Provide bussing to accommodate 2-hole compression lugs for power cable and grounding connections based on UL and NEMA standards for spacing and clearances. 2-hole compression lugs shall be provided by installing contractor.

D. Provide factory installed main bonding jumper.

E. Grounding electrode conductor (GEC):

1. Bottom connection
2. Generator neutral to be solidly grounded.
3. Provision for termination of #3/0 bare copper *GE*C

F. Torque all bolted connections in accordance with manufacturer’s recommendations and seal with torque lacquer per Owner’s torqueing requirements to indicate proper torque has been applied.

2.12 FUEL BASE TANK

A. Baffled design. Adjust pick points accordingly.

B. Comply with local requirements

C. Dual wall double containment tank.

D. Corrosion resistant.

1. Sand blasted to SSPC-5 requirements
2. Painted with two coats of rust-inhibiting primer and finished painted with two coats of polyurethane paint.

E. Symmetrical to engine-generator package set footprint.

F. UL 142 listed

G. Leak detection and fuel level alarms.

H. Secondary containment: 110% of main fuel capacity

I. Pressure-vacuum vent

1. Adjustable water column vacuum setting
2. Thread –on style; anodized aluminum base and poppet; polypropylene body
3. Corrosion resistant
4. NFPA 30 compliant
5. Stainless steel wire screen
6. Suitable for engine maximum fuel flow rate
7. Manufacturer: OPW 623V series or equal.

J. Fuel level gauge.

K. Lockable fill cap.

L. 5-gallon spill containment at fuel fill port.

M. Capacity: 660 Gallon capacity.

N. Designed to accommodate bottom entry of all cabling. Provide sufficient space for stubbing up four (4) 4-inch conduits.

O. Tank dimensions:

1. Height of tank not to restrict access to controls and devices
2. Controls and switches and all other accessible devices to comply with NEC 404.8 measured from finished grade.

P. Provide emergency vents outside. Spring loaded port. Coordinate location during submittal review.

2.13 NAMEPLATES

A. Provide screw-on lamacoid nameplates.

2.14 HOUSING FOR OUTDOOR INSTALLATION

A. Weatherproof, sound attenuated housing:

1. All work to comply with requirements of the NEC
2. Sound attenuation: approximately 73 dBA at 7 meters based in industry standard free field sound level measurements.

B. General

1. 12 gauge steel welded together modular panels.
2. Paint process prior to assembly:

a. Cleaning and mechanical abrasion
b. Two coats epoxy primer
c. Two coats high gloss acrylic polyurethane finish
d. Or equivalent finishing method

3. Caulked between each vertical seam.
4. Mount and seal enclosure to a structural steel base frame. Construct base with inside and outside stringers and transverse end beams for supporting a solid steel, diamond plate non-skid deck floor plate. Design floor loading to accommodate the engine generator and all ancillary equipment. Furnish suitable steel spring type vibration isolators for engine generators.
5. Vibration isolation:

    a. Spring type with neoprene acoustical pads, leveling devices and vertical limit stops.
    b. Minimum static deflection: 1 inch or as required to meet seismic certification.
    c. Spring mounting: located between engine-generator assembly and base frame.

6. Exhaust silencers to be mounted within enclosure.

    a. Furnish a suitable “rain skirt” and collar at the point where the exhaust pipe penetrates the roof of the enclosure.
    b. Design to prevent the entrance of rain and allow for expansion and vibration of the exhaust piping without chafing or stress to the exhaust system.
    c. Exhaust stack to extend horizontally as needed to location of radiator air discharge.
    d. Discharge radiator air flow will combine with exhaust gas flow in upward overall gas discharge stream.

7. Roof pitched to prevent moisture accumulation
8. The engine generator set and radiator shall be installed in the housing prior to shipment to the site so that it can be set onto the fuel tank as a package.
9. Dimensions of supplied equipment not to exceed the layout shown on plan.

C. Air intake and discharge louvers:

1. Intake louvers: Fixed
2. Discharge louvers: Fixed

D. Interior power receptacles two (2) one each side of housing.

E. Doors and access panels:

1. Hinges:

    a. Heavy-duty stainless-steel leaf-type.
    b. Full height continuous gear type concealed between the door and door leaf of the doorframe.

2. Stainless steel handles with three-point latching mechanism for all doors.
3. Lockable doors and access panels. Rust-resistant with rubber seals. Provide two sets of keys for the owner’s use.

4. Provide rain hoods over all access doors.

F. Air intake and exhaust louvers shall be aluminum or steel.

G. Lift bolts and hardware

1. Provide complete integrated hardware for rigging, transport, loading/unloading.
2. Suitable to multiple picks from any and all points and shall be reusable outside of the factory.
3. Hardware suitable to pick the generator and enclosure a minimum of five times after leaving the factory.
4. Hardware to match the housing in color and shall be primed and painted.

H. Acceptable Enclosure Manufacturers: Robinson, E.K. Machine, Phoenix Products, Professional Power Products, or approved equal.

2.15 SOURCE QUALITY CONTROL

A. Prior to shipment, all equipment furnished under this specification shall be factory witness inspected and tested if requested, to demonstrate conformance with this specification. Conduct factory witness tests on generator to verify proper operation and conformance to these specifications.

B. Submit factory testing script for approval a minimum of 30 working days prior to test.

C. Provide two (2) weeks minimum notice of test dates.

D. Supply all equipment, metering, devices, and apparatus required to test the equipment. Supply a calibrated Drantez or BMI disturbance analyzer capable of sub-cycle recording with a wave form analyzer and recording strip chart to record step load voltage and frequency transient response.

E. All meters to be used in factory acceptance tests are to be calibrated within 6 month of the test.

F. Meter Accuracy Test: Using calibrated meters, verify voltage and current accuracy at the following load levels: 0%, 25%, 50%, 75% and 100% of full load.

G. Provide manufacturer standard production Engine Generator Run Test (to be conducted on all engine generators at the engine generators factory prior to installation in the enclosure): Conduct a full-load test at rated power factor (0.8 PF) using an artificial load bank. Read and record all gages and meters before starting the test, then every 15 minutes during the test. Conduct a thermographic scan on each cylinder head. Record cylinder head temperatures (make measurements at same aim-point). After completion of test, remove the load and run the engine generator at no load for 10 minutes; then shut unit down and immediately make one last recording of all gage and meter indications.

H. Certified Factory Test Reports: Record and keep detailed records of all factory testing procedures and results including load test reports.

PART 3 - EXECUTION

3.1 EXAMINATION (INSTALLING CONTRACTOR)

A. Review the engineering drawings and check for obstructions and interferences prior to locating and installing the engine generator enclosure.

B. Examine installation area to assure there is enough clearance to install engine generator enclosure.

C. Verify all electrical connections to be made prior to installation of the engine generator enclosure.

3.2 INSTALLATION (INSTALLING CONTRACTOR)

A. Install engine generators including outdoor enclosures and all associated components in accordance with final submittals and manufacturer's instructions. Verify measurements and dimensions at the jobsite and coordinate with work of other trades. Install in locations shown on the Drawings, in proper alignment, plumb and level.

B. Install engine generator enclosure with adequate space for removal, repair and clearances. Provide sufficient clearances to insure adequate intake air for proper engine generator operation. Provide unrestricted air flow at discharge.

C. Install engine generator enclosure with sub-base fuel tank on a reinforced foundation pad in accordance with the Drawings.

D. Assemble components and parts that have been shipped individually, if unassembled, for shipment purposes. Comply with manufacturer's installation instructions.

E. Provide all field wiring and connections required for complete assembly of generator outdoor enclosure including all components to make a complete and operational system.

F. Provide all wiring and connections to building automation system for remote monitoring.

G. Provide all wiring and connections to remote annunciator panels.

H. Provide all control, alarm and monitoring wiring between generator enclosures and low voltage switchboards per manufacturer's instructions and as shown on the Drawings.

I. Provide all 480-volt, 3 phase power feeds and connections to distribution panelboards within enclosure.

J. Provide equipment grounding connections as indicated on the Drawings.

K. Tighten connections and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for equipment connectors. Where Manufacturer's torqueing requirements are not indicated, tighten connectors and

terminals to comply with tightening torques specified in UL Standard 486A. Provide torque seal marks per Owners requirements.

3.3 REMOTE ANNUNCIATORS

A. Main security office: coordinate wiring and installation requirements with site electrical contractor.

3.4 IDENTIFICATION (INSTALLING CONTRACTOR)

A. Provide identification of engine-generator on exterior housing in two locations.

B. Identify fuel oil piping.

C. Identify all electrical devices, outlets, and distribution equipment.

D. Identify all devices, equipment, and systems with reference to approved shop drawings.

3.5 HAZMAT SIGNAGE (INSTALLING CONTRACTOR)

A. Comply with local codes and regulations for identification of hazard material of fuel oil

B. Provide placard of permanent construction

C. Provide placard of size, type, lettering as required by AHJ

D. Signage to be permanently fixed in location designated by AHJ

3.6 TORQUE SAMPLING REQUIREMENTS

A. Provide for torque sampling.

3.7 STARTUP SERVICES

A. Manufacturer: Provide the services of a qualified factory-trained manufacturer's representative(s) to conduct equipment pre-startup, energization and startup.

1. Provide engineering services, tools and necessary test equipment to perform inspection and startup procedures.
2. Perform all inspections and startup procedures per manufacturer's written instructions.
3. Provide technical direction and assistance to the contractor in general assembly of the equipment, connections, and adjustments, and testing of the assembly and components contained therein.
4. Verify that engine generators and enclosures are installed and connected per the Contract Documents
5. Provide all checklists and equipment start up plans. For each piece of equipment, the technician shall complete, a start-up completion form certifying that the equipment has been properly installed, matches the approved submittals, has

been started, and is functioning to the Manufacturer's standards within three (3) working days of completion of start-up.

B. Contractor: Assist factory authorized service representative(s) in performing startup services.

3.8 MANUFACTURER'S CERTIFICATION

A. A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted, and tested in accordance with the manufacturer's recommendations and NFPA 110.

3.9 FIELD QUALITY CONTROL

A. Manufacturer:

1. Provide the services of a qualified factory-trained manufacturer's representative(s) to assist Contractor with site acceptance testing.
2. Participate in weekly QA/QC meetings for providing updates on QA/QC items as well as manpower scheduling for QA/QC item resolution, start-up, commissioning support and training.
3. Conduct fuel tank pressure leak test at final installation site.
4. In conjunction with Contractor, program and sign-off that the "as-left" settings for each adjustable circuit breaker is per the approved coordination study.

B. Contractor:

1. Assist manufacturer to provide electrical acceptance testing.

3.10 COMMISSIONING

A. Manufacturer: Provide onsite services of a qualified factory-trained manufacturer's representative(s) to assist in the commissioning process for the duration required.

3.11 DEMONSTRATION

A. Manufacturer:

1. Provide adequate hours of on-site maintenance and operational training for Owner's personnel. Training shall be broken into smaller training segments at the discretion of the Owner. Schedule and coordinate all training dates with the Owner. All training dates shall be scheduled by the manufacturer and approved by the Owner a minimum of two weeks prior to training.
2. Instruction shall be dedicated solely to engine-generator sets and their accessories and provided by competent instructors fully familiar with the equipment. Casual discussions with the Owner's employees shall not be included as part of the instruction.
3. Training shall consist of both classroom and hands on equipment operation.
4. To qualify for time expended, the manufacturer must have the authorized Owner Representative's signature for each training session.

B. Contractor: Assist factory-authorized service representative to train Owner's personnel.

3.12 COMMUNICATION INTERFACE

A. Manufacturer shall provide the generator monitoring and alarm data in real and historical time in BACnet protocol to the Building Information Management System (BIM) and coordinate with the BIM Contractor to ensure that this information is displayed on an internet accessible dashboard in both real time and historical readings.

B. Alerting select recipients for generator alarms and maintenance by email or SMS.

END OF SECTION 260622

# SECTION 262413 - SWITCHBOARDS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Provide materials, equipment, fabrication, delivery, and testing for two switchboards in San Jose, CA. One switchboard shall be located in the South Building #1 and the second switchboard shall be located in the North Building #3 on concrete floors. The switchboards shall be in conformity with the project drawings and specifications, applicable codes, standards, and authorities having jurisdiction, for the following:

1. Shall be designed to replace the existing main switchboard except that they will have provisions for both Utility Power and Generator Power.

2. Shall have approximately the same footprint as the existing switchboard to facilitate reconnecting existing underground feeders. See project plans.

3. Shall be rated 2000 A, 480 V and 42 KAIC minimum.

4. Utility Metering Compartment: Fabricated compartment and section complying with utility company's requirements.

5. Transfer Control between the main utility circuit breaker and the generator main circuit breaker.

### 1.2 REFERENCES

A. American National Standards Institute (ANSI) C12 for Electricity Metering

B. ANSI C57.13 Requirements for Instrument Transformers

C. National Electrical Manufacturers’ Association (NEMA) AB1 Molded Case Circuit Breakers

D. NEMA PB2 Dead Front Distribution Switchboards

E. Underwriters Laboratories (UL) UL891

### 1.3 RELATED SECTIONS

A. Section 015001 Temporary Power

B. Section 260622 Engine Generator

### 1.4 SUBMITTALS

A. Product Data: Type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: Switchboard and related equipment.

1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.

2. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NEMA PB 2, "Deadfront Distribution Switchboards."

C. Comply with NFPA 70.

1.6 WARRANTY

A. The manufacturer shall warrant products against defects in material and workmanship for 12 months from the date of commissioning. During the warranty period the manufacturer shall repair or replace defective products.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. The Contractor shall coordinate with the Owner and Manufacturer in establishing delivery dates, receiving, unloading and storage of the Switchboards until it will be installed.

B. The manufacturer is responsible for delivery of the Switchboards to the project site. The Owner and the Contractor shall inspect the Switchboards upon delivery.

C. Provide protective coverings during construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

1. Square D/Schneider Electric.

2. Eaton Corporation.

3. ABB/General Electric Co.; Electrical Distribution & Protection Div.

4. Siemens Energy & Automation, Inc.

5. Industrial Electrical Manufacturing (IEM).

6. Butcher Power Products.

B. If switchboard manufacturer selected is IEM or Butcher Power Products, the circuit breakers and power transfer equipment shall be by Schneider, Eaton, ABB or Siemens.

C. Front-Connected, Front-Accessible Switchboards: Fixed, individually mounted main device, panel-mounted branches, and sections rear aligned.

D. Nominal System Voltage: As shown on plans.

E. Main-Bus Continuous rating: As shown on plans.

F. Enclosure: Steel, NEMA 250, Type 1.

G. Enclosure Finish: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

H. Barriers: Between adjacent switchboard sections.

I. Utility Metering Compartment: Fabricated compartment and section complying with utility company's requirements. If separate vertical section is required for utility metering, match and align with basic switchboard.

J. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

K. Dead Front or Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

L. Pull Box on Top of Switchboard (if required for Generator Feeders):

1. Adequate ventilation to maintain temperature in pull box within same limits as switchboard.

2. Removable covers shall form top, front, and sides. Top covers at rear shall be easily removable for drilling and cutting.

3. Cable supports shall be arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.

M. Buses and Connections: Three phase, four wire, unless otherwise indicated. Aluminum or hard-drawn copper of 98 percent conductivity with feeder circuit-breaker line connections.

1. Ground Bus: 1/4-by-2-inch- minimum-size, hard-drawn copper of 98 percent conductivity, equipped with pressure connectors for feeder and branch-circuit ground conductors.

2. Contact Surfaces of Buses: Silver or Tin plated aluminum or copper.

3. Main Phase Buses, Neutral Buses, and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from one end.

N. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.2 SURGE PROTECTION DEVICES (SPD)

A. IEEE C62.41, integrally mounted, solid-state, parallel-connected, suppression and filtering modules.

B. Surge Current Capacity:

1. 250 KA per phase.

2. 125 KA per mode.

C. EMI/RFI Noise Attenuation Using 50-ohm Insertion Loss Test: 50 dB at 100 kHz.

D. Maximum UL 1449 clamping levels shall not exceed 400 V, line to neutral and line to ground on 120/208 V systems and 800 V, line to neutral and line to ground on 277/480 V systems.

E. Accessories:

1. LED lights on failure of any surge diversion module.

2. Six-digit transient-counter set to total transient surges that deviate from the sine-wave envelope by more than 125 V.

2.3 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 3, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

3. Electronic trip-unit circuit breakers shall have RMS sensing, field-replaceable rating plug, and the following field-adjustable settings:

a. Instantaneous trip.

b. Long- and short-time pickup levels.

c. Ground-fault if shown on the Plans.

d. Arc Reduction Maintenance Switch (ARMS) where required.

4. GFCI Circuit Breakers: Single- and two-pole configurations with 30-mA trip sensitivity.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.

2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

3. Ground-Fault Protection: Where shown on the Plans, integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

4. Shunt Trip: Where shown on the Plans, 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

2.4 TRANSFER CONTROL

A. Provide the switchboard with one utility main breaker and one generator main breaker. The transfer scheme shall be designed to automatically open the utility main breaker upon loss of utility power and transfer all loads to the generator main by closing the generator main breaker. The system shall be capable of transferring back automatically in an open transition mode based on the position of the auto retransfer selector switch.

B. The logic for the automatic transfer scheme is provided by a Programmable Logic Controller (PLC). Microprocessor auto transfer controllers are also acceptable. Customer interface shall be via a touchscreen. The PLC utilizes breaker status, relay and switch inputs to determine the switchgear sequence of operation. The PLC outputs energize breaker close and trip circuits and touchscreen indicators.

C. Manufacturer shall provide references and contact information of three previous projects that have used the transfer control system.

2.5 CONTROL POWER

A. Control Circuits: 120 V, supplied through secondary disconnecting devices from control-power transformer.

B. Control-Power Fuses: Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.

C. Control Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

2.6 IDENTIFICATION

A. Mimic Bus: Continuously integrated mimic bus factory applied to front of switchboard. Arrange in single-line diagram format, using symbols and letter designations consistent with final mimic-bus diagram. Coordinate mimic-bus segments with devices in switchboard sections to which they are applied. Produce a concise visual presentation of principal switchboard components and connections.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Schedule installation of the Switchboards during weekend or holidays as described in Section 015001 - Temporary Power, to minimize the disruption of normal operation of the facility.

B. Install switchboard and accessories according to NEMA PB 2.1 and NECA 40.

C. Install and anchor switchboard level on concrete floor per manufacturer's instructions and as shown on the Drawings.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboard, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

F. Install overcurrent protective devices, transfer control switch, transient voltage suppression devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

G. Install equipment in accordance with reviewed product data, final shop drawings, manufacturer's written instructions and recommendations, and as indicated on the Drawings E-5, E-6, E-8 and E-9.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "General Electrical Requirements."

B. Every circuit shall be legibly identified as to its clear, evident and specific purpose or use. The identification shall include an approved degree of detail that allows each circuit to be distinguished from all others. Spares shall also be described accordingly. Label all circuit breakers with laminated plastic nameplates with stainless steel screws. The circuit breaker nameplate shall provide the load, size. See nameplate schedule attached.

C. Switchboard Nameplates: Label each switchboard compartment with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws. Switchboards shall be permanently marked to indicate each device or equipment where power originates.

D. Warning labels and nameplates shall be present at access locations to advise personnel of possible hazards. The SWBD shall be marked in accordance with UL, NFPA 70 NEC, NFPA 70E, and other applicable standards.

3.3 FIELD QUALITY CONTROL AND COMMISSIONING

A. Startup, Testing, and Training shall be performed by the switchboard manufacturer.

B. Functional testing, commissioning, and first parameter adjusting shall be carried out by a factory-trained manufacturer's field service representative. The manufacturer's field service technician shall provide all material, equipment, labor and technical supervision to perform inspection, testing and adjustments to ensure equipment is installed,

adjusted, and tested in accordance with the manufacturer's recommendations and is ready for operation. The manufacturer's field service technician shall replace damaged or malfunctioning equipment and report to the Engineer any discrepancies or issues with the installation.

C. Prepare for acceptance tests as follows:

1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

D. Perform field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in appropriate sections of NETA ATS.

2. Provide certificate of proper installation and operation.

3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

4. Provide 4 hours of on-site training in the operation of the switchboards including the operation of the Programmed Transfer Control equipment.

END OF SECTION 262413

## ATTACHMENT

## CIRCUIT BREAKER NAMEPLATE SCHEDULE

| TAG # | TYPE | SIZE | INSCRIPTION |
|---|---|---|---|
| **BUILDING #1 SWITCHBOARD** | | | |
| 1 | PLATE | 1” X 4” | UTILITY BRKR<br>1600A/3P |
| 2 | PLATE | 1” X 4” | GEN BRKR<br>1000A/3P |
| 3 | PLATE | 3/4” X 4” | BUS BARN 150A/3P |
| 4 | PLATE | 3/4” X 4” | KITCHEN 400A/3P |
| 5 | PLATE | 3/4” X 4” | DIST. PNL “DB” 1200A/3P |
| 6 | PLATE | 3/4” X 4” | BLDG #2 175A/3P |
| 7 | PLATE | 3/4” X 4” | PNL “SH” 100A/3P |
| **BUILDING #3 SWITCHBOARD** | | | |
| 1 | PLATE | 1” X 4” | UTILITY BRKR<br>1600A/3P |
| 2 | PLATE | 1” X 4” | GEN BRKR<br>1000A/3P |
| 3 | PLATE | 3/4” X 4” | ELEV #1 70A/3P |
| 4 | PLATE | 3/4” X 4” | ELEV #2 90A/3P |
| 5 | PLATE | 3/4” X 4” | FILTER “H1” 400A/3P |
| 6 | PLATE | 3/4” X 4” | FILTER “H2” 400A/3P |
| 7 | PLATE | 3/4” X 4” | FILTER “H3” 400A/3P |
| 8 | PLATE | 3/4” X 4” | UPS 400A/3P |

| | | | |
|---|---|---|---|
| 9 | PLATE | 3/4” X 4” | MCC 800A/3P |
| 10 | PLATE | 3/4” X 4” | MTS 600A/3P |
| 11 | PLATE | ¾” X 4” | EV CHARGER 500A/3P |

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# SECTION 263624 - MANUAL TRANSFER SWITCH

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Provide materials, equipment, fabrication, delivery, installation and testing for a Manual Transfer Switch (MTS) in San Jose, CA. The MTS shall be located near the North Building #3 on a concrete base. The MTS shall be in conformity with the project plans and specifications, applicable codes, standards, and authorities having jurisdiction, for the following:

1. Manually operated and mechanically held with integrated cam-lock type connectors for a portable generator.

2. Rated 600 A and 480 V.

3. Enclosure shall be weatherproof and secured with a full height hinged door rated NEMA 3RX.

4. Shall have a strip heater with thermostat to prevent condensation.

### 1.2 REFERENCES

A. UL 1008 Transfer Switch Equipment

B. NFPA 70 – National Electrical Code, Articles 517, 700, 701 and 702

C. NEMA Standard ICS 1-109.21 – Testing of Electrical Equipment

D. NEMA Standard ICS 10-2005 – AC Transfer Switch Equipment

E. NFPA 110 - Standard for Emergency and Stand-by Power Systems.

### 1.3 SUBMITTALS

A. Provide submittals in compliance with Section 260500 – Submittal including the following.

1. Product data and wiring diagrams for Manual Transfer switch.

2. Manufacturer’s Certificate of Compliance stating any exceptions to these specifications.

### 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. The Contractor shall coordinate with the Owner and Manufacturer in establishing delivery dates, receiving, unloading and storage of the MTS until it will be installed.

B. The manufacturer is responsible for delivery of the MTS to the project site. The Owner and the Contractor shall inspect the MTS upon delivery.

C. Provide protective coverings during construction.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

B. The Manual Transfer Switch shall be ASCO Series 300 Catalog number J03MTQA30600N0XS with 44G strip heater, 73 surge suppressor and 170 accessories; Trystar or approved equal.

2.2 GENERAL

A. Like Items of Equipment: Provide end products of one manufacturer in order to achieve standardization for appearance, operation, maintenance, spare parts, and service.

B. The transfer switch unit shall be manually operated and mechanically held. The switch shall be mechanically interlocked to ensure only one of three possible positions, Source 1, Source 2, or Center Off. Fused disconnect type switches shall not be acceptable.

C. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.

D. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented blow-on construction for high withstand current capability and be protected by separate arcing contacts.

E. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors.

F. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

G. Where neutral conductors must be switched, the MTS shall be provided with fully rated neutral transfer contacts.

H. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully-rated AL-CU pressure connectors shall be provided.

I. Manual transfer switch enclosure shall be Type 3RX constructed of continuous seam-welded stainless steel. The main access shall be through an interlocked, hinged door that extends the full height of the enclosure. Access for generator cables with female cam-style plugs shall be via a) drawn flange cable entry openings in the bottom of enclosure for wall mount units, or b) hinged lower door for pad mount units. A hinged flap door shall be provided to cover the cable openings when cables are not connected; the hinged flap door shall allow cable entry only after the main access door has been opened.

J. The MTS shall be tested in accordance with UL 1008 for transfer switches. Switch ratings of 260 amperes and less shall have endurance rating of 6000 cycles, 400-ampere shall have endurance rating of 4000 cycles, and 600 – 1200 ampere shall have endurance rating of 3000 cycles.

2.3 RATINGS

A. The transfer switch shall be rated 600A for total system load including inductive and resistive loads.

B. The MTS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the MTS terminals with the type of overcurrent protection shown on the plans. WCR MTS ratings @ 480v shall be as follows when used with specific circuit breakers or current limiting fuses:

| MTS Size | Withstand & Closing Rating MCCB | W/CLF |
|---|---|---|
| 150 - 600 | 50,000A | 200,000 |
| 800 - 1200 | 65,000A | 200,000 |

2.4 OPERATION

A. The transfer switch shall be arranged for manually actuated manual operation.

B. The manual transfer shall be actuated via a mechanical operating mechanism.

C. The manual operating handle shall be capable of external operation without opening the enclosure door.

D. It shall have the same contact to contact speed as automatic operation.

E. There shall be three positions for manual operation:

1. Connected to Source 1 (preferred)
2. Connected to Source 2 (alternate)
3. Connected to center off (disconnected position)

F. Switch position when connected to Source 1, or Source 2 shall be pad – lockable.

2.5 TESTS

A. Transfer switch and components shall be tested in accordance with UL-1008 for the ratings of each switch.

B. Control panel shall meet the voltage surge withstand capability in accordance with ANSI C37.90a and the impulse withstand voltage test in accordance with NEMA ICS 1-109.

C. Factory tests shall include dielectric strength test per NEMA Standard ICS 1-109.05, and the complete unit shall be tested to ensure proper operation of all components and sequence of operation.

D. Each unit shall be subject to a functional test in the field prior to operational testing. Each function shall be tested and demonstrated in the presence of the Owner's Representative. After the functional testing has been completed, operational testing in conjunction with operational testing of the complete emergency generator system shall be conducted and demonstrated in the presence of the Owner's Representative.

E. Submit detailed functional testing and operational test procedures for review by the Engineer prior to testing. Follow approved procedures in conducting field testing and demonstrating.

PART 3 - EXECUTION

3.1 GENERAL

A. Prior to installation of manual transfer switches, Contractor shall examine the areas and conditions under which the manual transfer switch is to be installed.

B. Concrete Pads: Provide minimum 3-inch-thick concrete housekeeping pads under all free-standing pieces of switchgear. Extend pads a minimum of 2 inches beyond the edges of the equipment. Provide anchoring as shown on the Drawings.

C. Install equipment in strict accordance with manufacturer's recommendations. In addition, the installation shall meet the requirements of local codes, the National Electrical Code and National Electrical Contractors Association's "Standard of Installation".

C. Make conductor connections per manufacturer's recommendations.

D. Provide all control wiring connections to genset for testing, manual and automatic operation. Label and tape all control wires at MTS and genset and all junction and pull boxes.

END OF SECTION 263624

**SECTION 31 00 00**
**SITE CLEARING**

## PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Protecting existing trees and vegetation to remain.
2. Removing trees and other vegetation.
3. Clearing and grubbing.
4. Topsoil stripping.
5. Removing above-grade site improvements.
6. Disconnecting, capping or sealing, and abandoning site utilities in place.
7. Disconnecting, capping or sealing, and removing site utilities.

B. Related Sections include the following:

1. Division 1 for verifying utility locations and for recording field measurements.
2. Division 1 Section for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures during site operations.
3. Division 2 for partial demolition of buildings or fences and structures undergoing alterations.
4. Division 2 for protecting trees remaining on-site that are affected by site operations.
5. Division 3 for soil materials, excavating, backfilling, and site grading.
6. Division for finish grading, including placing and preparing topsoil for lawns and planting.

1.2 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of weeds, roots, and other deleterious materials.

1.3 MATERIALS OWNERSHIP

A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.4 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings according to Division 1 Section "Contract Closeout."

1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing indicated removal and alteration work on property adjoining Owner's property will be obtained by Owner before award of Contract.

C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

D. Notify utility locator service for area where Project is located before site clearing.

**PART 2 - EXECUTION**

2.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

2.2 TREE PROTECTION

A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.

2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.

B. Do not excavate within drip line of trees, unless otherwise indicated.

C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

1. Cover exposed roots with burlap and water regularly.

2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3. Coat cut faces of roots more than 1-1/2 inches (38 mm) in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.

4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.

2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

## 2.3 UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing when requested by Contractor.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Owner will arrange to shut off indicated utilities when requested by Contractor.

2. Arrange to shut off indicated utilities with utility companies.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated.

D. Excavate for and remove underground utilities indicated to be removed.

## 2.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

2. 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.

3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.

4. Use only hand methods for grubbing within drip line of remaining trees.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding 8-inch (200-mm) loose depth, and compact each layer to a density equal to adjacent original ground.

2.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Limit height of topsoil stockpiles to 72 inches (1800 mm).

2. Do not stockpile topsoil within drip line of remaining trees.

3. Dispose of excess topsoil as specified for waste material disposal.

4. Stockpile surplus topsoil and allow for respreading deeper topsoil.

2.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

2.7 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

**END OF SECTION**

**SECTION 32 12 16**
**ASPHALT PAVING**

## 1. PART 1 GENERAL

### 1.01 SUMMARY

A. Provide asphaltic concrete paving where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

### 1.02 SUBMITTALS

A. Comply with pertinent provisions of these Sections.

B. Product data: Within 30 calendar days after the Contractor has received the Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Certificates, signed by the materials producer and the asphalt-paving subcontractor, stating that materials meet or exceed the specified requirements.

### 1.03 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

### 1.04 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of these Sections.

## 2. PART 2 PRODUCTS

### 2.01 AGGREGATES

A. Provide aggregates consisting of crushed stone, gravel, sand, or other sound, durable, mineral materials processed and blended, and naturally combined.

B. Base rock shall conform to Caltrans Class 2 Aggregate Base.

C. Base aggregate maximum size: Reference Lowney Associates, Report No. 1481-1, dated August 27, 1999.

D. Asphalt Concrete shall be Type B and shall conform to Section 39 of the Standard Specifications and these Special Provisions:
   1. The viscosity grade of paving asphalt shall be AR-4000.
   2. In no case shall the minimum asphalt content be below 5.3% of the dry aggregate weight.
   3. All surface courses of asphalt concrete shall be 1/2” maximum aggregate, and a minimum of 5.8% asphalt.

2.02 WEED KILLER

A. Provide a dry, free-flowing, dust-free chemical compound containing not less than 30% sodium chlorate or a chlorateborate compound, non-flammable, not creating a fire hazard when applied in accordance with the manufacturer's recommendations, soluble in water, and capable of being spread dry or in solution.

B. Acceptable products:
1. "Clorax 40": Chipman Chemical Company, Inc., Palo Alto, California
2. "Monobar-Chlorate": U.S. Borax and Chemical Corp., Los Angeles, California

2.03 HEADERS AND STAKES

A. Provide Redwood, Construction grade, in dimensions shown on the Drawings or as required for the use where dimensions are not shown on the Drawings.

2.04 ASPHALTS

A. Asphalt Concrete shall be Type B and shall conform to Section 39 of the Standard Specifications and these Special Provisions:
1. The viscosity grade of paving asphalt shall be AR-4000.
2. In no case shall the minimum asphalt content be below 5.3% of the dry aggregate weight.
3. All surface courses of asphalt concrete shall be 1/2” maximum aggregate, and a minimum of 5.8% asphalt.

2.05 SLURRY COAT

A. Poly-Kote TA-1000 is a special blend of asphalt emulsion, mineral fillers, fiber, and polymer for use on parking lots, driveways, playgrounds, tennis courts, and other asphalt surfaces. Poly-Kote TA-1000 is formulated to fill voids, provide a smoother black surface, and protect asphalt surfaces from possible water damage. Contractor shall apply a slurry coat on new and existing AC pavement.

PHYSICAL PROPERTIES (NO ASBESTOS OR COAL TAR)

Color (cured film).....Deep Black
Penetration of base asphalt.....40 pen. Max. ASTM D-5
Residue at 300-400 degrees f.....55-65 %
Cone Penetration at 77 degrees f.....400-750 dmm ASTM D-217
Density;lbs.per gallon at 60 degreesf.....10-11

B. TA-200 is a specially blended acrylic copolymer emulsion, designed to modify Poly-Kote TA 1000 asphalt base. TA-200 will increase toughness/flexibility, and enhance suspension of fillers. Its also improves color, oil/gas resistance, and will protect from "DAMAGING" ultra-violet rays; when added to POLY-KOTE TA 1000.

| PHYSICAL PROPERTIES | Minimum | Maximum |
|---|---|---|
| LBS. Per Gallon @ 77 Degrees f | 8.5 | 8.9 |
| Specific Gravity @ 77 Degrees f | 1.0 | 1.2 |
| % Nonvolatile | 49% | 51% |

2.06 MIXING ASPHALTIC CONCRETE MATERIALS

A. Provide hot plant mixed asphaltic concrete paving materials.
1. Temperature leaving the plant: 290 degrees F minimum, 320 degrees F maximum.
2. Temperature at time of placing: 280 degrees F minimum.

## 3. PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 FINAL PREPARATION OF SUBGRADES

A. After preparation of subgrade as specified in another Section of these Specifications, scarify and moisture condition the entire area to be paved to a depth of 8 inches, and then compact to a smooth, hard, even surface of 95% compaction to receive the aggregates.

B. Apply the specified week killer to the entire area to be paved. Adhere to the manufacturer's application recommendations.

3.03 PLACEMENT OF BASE COURSES

A. Sub-base (when required):
1. Spread the specified sub-base material to a thickness providing the compacted thickness shown on the Drawings.
2. Compact to 95%.

B. Base:
1. Spread the specified base material to a thickness providing the compacted thickness shown on the Drawings. No single lift shall exceed 8" in loose thickness prior to compaction.
2. Compact to 95% at near optimum moisture content.

C. Thickness tolerance: Provide the compacted thicknesses shown on the Drawings within a tolerance of minus 0.0" to plus 0.5".

D. Smoothness tolerance: Provide the lines and grades shown on the Drawings within a tolerance of 3/8" in ten feet.
1. Deviations: Correct by removing materials, replacing with new materials, and reworking or recompacting as required.

E. Moisture content: Use only the amount of moisture needed to achieve the specified compaction.

3.04 PLACEMENT OF ASPHALTIC CONCRETE PAVING

A. Install the specified headers and stakes to achieve the arrangement of paving shown on the Drawings.

B. Remove all loose materials from the compacted base.

C. Apply the specified prime coat and tack coat where required and allow to dry, in accordance with the manufacturer's recommendations as approved by the Engineer.

D. Adjust frames and covers, if so required, to meet final grades.

E. Receipt of asphaltic concrete materials:
1. Do not accept material unless it is covered with a tarpaulin until unloaded, and unless the material has a temperature of not less than 280 degrees F.

2. Do not commence placement of asphaltic concrete materials when the atmospheric temperature is below 50 degrees F, nor during fog, rain, or other unsuitable conditions.

F. Spreading:
1. Spread material in a manner that requires the least handling.

2. Where thickness of finished paving will be 3" or less, spread in one layer.

G. Rolling:
1. After the material has been spread to the proper depth, roll until the surface is hard, smooth, unyielding, and true to the thickness and elevations shown on the Drawings.
2. Roll in at least two directions until no roller marks are visible.
3. Finished paving smoothness tolerance:
   a. Free from birdbaths.
   b. No deviations greater than 1/8" in six feet.

3.05 FLOOD TEST

A. Prior to application of seal coat, perform a flood test in the presence of the Engineer.

B. Method:
1. Flood the entire asphaltic concrete paved area with water by use of a tank truck or hoses.

2. If a depression is found where water ponds to a depth of more than 1/8" in six feet, feather and smooth the edges of fill so that the joint between fill and original surface is invisible and retest. Continue until ponding is eliminated.

3.06 APPLICATION OF SLURRY COAT

A. Prepare the surfaces, mix the seal coat material, and apply in accordance with the manufacturer's recommendations as approved by the Engineer.

B. Apply slurry coat as specified above, 2.05.

C. Achieve a finished surface of slurry coat which, when dry and thoroughly set, is smooth, tough, resilient, of uniform black color, and free from coarse textured areas, lap marks, ridges, and other surface irregularities.

3.07 PROTECTION

A. Protect the asphaltic concrete paved areas from traffic until the sealer is set and cured and does not pick up under foot or wheeled traffic.

**END OF SECTION**

# SECTION 32 13 12
# CONCRETE PAVING

## PART 1 - GENERAL

1.1 SUMMARY

A. Provide Portland cement concrete paving where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Do not commence placement of concrete until mix designs have been reviewed and approved by the Architect and all governmental agencies having jurisdiction, and until copies of the approved mix designs are at the job site and the batch plant.

C. Provide access for, and cooperate with, the inspector and testing laboratory described in General Requirements.

## PART 2 - PRODUCTS

2.1 FORMS

A. Provide wood or metal formwork, including adequate bracing, to the lines and grades shown on the Drawings within a vertical tolerance of 0.05 feet and an alignment tolerance of 1" at any point.

B. Earth forms will not be permitted for paving.

2.2 REINFORCEMENT

A. Comply with the following as minimums:

1. Bars: ASTM A615, grade 60, unless otherwise shown on the Drawings, using deformed bars for number 3 and larger.
2. Welded wire fabric: ASTM A185
3. Bending: ACI 318.

B. Fabricate reinforcement to the required shapes and dimensions, with fabrication tolerances complying with the CRSI "Manual of Standard Practices."

C. Do not use reinforcement having any of the following defects:

1. Bar lengths, depths, or bends exceeding the specified fabricating tolerances;

2. Bends or kinks not indicated on the Drawings or required for the Work;

3. Bars with cross-section reduced due to excessive rust or other causes.

2.3 CONCRETE

A. Comply with the following as minimums:

1. Portland cement: ASTM C150, type I or II, low alkali.

2. Aggregate, general:

a. ASTM C30, uniformly graded and clean;

b. Do not use aggregate known to cause excessive shrinkage.

3. Aggregate, coarse: Crushed rock or washed gravel with maximum size between 3/4" and 1-1/2", and with minimum size number 4.

4. Aggregate, fine: Natural washed sand of hard and durable particles varying from fine to particles passing a 3/8" screen, of which at least 12% shall pass a 50-mesh screen.

5. Water: Clean and potable.

B. Use only such additives as are recommended in the mix design and approved by the Architect and governmental agencies having jurisdiction.

C. Unless specified otherwise on the drawings, all concrete shall be not less than 3,000 psi 28-day compressive strength.

D. Provide "Hunt TLF" curing agent manufactured by Hunt Process Co., Inc., at the manufacturer's recommended rate of application.

2.4 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

**PART 3 - EXECUTION**

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FINAL PREPARATION OF SUBGRADES

A. After preparation of subgrade as specified in another Section of these Specifications, thoroughly scarify and sprinkle the entire area to be paved, and then compact to a smooth, hard, even surface of 95% compaction to receive the aggregates.

3.3 PLACEMENT OF BASE COURSE

A. Base (where required):

1. Spread the specified coarse aggregate to a thickness providing the compacted thickness shown on the Drawings. No single lift shall exceed 8" in loose thickness prior to compaction.

2. Compact to 95% at near optimum moisture content.

B. Thickness tolerance: Provide the compacted thicknesses shown on the Drawings within a tolerance of minus 0.0" to plus 0.5".

C. Smoothness tolerance: Provide the lines and grades shown on the Drawings within a tolerance of 0.05 feet vertically and 1" in alignment at any point.

D. Correct deviations by removing materials, replacing with new materials, and reworking or recompacting as required.

E. Use only the amount of moisture needed to achieve the specified compaction.

3.4 INSTALLATION

A. Upon completion of base course and formwork, install reinforcement as shown on the Drawings.

1. Clean reinforcement to remove loose rust and mill scale, earth, and other materials that reduce bond or destroy bond with concrete.

2. Position, support, and secure reinforcement against displacement by formwork, construction, and concrete placement operations.

3. Place reinforcement to obtain the required coverages for concrete protection.

B. Transit mix the concrete in accordance with provisions of ASTM C94.

1. With each load, provide ticket certifying to the materials and quantities and to compliance with the approved mix design.

2. On the transit-mix ticket, state the time water was first added to the mix.

3. At the batch plant, withhold 2-1/2 gal of water per cu yd of concrete.

4. Upon arrival at the job site, and as directed by the testing laboratory inspector, add all or part of the withheld water before the concrete is discharged from the mixer.

5. Mix not less than five minutes after the withheld water has been added, and not less than one minute of that time immediately prior to discharge of the batch.

6. Unless otherwise directed, provide 15 minutes total mixing time per batch after first addition of water.

C. Do not use concrete that has stood over 30 minutes after leaving the mixer, or concrete that is not placed within 90 minutes after water is introduced into the mix.

D. Conveying:

1. Place concrete in accordance with the following and pertinent recommendations contained in ACI 304.

2. Deposit concrete continuously in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section.

3. If a section cannot be placed continuously, provide construction joints as specified herein.

4. Perform concrete placing at such a rate that concrete that is being integrated with fresh concrete is still plastic.

5. Deposit concrete as nearly as practicable in its final location so as to avoid segregation due to rehandling and flowing.

6. Do not subject concrete to any procedure that will cause segregation.

7. Do not use concrete which becomes non-plastic and unworkable, or does not meet required quality control limits, or has been contaminated by foreign materials.

8. Remove rejected concrete from the site.

E. Deposit and consolidate concrete in a continuous operation within the limits of construction joints until the placing of a panel or section is completed.

1. Bring surfaces to the correct level with a straightedge, and then strike off.

2. Use bullfloats or darbies to smooth the surface, leaving it free from bumps and hollows.

3. Do not sprinkle water on the plastic surface. Do not disturb the surfaces prior to start of finishing operations.

F. Expansion joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated.

1. Extend joint fillers full-width and depth of joint, and not less than 1/2 inch or more than 1 inch below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.

2. 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.

3. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

G. Finishing:

1. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.

2. During or after the first floating, check the planeness of surface with a ten-foot straightedge applied at not less than two different angles.

3. Cut down high spots and fill low spots, and produce a surface level within 1/4" in two feet as determined by a two foot straightedge placed anywhere on the surface in any direction.

4. Refloat the surface immediately to a uniform sandy texture.

5. While the surface is still plastic, provide a textured finish by drawing a fiber bristle broom uniformly over the surface.

a. Unless otherwise directed by the Architect, provide the texturing in one direction only.

b. Provide medium broom finish at slopes less then 6% and heavy broom finish at slopes greater or equal then 6% as directed by the Architect.

## 3.5 INTEGRAL COLOR IN CONCRETE

A. Integral colored concrete to be used in locations shown on drawings.

B. Water-reducing, set-controlling admixture; Chromix Admixture, L.M. Scofield Co., Los Angeles, CA, or approved equal.

C. Integral color shall be added as recommended by manufacturer to produce accepted color.

D. Color as shown on drawings: To be selected from manufacturer’s standard or custom colors, as accepted.

3.6 CURING AND PROTECTION

A. Beginning immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.

**END OF SECTION**

# SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Chain-link fences.
2. Swing gates.

B. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for cast-in-place concrete post footings.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Fence and gate posts, rails, and fittings.
b. Chain-link fabric, reinforcements, and attachments.
c. Gates and hardware.

B. Shop Drawings: For each type of fence and gate assembly.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include accessories, hardware, gate operation, and operational clearances.

C. Samples for Initial Selection: For each type of factory-applied finish.

### 1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of chain-link fence, operator, and gate.

B. Product Test Reports: For framework strength according to ASTM F1043, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Sample Warranty: For special warranty.

### 1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For gate operators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Emergency Access Requirements: According to requirements of authorities having jurisdiction for gates with automatic gate operators serving as a required means of access.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.7 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to comply with performance requirements.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
c. Faulty operation of gate operators and controls.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Chain-link fence and gate frameworks shall withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated according to ASCE/SEI 7.

1. Design Wind Load: As indicated on Drawings.

a. Minimum Post Size: Determine according to ASTM F1043 for post spacing not to exceed 8 feet for Material Group IA, ASTM F1043, Schedule 40 steel pipe.

B. Lightning Protection System: Maximum resistance-to-ground value of 25 ohms at each grounding location along fence under normal dry conditions.

2.2 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:

1. Fabric Height: As indicated on Drawings.
2. Steel Wire for Fabric: Wire diameter of 0.192 inch.

    a. Mesh Size: 2-1/8 inches.
    b. Zinc-Coated Fabric: ASTM A392, Type II, Class 2, 2.0 oz./sq. ft. with zinc coating applied before weaving.
    c. Polymer-Coated Fabric: ASTM F668, Class 2a over zinc-coated steel wire.

        1) Color: Black, according to ASTM F934.

    d. Coat selvage ends of metallic-coated fabric before the weaving process with manufacturer's standard clear protective coating.

3. Selvage: Knuckled at both selvages.

## 2.3 FENCE FRAMEWORK

A. Posts and Rails: ASTM F1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F1043 or ASTM F1083 based on the following:

1. Fence Height: As indicated on Drawings.

2. Heavy-Industrial-Strength Material: Group IA, round steel pipe, Schedule 40.

    a. Line Post: 2.375 inches in diameter.
    b. End, Corner, and Pull Posts: 2.875 inches in diameter.

3. Horizontal Framework Members: Intermediate top and bottom rails according to ASTM F1043.

    a. Top Rail: 1.66 inches in diameter.

4. Metallic Coating for Steel Framework:

    a. Type A: Not less than minimum 2.0-oz./sq. ft. average zinc coating according to ASTM A123/A123M or 4.0-oz./sq. ft. zinc coating according to ASTM A653/A653M.

5. Polymer coating over metallic coating.

    a. Color: Match chain-link fabric, according to ASTM F934.

## 2.4 SWING GATES

A. General: ASTM F900 for gate posts and single and double swing gate types.

1. Gate Leaf Width: As indicated.

B. Pipe and Tubing:

1. Zinc-Coated Steel: ASTM F1043 and ASTM F1083; protective coating and finish to match fence framework.
2. Gate Posts: Round tubular steel.
3. Gate Frames and Bracing: Round tubular steel.

C. Frame Corner Construction: Welded.

D. Hardware:

1. Hinges: Self-closing
    a. Locinox: Mammoth 180 – 9005, Large Size
    b. 180-degree outward swing.
2. Latch: Permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
3. Closer: Manufacturer's standard.
4. Exit Hardware:
    a. Lockset: per drawings
    b. Panic Hardware with gate lever: Per Architectural Drawings.
    c. Operable door hardware are installed within 34”-44” A.F.F.
    d. Cane Bolt: Provide cane bolt assembly with eyehole for padlock; designed to engage sleeve set in paving to secure gate(s) in open position at 180 degrees.

2.5 FITTINGS

A. Provide fittings according to ASTM F626.

B. Post Caps: Provide for each post.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails to posts.

E. Tension and Brace Bands: Pressed steel.

F. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.

H. Tie Wires, Clips, and Fasteners: According to ASTM F626.

1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:

    a. Hot-Dip Galvanized Steel: 0.148-inch- diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.

I. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. of zinc.

a. Polymer coating over metallic coating.

2. Aluminum: Mill finish.

## 2.6 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. 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. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

## 2.7 GROUNDING MATERIALS

A. Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

B. Connectors and Grounding Rods: Listed and labeled for complying with UL 467.

1. Connectors for Below-Grade Use: Exothermic welded type.
2. Grounding Rods: Copper-clad steel, 5/8 by 96 inches.

## 2.8 PRIVACY SLATS

A. General Contractor to submit privacy slat product model to Architect for review and approval.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

## 3.3 CHAIN-LINK FENCE INSTALLATION

A. Install chain-link fencing according to ASTM F567 and more stringent requirements specified.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

    a. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.

D. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.

E. Line Posts: Space line posts uniformly at 96 inches o.c.

F. Post Bracing and Intermediate Rails: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

G. Top Rail: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

H. Intermediate and Bottom Rails: Secure to posts with fittings.

I. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

J. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches o.c.

K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.

L. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side.

## 3.4 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

## 3.5 GROUNDING AND BONDING

A. Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

B. Fence and Gate Grounding:

1. Ground for fence and fence posts shall be a separate system from ground for gate and gate posts.
2. Install ground rods and connections at maximum intervals of 1500 feet.
3. Fences within 100 Feet of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet.
4. Ground fence on each side of gates and other fence openings.

    a. Bond metal gates to gate posts.
    b. Bond across openings, with and without gates, except openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches below finished grade.

C. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at grounding location.

D. Connections:

1. Make connections with clean, bare metal at points of contact.
2. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
3. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
4. Make above-grade ground connections with mechanical fasteners.
5. Make below-grade ground connections with exothermic welds.
6. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

## 3.6 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain chain-link fences and gates.

**END OF SECTION 32 31 13**

# SECTION 32 31 19 ORNAMENTAL METAL FENCES AND GATES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. This Section includes pre-manufactured ornamental metal fencing and gate systems, including concrete fence and gate post footings.

### 1.3 REFERENCES

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

1. ASTM A 653: Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc• Iron Alloy-Coated (Gal annealed) by the Hot-Dip Process.
2. ASTM A 924: Specification for General Requirements for Steel Sheet, Metallic• Coated by the Hot-Dip Process.
3. ASTM B 633: Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
4. ASTM C 33: Specification for Concrete Aggregates.
5. ASTM C 94: Specification for Ready-Mixed Concrete.
6. ASTM C 150: Specification for Portland Cement. American Welding Society (AWS).

C. California Building Code (CBC): California Code of Regulations, Title 24, Part 2.

D. National Association of Architectural Metal Manufacturers (NAAMM):

1. Metal Finishes Manual for Architectural and Metal Products.

### 1.4 PERFORMANCE REQUIREMENTS

A. Structural performance: provide ornamental metal fences and gates capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated–

1. Minimum Post Size and Maximum Spacing for Wind Velocity Pressure: Determine based on fence panel picket size and spacing, and on wind loads calculated based on requirements of the California Building Code using factors defined therein and applicable to local site conditions.
   a. Wind Speed: 85 mph.
2. Fence Panels (Typical Section Between Posts): Capable of supporting without deformation, a concentrated load of 500 LB/FT applied in the horizontal direction at mid-span between posts spaced at 8 feet apart.

3. Swing Gates: Capable of supporting a concentrated 200 LB/FT vertical load at the top corner strike side of the gate.

B. Thermal Movements: Provide ornamental metal fence and gate system that allows 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 o f materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 degree F, ambient; 180 degree F, material surfaces.

## 1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions individual components and profiles, and finishes for ornamental metal fences gates.
1. Fence and gate posts, rails, pickets, and fittings.
2. Gates and hardware.

B. Shop Drawings: Show locations of fences, gates, posts, rails, pickets, details extended posts, gate swings, hardware, and accessories. Indicate materials, dimensions sizes, weights, and finishes of components. Include plans, gate elevations, sections, details post anchorage, attachment, bracing and other required installation and operational clearances.

C. Samples for verification: For each type of ornamental metal fence and gate indicated.

D. Qualification Data: For Installer.

## 1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed ornamental metal fences and gates similar in material, design, and extent to those indicated in this Project and whose work has resulted in construction with a record successful in-service performance.
1. Engineering Responsibility: Preparation of data for ornamental metal fences and gates, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Include 10 foot length of fence and one gate complying with requirements.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section for project meetings.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Product: Subject to compliance with requirements, provide one of the following products:
1. Ameristar; Montage Commercial, per drawings
2. Equal product in accordance with Division 1 requirements for product substitutions.

2.2 MATERIALS

A. Steel Sheet for Forming Fence Components: ASTM A 924.
1. Sheet to be zinc-coated (galvanized) on both faces to meet requirements ASTM A 653, G90 coating designation.

2.3 FASTENERS

A. General: Provide the following:
1. Galvanized Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
2. Dissimilar Materials: Type 316 stainless-steel fasteners.

B. Fasteners for Anchoring Ornamental Metal Fencing 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. Provide concealed fasteners for interconnecting fencing components and for attaching fencing and gates to other work, unless otherwise indicated.
1. Where exposed fasteners are unavoidable, provide manufacturer's tamper• resistant flat-head machine screws, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

A. Seals for Picket/Rail Intersections: Manufacturer's standard PVC grommets for sealing top surface of horizontal rails where each vertical picket penetrates through rail.
1. Color: Match color of fencing components.

B. Decorative pattern along fence and gates:

1. 1 /8" thick steel spot welded to fence posts and pickets and gate vertical perimeter posts

C. Post Caps: Manufacturer's formed metal caps for closing off exposed open end at top of post. Finish and color to match post
   1. Style: Flat top.

D. Welding Rods and Bare Electrodes: Select according to AWS specifications alloy welded.

E. Concrete: Normal-weight concrete with not less than 3000-psi compressive strength (28 days), 3-inch slump. Measure, batch, and mix according to ASTM C 94.
   1. Portland cement: ASTM C 150, Type I or II
   2. Aggregate: ASTM C33; 1-inch maximum size.
   3. Water: ASTM C 94; potable.

2.5.1 FABRICATION

A. General: Fabricate ornamental metal fencing to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish and anchorage, but not less than that required to support specified design loads.
   1. Provide manufacturer's standard system which includes the following features:
      a. Allows variable pitch at rail/post connections to accommodate different ground slope conditions in the field.
      b. Pickets are connected to rails with concealed galvanized steel retaining rod along length of rail, which passes through predrilled opening in each picket to lock picket into place or other means of connecting to allow variable between picket and rail to accommodate different ground slope conditions.

B. Fabricate ornamental metal fencing components from steel sheet, as follows:
   1. Posts: Tubing formed from steel sheet, size as needed to withstand specified design loads, but not less than 3-by-3-inch square.
      a. Wall thickness: 0.1046 inch (12 gauge) minimum, but not less than that required to withstand specified design loads.
   2. Rails: Steel sheet formed into double-wall channel configuration, 1-3/4 inches by 1-3/4 inches; pre-punched to receive pickets; thickness as required to withstand specified design loads.
      a. Wall thickness: 0.0713-inch (14 gauge) minimum, but not less than that required to withstand specified design loads.
   3. Pickets: Tubing formed from steel sheet, 1-inch square; wall thickness as required to withstand specified design loads.

C. Pre-punch openings in horizontal rails to accept vertical pickets; openings to be spaced at 4.98 inches on center. Arrange pickets so that distance from centerline of post to first adjacent picket is equal at both ends of fence panel.
   1. Install PVC grommet at top horizontal surface of rail where vertical pickets pass through rail.

D. Assemble sections of ornamental metal fencing in 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.

E. 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.

F. Form work true to line and level with accurate angles and surfaces.

G. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap as required to receive finish hardware, screws, and similar items.

I. Welded Connections: Open components at connections provide close 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.

J. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth rigid hairline joints.

K. Close exposed open ends of hollow pickets with manufacturer's standard PVC caps, flush with end of picket.

L. Provide brackets, flanges, miscellaneous fittings, and anchors to connect ornamental metal fencing to adjacent work, where indicated.

M. Provide inserts and other anchorage devices for connecting ornamental metal fencing to adjacent concrete or masonry work, where indicated. Fabricate anchorage devices capable of withstanding loads imposed by fencing. Coordinate anchorage devices with supporting structure.

N. Insert PVC caps into exposed open ends at top of pickets.

O. Install metal caps on exposed open ends at top of fence posts.

## 2.6 SWING GATES

A. Fabricate gates to comply with same requirements indicated for ornamental metal fencing in regards to design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support design loads.

1. Provide gusset plates or other reinforcing at connections as required.
2. Gate Opening Width: As indicated on drawings.
3. Hardware Mounting Plate: Provide 1/8-inch thick steel plate for mounting exit hardware.
4. Provide the following hardware:
   a. Hinges: Manufacturer's barrel hinges of size and quantity as required to support weight of gate and specified design loads.
   b. Self-Closing Hinges:
      i) Manufacturer: Locinox
      ii) Product Model: Mammoth 180 – 9005, Large Size
         - 180-degree outward swing.
   c. Exit Hardware:
      i) Lockset: Per Architectural Drawings .
      ii) Door Lever: Per Architectural Drawings.
      iii) Operable door hardware are installed within 34"-44" A.F.F.
      iv) Rim Cylinder: Per Architectural Drawings.
      v) Cane Bolt: Provide cane bolt assembly with eyehole for padlock; designed to engage sleeve set in paving to secure gate(s) in open position at 180 degrees.

## 2. 7 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Powder-Coat Finish: Prepare, treat, and coat galvanized metal to comply with coating manufacturer's written instructions and as follows:

1. Process:
   a. Prepare galvanized metal by thoroughly removing grease, dirt, oil, flux, and other foreign matter.
   b. Treat prepared metal with zinc-phosphate pretreatment, rinse, and seal surfaces.
   c. Electrostatically spray-apply thermosetting epoxy powder coating base coat with a cured-film thickness not less than 2.0 mils.

d. Electrostatically spray-apply thermosetting polyester powder coating topcoat with cured-film thickness not less than 2.0 mils.

2. Salt and Spray Performance: No deterioration, loss of adhesion, or other effects after 3,500 hours of exposure, per ASTM B 117.

3. Color: Black.

## 2.8 RUBBER GATE STOPS

1. Manufacturer: American Fence & Supply Co.
2. Product Model: 500RGS
3. Color: Black
4. Install: Per manufacturer's instructions.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, paving work, and other conditions affecting performance.

B. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Stake locations of fence lines, gates, and end and corner posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

## 3.3 ORNAMENTAL METAL FENCING INSTALLATION

A. General: Install ornamental metal fencing system in accordance with written instructions of manufacturer.

B. Where occurring along property line, install fencing on established boundary lines inside property line.

C. Post Excavation: Drill or hand-excavate h o l e s for posts to diameters and spacing indicated, in firm, undisturbed soil.

D. Post Setting: Set posts in concrete footings at indicated spacing.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Footings: Place concrete around posts to dimension indicated and vibrate or tap for consolidation. Protect aboveground portion of posts from concrete splatter.
   a. Concealed Concrete: Top 2 inches below grade to allow covering with surface material.

E. Fence Panels: Install fence panels, consisting of horizontal rails and vertical pickets, spanning between fence posts. Set panels accurately in location, alignment, and elevation.

1. Where ground slopes, align horizontal rails to follow ground slope between posts, using adjustable rail/post connections.

## 3.4 ORNAMENTAL METALGATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

## 3.5 ADJUSTING

A. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

**END OF SECTION 32 31 19**

SECTION 328400

PLANTING IRRIGATION

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

### 1.2 SUMMARY

A. Provide complete, automatically controlled, spray sprinkler, turf rotor, bubbler and/or drip underground irrigation system as shown on Drawings.

B. This Section includes but is not limited to: excavating, backfilling, finish grading, piping, valves, sprinklers, specialties, controls, and wiring for automatic control irrigation system.

C. Related Sections include the following:

1. 329000 Planting.
2. 015639 Temporary Tree and Plant Protection.

### 1.3 DEFINITIONS

A. Certified Landscape Irrigation Auditor (CLIA): a person certified to perform landscape irrigation audits by the Irrigation Association Certification Board.

B. Lateral (Circuit) Piping: Downstream from control valves to sprinklers, rotors, emitters and specialties. Piping is under pressure during flow.

C. Mainline Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.

D. The following are industry abbreviations for plastic materials:

1. ASME: American Society of Mechanical Engineers.
2. ASTM: American Society for Testing and Materials.
3. AWG-UF: American Wire Gauge - Underground Feeder
4. NFPA: National Fire Protection Association.
5. PSIG: Pounds per Square Inch Gauge.
6. PVC: Polyvinyl Chloride Plastic.

7. SDR: Standard Direct Ratio.
8. V: Volt

1.4 PERFORMANCE REQUIREMENTS

A. Location of Sprinklers, Rotors, Emitters and Specialties: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards. Maintain 100 percent, head to head, water coverage of turf and planting areas indicated with uniform coverage and minimum over-spray onto paving and no spray onto buildings and structures.

B. Minimum Working Pressures: The following are minimum rated pressure requirements for piping, valves, and specialties, unless otherwise indicated:

1. Irrigation Main Piping: 200 psig.
2. Lateral (Circuit) Piping: 150 psig.

C. Irrigation Schedule: In accordance with DSA Title 24, Part 1 – Outdoor Water Use Requirements, Contractor shall prepare two (2) – three (3) irrigation schedules, one for plant establishment, one for the established landscape and one for temporarily irrigated areas if applicable. Each schedule shall indicate the number of gallons used and shall target the Estimated Total Water Use (ETWU) and not exceed the Maximum Applied Water Allowance (MAWA) calculated on the Irrigation Plan "California Water Efficient Landscape Worksheet." Irrigation Schedule shall be submitted at substantial completion. After acceptance of substantial completion, Contractor shall laminate schedule in plastic and place in controller enclosure prior to final completion and end of maintenance. In preparing the Irrigation Schedule, the Contractor shall consider the following:

1. Irrigation interval (days between irrigation).
2. Irrigation run times.
3. Number of cycle starts to avoid runoff.
4. Amount of applied water scheduled to be applied on a monthly basis.
5. Application rate setting.
6. Root depth setting.
7. Plant type setting.
8. Soil type.
9. Slope factor setting.
10. Shade factor setting.
11. Irrigation uniformity or efficiency setting.

1.5 SUBMITTALS

A. Product and Project Data: With-in 14 days after award of the contract, furnish the Owner's Representative with submittal data on all items intended for installation. Substitute equipment or material installed without the approval of the Owner's Representative will be removed and replaced with specified items at this Contractor's expense. Submit manufacturer's technical data and installation instructions for irrigation components conforming to requirements of Submittals, Shop Drawings and Product Data. Include pressure ratings, rated capacities, and settings of irrigation components. Submittal shall include the following:

1. Backflow device including cage and/or blanket.
2. Main, lateral (circuit) and sleeving pipe.
3. Pipe fittings, primer and cement.
4. Tracer wire and/or warning tape.
5. Isolation valves.
6. Remote control valves.
7. Valve boxes.
8. Sprinklers, rotors, bubblers, drip emitters.
9. Swing joints.
10. Tree bubbler drain tubes.
11. Controllers. Include wiring diagrams, enclosures and mounting methods.
12. Control wires. Include splice kits and conduit.
13. Valve identification tags.
14. Irrigation Wiring Diagram: Contractor shall prepare and submit an irrigation wire diagram showing location of control wire, common wire, spare control wire and spare common wire with quantities noted at each run shown on copy of irrigation plan in a legible size and format.
15. Irrigation installation firm qualifications in accordance with "quality assurance".
16. Name and contact information of certified irrigation auditor performing the irrigation audit for this project for landscape projects of 2,500 square feet and larger.

B. Coordination Drawings: During the course of construction, maintain orderly set of irrigation drawings and details on project site during installation of irrigation system. Record daily changes showing piping and major system components. Measure and neatly record dimensions for all mainlines, control wire runs, and all other pertinent information facilitating maintenance and extension of the irrigation system to within one (1) foot horizontally and six (6) inches vertically. Indicate interface and spatial relationship between piping, system components, adjacent utilities, and proximate structures. Up to date coordination drawings shall be available for review prior to meetings with the Owner's Representative.

C. Submittals at Substantial Completion:

1. Irrigation Record Drawings. Contractor shall record information gathered on “Coordination Drawings” onto a clean set of Irrigation Plans for documentation of as-built conditions.
2. Controller Legend: Upon approval of record drawing submittal, prepare two (2) legible, reduced to 11” by 17” in size, non-fading, waterproof copies of the Record Irrigation Drawings, laminated between two (2) .020 mm (minimum) plastic sheets, printed on front side only. Attach one (1) copy to door of controller or enclosure and deliver one (1) copy to Owner. Plan sheet shall include the following information:
    a. Installing Contractor’s company name, phone number and address.
    b. Color coded zone identification by valve.
    c. Zone start time.
    d. Zone water duration.
    e. Type of planting irrigated.
    f. Valve size, station numbers and controller designations.
3. For landscapes 2,500 square feet and larger, Contractor shall retain the services of a third party Certified Landscape Irrigation Auditor to perform a landscape irrigation water audit and prepare an irrigation audit report compliant with MWELO 492.12 including, but not limited to inspection, system tune-up, system test with distribution uniformity, correcting over-spray or run-off and configuring controllers with application rate, soil type, plant factors, slope, sun exposure and other factors necessary for accurate programming. Submit preliminary report at substantial completion, allow for adjustments during maintenance and submit report confirming irrigation installation is compliant with DSA MWELO at final completion.
4. Submit Irrigation Schedule for review and approval in accordance with DSA Title 24, Part 1 at substantial completion. Once approved, laminate in plastic and place inside controller enclosure for final completion at end of maintenance period.
5. Contractor shall provide the owner with one (1) quick coupler key with hose swivel per each five (5) quick couplers.
6. Irrigation System Leak Test Results.
7. Irrigation backflow preventer certification.
8. Central control installation certification from a factory authorized representative.
9. Booster pump installation certification from factory-authorized representative.
10. Operation and Maintenance Data: For irrigation systems, to include in emergency, operation, and maintenance manuals. In addition to items specified in "Closeout Procedures,” include data for the following:
    a. Automatic-control valves.
    b. Sprinklers, rotors and/or emitters.
    c. Controllers.

## 1.6 QUALITY ASSURANCE

A. Governing Agency Requirements:

1. For projects subject to review and approval by local governing agencies, Contractor shall comply with the State of California Model Water Efficient Landscape Ordinance at a minimum and shall conform to local codes and/or ordinances, whichever may be more stringent.

2. For projects under review of DSA, Contractor shall comply with the State of California Model Water Efficient Landscape Ordinance requirements at a minimum.

B. Installer Qualifications:

1. Experience: The irrigation installation firm shall have contracted for and successfully completed construction of a minimum of five (5) California public school district construction projects, approved by the Division of the State Architect (DSA), within the past five (5) years of similar size, complexity, budget and scope.

2. Licensure: The irrigation installation firm shall hold a current, active C27 "Landscaping Contractor" license classification by the California State License Board that has been consistently active for at least five (5) years and that has not been suspended or revoked.

3. Supervision: The irrigation installation firm shall have a qualified and experienced irrigation technician on site during irrigation installation.

4. Drip Irrigation: The irrigation installation firm shall have contracted for and successfully complete construction of a minimum of five (5) drip irrigation installations within the past five (5) years of similar size and complexity.

C. Manufacturer Qualifications: Provide underground irrigation system as a complete unit. Each type component produced by a single acceptable manufacturer, including heads, valves, controls and accessories.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Pipe crossings beneath fire Lanes: Comply with NFPA 24-10, Depth of Cover at Fire Access Lanes.

F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in "Project Management and Coordination".

G. All work and materials shall be in strict accordance with the latest rules and regulations of the State Fire Marshal, Safety Orders of the Division of Industrial Safety, California Electrical Code, California Administrative Code, part 4, Title 24, "Basic Mechanical Regulations" and other applicable state or local laws or ordinances. Nothing in these drawings or specifications is to be construed as permitting work which does not conform to the codes or regulations.

H. Contractor shall provide all licenses, fees and other charges required for completion of the work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Owner's Representative no fewer than two days in advance of proposed interruption of water service.

2. Do not proceed with interruption of water service without Owner's Representative's written permission.

B. Interruption of Existing Irrigation Service: Do not interrupt existing to remain irrigation service. Prior to demolition work and prior to beginning irrigation work, review project site and meet with Owner Representative to review locations and connections of existing to remain irrigation system. Coordinate with General Contractor to ensure existing irrigation remains in place and operable through the duration of construction. In the event existing irrigation is shut off or damaged during construction, contractor shall provide temporary connections or modifications to continue water service to existing to remain planting material or turf to maintain in a healthy growing condition throughout construction. In the event water service is not available, contractor shall apply water through manual delivery means as necessary. Obtain approval from Owner's Representation two days in advance of any planned disruptions in water service.

1.9 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.10 MAINTENANCE

A. Irrigation maintenance shall coincide with planting maintenance, refer to Specification 32 90 00 "Planting". In the event planting is not part of this work, maintenance shall begin at written approval from Owner's Representative of substantial completion, run ninety (90) calendar days and until receipt of Owner's Representative's written acceptance of completion of punch list items.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Use new materials of brands shown or Drawings, specified herein or approved equal.

B. Use existing materials if shown on Drawings.

C. Substitution of sprinklers, rotors, drip, valves and controllers will not be allowed due to variation in flows, precipitation rates, friction losses, and sizing and maintaining consistency with client equipment standards.

### 2.2 PIPES, TUBES, AND FITTINGS

A. Above Grade Irrigation Mainline: steel pipe, ASTM A 53/A 53M, Schedule 40, Type S or E, Grade A or B, galvanized with threaded ends.

1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized, seamless steel pipe with threaded ends.
2. Malleable-Iron Unions: ASME B16.39, Class 150, hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface, and female threaded ends.
3. Gray-Iron Threaded Fittings: ASME B16.4, Class 125, galvanized, standard pattern.
4. Cast-Iron Flanges: ASME B16.1, Class 125.
5. Cast-Iron Flanged Fittings: ASME B16.1, Class 125, galvanized.

B. Mainline piping (unless specified otherwise on Drawings):

1. Class 200 (C900), gasketed, purple reclaimed water PVC pipe, ASTM D-2241, NSF approved (size 6” and larger).
2. Class 315 purple reclaimed water PVC pipe, ASTM D-2239, NSF approved (2-1/2” to 4”)
3. Schedule 40 purple reclaimed water PVC pipe, ASTM D-1785, NSF approved (2” and smaller).
4. Fittings to be schedule 80 PVC.
5. Six (6) inch and larger pipe to be secured with Lemco stainless steel LB series joint restraints or approved equal.

C. Lateral piping (unless specified otherwise on Drawings):

1. Schedule 40 purple reclaimed water PVC pipe, ASTM D 2466, NSF approved.
2. Fittings to be schedule 40 PVC.

D. Sleeves (unless specified otherwise on Drawings):

1. For irrigation piping, use schedule 40 PVC pipe, NSF approved, two, three (3) inch minimum size for irrigation piping.

2. For irrigation wiring, use schedule 40 PVC pipe, UL listed, NEMA TC-6, ANSI/UL651, ASTM F512, for outdoor, direct bury applications, PVC, two (2) inch minimum size.

3. Fittings to be schedule 40 PVC.

2.3 VALVES:

A. BACKFLOW PREVENTION DEVICE: As indicated on the Drawings installed using above grade steel pipe.

B. QUICK-COUPLERS: As indicated on the Drawings.

C. VALVE BOXES:

1. In paved areas, use Christy concrete utility box, size as required.

2. In planting areas, use Christy plastic underground enclosure. Boxes shall have locking lid, bolt and washer, size as required, color to be green in turf areas and black in planting areas, and purple for recycled water systems.

3. Valve boxes to be rectangular for remote control valves and ball or gate valves and round for quick coupling valves.

4. Valve box lids shall be labeled “IRRIGATION”.

D. PULL BOXES AND SPLICE BOXES:

1. In paved areas, use Christy concrete utility box, size as required.

2. In planting areas, use Christy plastic underground enclosure. Boxes shall have locking lid, bolt and washer, size as required, color to be green in turf areas, black in planting areas, and purple for recycled water systems.

3. Valve boxes to be rectangular for remote control valves and ball or gate valves and round for quick coupling valves.

4. Valve box lids shall be labeled “IRRIGATION”.

E. WIRE MESH AT VALVE BOXES: ½ inch by ½ inch, 16 gauge, galvanized wire mesh hardware cloth.

F. VALVE IDENTIFICATION TAGS: Shall be plastic yellow in color for potable water systems and purple in color for recycled water systems with 1 1/8” stamped black letters indicating controller/station number.

G. SAND BACKFILL: shall consist of natural sand, manufactured sand, existing of native material, or combinations thereof, and shall conform to ASTM c-40 organic impurities, ASTM d-2419 sand equivalent and a pH value between 4.5 and 9.

H. VALVE BOX ROCK: shall be ¾" or smaller drain rock or pea gravel unless specified otherwise on Drawings.

I. VALVE BOX SUPPORT BRICK: shall be common red brick unless specified otherwise on Drawings.

2.4 AUTOMATIC CONTROL SYSTEM:

A. CONTROLLER: As indicated on Drawings.

B. AUTOMATIC CONTROLLER GROUNDING: Contractor shall install grounding recommended by manufacturer for installation method detailed on this project.

C. WIRING: All 24 v line to be #14-1 awg-uf. Control wire insulation to be red in color and spare wire to be yellow in color. 24 v common wire to be #12-1 awg-uf, insulation to be white in color and spare common insulation shall be black in color.

D. SPLICING MATERIALS: manufacturer's packaged kit consisting of insulating, spring-type connector or crimped joint and epoxy resin moisture seal; suitable for direct burial.

E. CONNECTORS: Shall be or 3M "DBY" connectors or equal.

2.5 TRACER WIRE/DETECTABLE WARNING TAPE:

A. Install tracer wire or detectable warning tape as indicated on Drawings.

B. Tracer Wire: #8 solid Bare Copper Wire.

C. Detectable Warning Tape: Electronically detectable plastic tape with metallic core, Terra Tape D, manufactured by Griffolyn Co., or equal, two (2) inches in width, continuously imprinted "caution buried water line".

2.6 CONCRETE THRUST BLOCKING:

A. Shall be clean, Portland cement concrete, cast in place, five sacks of cement per cubic yard mixture with a 28-day compressive strength of 2,500 psi.

2.7 SPRINKLERS, DRIP SYSTEM, BUBBLERS, EMITTERS:

A. As indicated on Drawings.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 31 "Earthwork" for excavating, trenching, and backfilling.

B. Install piping and wiring in sleeves under sidewalks, roadways, and parking lots, and under or through footings and building walls.

1. Install piping sleeves by boring or jacking under existing paving if possible.
2. Install a minimum of two (2) three (3) inch diameter sleeves in each location for irrigation piping and a minimum of one (1) two (2) inch diameter electrical conduit sleeving in each location for irrigation wire.
3. Sleeves shall extend twelve (12) inches beyond edges of paving and walls with ends capped.

C. Provide minimum cover over top of underground piping according to the following:

1. Irrigation Mainline Piping: Minimum depth of 24 inches below finished grade to top of pipe.
2. Lateral Piping: Minimum depth of 18 inches below finished grade to top of pipe.
3. Sleeves containing control wires, mainline and/or lateral piping beneath standard paving: Minimum depth of 24 inches from finish surface to top of sleeve.
4. Sleeves containing control wires, mainline and/or lateral piping beneath vehicular paving including fire lanes/emergency vehicle access (EVA): Minimum depth of 36 inches from finish surface to top of sleeve.
5. Drip Irrigation: Install drip and/or emitter lines and tubing as detailed on Drawings.

D. Excavate trenches with vertical sides, uniform bottom, free of deleterious materials, and wide enough for pipes to lay side by side, fully supported on bottom. Minimum 3” clearance between pipes. Twelve (12”) inch minimum width for mainlines and six (6”) inch minimum width for lateral lines.

E. Trenches with pressure pipe and control wiring to be backfilled with sand to 6 inches minimum above top of pipe. Continue backfilling in 6 inch layers with soil free of rocks or waste materials. Compact soil to a density equal to the surrounding undisturbed soil, but not less than 90%. Any subsequent depressions shall be filled at the Contractor’s expense. Particular attention is directed to firmly tamp and moistening around sprinkler heads and quick-couplers.

1. For irrigation pipes three (3) inches and larger in size, install additional six (6) inch depth sand beneath piping.

F. Trenches and backfill installed under paving, asphalt concrete or concrete shall be backfilled with sand and compacted in layers equal in density to the adjacent undisturbed soil or to 90% compaction, using manual or mechanical tamping devices. All trenches shall be left flush with the adjoining grade.

1. The Contractor shall set in place, cap and pressure test pressurized mainline under paving prior to the paving installation.
2. For irrigation pipes three (3) inches and larger in size, install additional six (6) inch depth sand beneath piping.

## 3.2 PREPARATION

A. Set stakes to identify locations of proposed irrigation system. Obtain Owner’s Representative's approval before excavation.

3.3 PIPING APPLICATIONS

A. Install components having pressure rating equal to or greater than system operating pressure.

B. Piping in control valve boxes and above ground may be joined with flanges instead of joints indicated.

C. Aboveground Irrigation Main Piping: Use any of the following piping materials for each size range:

1. NPS 4 and Smaller: Steel pipe; malleable-, gray-, or cast-iron fittings; and threaded joints.

2. NPS 5 and Larger: Steel pipe; malleable-, gray-, or cast-iron fittings; and threaded joints.

D. Underground irrigation main piping shall be purple recycled water pipe, polyvinyl chloride (Type I) plastic pipe PVC 1120 and NSF approved, Schedule 40 PVC solvent-weld.

E. Underground Irrigation Lateral (Circuit) piping shall be purple recycled water pipe, polyvinyl chloride (Type I) plastic pipe PVC 1120 and NSF approved, schedule 40 PVC solvent-weld.

F. Mainline pipe sizes 6” and larger shall use gasketed pipe with bell fittings. Where solvent weld joints are required, contractor shall additionally install concrete thrust blocking.

G. Underground Branches and Offsets at Sprinklers and Devices: Schedule 80, PVC pipe; threaded PVC fittings; and threaded joints.

H. Mainline Fittings and Couplings: Schedule 80, PVC pipe, solvent weld up to 4” and gasketed with bell fittings 6” and larger pipe.

I. Risers to Aboveground Sprinklers and Specialties: ASTM A-120 Schedule 40 galvanized steel pipe with 150 lb. banded galvanized malleable iron fittings.

J. Double Swing Joint Assembly (unless specified otherwise on Drawings):

1. Install per manufacturers recommendations.

2. Install double swing joint at all sprinkler heads and quick couplers.

3. Elbows shall be PVC Class 1220, Schedule 40.

4. Install as follows:

a. Screw 2 inch long nipple horizontally into plastic tee or ell at lateral line.

b. Screw on elbow and a 6 inch long nipple.

c. Screw on another elbow and a 2 inch long nipple and install riser vertically to head, or quick coupler valve.

d. Swing joint must offset to the right.

K. Sleeves: Schedule 40 PVC pipe and socket fittings; and solvent-cemented joints.

L. Transition Fittings: Use transition fittings for plastic-to-metal pipe connections according to the following:

1. Couplings:

a. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.

b. Underground Piping NPS 2 and Larger: AWWA transition coupling.

2. Fittings:

a. Aboveground Piping: Plastic-to-metal transition fittings.

b. Underground Piping: Union with plastic end of same material as plastic piping.

M. Dielectric Fittings: Use dielectric fittings for dissimilar-metal pipe connections according to the following:

1. Underground Piping:

a. NPS 2 and Smaller: Dielectric couplings or dielectric nipples.

b. NPS 2-1/2 and Larger: Prohibited except in valve box.

2. Above ground Piping:

a. NPS 2 and Smaller: Dielectric unions.

b. NPS 2-1/2 to NPS 4: Dielectric flanges.

3. Piping in Valve Boxes or Vaults:

a. NPS 2 and Smaller: Dielectric unions.

b. NPS 2-1/2 to NPS 4: Dielectric flanges.

4. Dielectric fittings are specified in Division 22 Plumbing.

## 3.4 VALVE APPLICATIONS

A. Backflow Prevention Devices:

1. New and relocated backflow devices must be tested at time of installation. Contractor shall have test performed by a Certified Backflow Tester who has a current State of California Contractor's license C-36 or General Contracting License.

2. For new backflow preventer installation, a Certified Tester shall test and provide results and certification to the Owner's Representative within five (5) days of the date of testing and to provide any testing data or certification required by the local water provider. A Department of Public Health sticker shall be place on backflow device before the system is accepted by the Owner's Representative.

3. Install per local codes and water purveyor requirements.

4. A Department of Public Health sticker shall be placed on backflow device before the system is accepted by the Owner's Representative.

B. Underground Gate/Ball Valves: Install in control-valve box as detailed on drawings.

C. Underground, Manual Control Valves: Install in manual control-valve box as detailed on drawings.

D. Remote Control Valves: Install in control-valve box as detailed on drawings.

E. Drain Valves: Install in control-valve box as detailed on drawings.

F. Install each valve in a separate valve box (unless noted otherwise in Drawings and details) and in appropriate locations as shown on Drawings. Allow 12 inches between valve boxes and between valve boxes and walls or walks or landscape edges. Boxes shall be arranged perpendicular and parallel to each other and aligned in a row.

## 3.5 PIPING INSTALLATION

A. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings. Piping shown on drawings is diagrammatic. General arrangement of piping shall be followed as near as practical. Where piping is shown running continuously in paving and adjacent to planting area, intent is to install piping within planting areas where practical.

B. Install pipe sleeves at all points where pipes pass through concrete, asphalt or masonry. In footings, allow 1 inch clearance around pipe, and in other locations allow ½ inch. Each end of sleeve shall extend 6 inches beyond edge of paving or structure above. Provide removable non-decaying plug at each end of sleeve to prevent intrusion of earth and debris.

C. If drain valves are used, install piping at minimum uniform slope of 0.5 percent down toward drain valves.

D. Install piping free of sags and vertical bends.

E. Install groups of pipes parallel to each other, spaced to permit valve servicing.

F. Install fittings for changes in direction and branch connections. Pipe bending shall not exceed manufacturer recommended radii.

G. Install flanges adjacent to valves and to final connections to other components with NPS 2-1/2 or larger pipe connection.

H. Install dielectric fittings to connect piping of dissimilar metals.

I. Install underground thermoplastic piping according to ASTM D 2774 and ASTM F 690.

J. Lay piping on solid sub-base, fully and evenly supported by bedding, uniformly sloped without humps or depressions.

K. Install PVC piping in dry weather when temperature is above 40 degrees F (5 degrees C). Allow joints to cure at least 24 hours at temperatures above 40 degrees F (5 degrees C) before testing unless otherwise recommended by manufacturer.

L. Snake pipe a minimum of one (1) additional foot per one hundred (100) feet of pipe to allow for expansion and contraction.

M. Cap or plug openings as soon as lines have been installed to prevent intrusion of debris.

N. Thrust Blocking: Install concrete thrust blocking, at a minimum, on pressurized mainline three (3) inches and four (4) inches in size at changes in direction, connections or branches from mainline and dead ends and as necessary to prevent pipe movement thrusts created by internal water pressure. Concrete shall be placed directly on the fitting perpendicular to the line of thrust and also against the undisturbed earth. The amount of concrete shall be in accordance to the pressure, angle and soil type. Refer to pipe manufacturer for calculating exact size of thrust blocking material, 2019 CPC and IAPMO installation standards.

O. Joint Restraints: Install joint restraints per manufacturer recommendations on pressurized mainlines six (6) inches and larger at changes in direction, connections or branches from mainline and dead ends and as necessary to prevent pipe movement thrusts created by internal water pressure.

P. After installation of pipe lines and sprinkler risers, and prior to installation of sprinkler heads, automatic valves and quick couplers, thoroughly flush all lines with a full head of water to remove any foreign material, scale, sediment, etc.

## 3.6 TRACER WIRE

A. Install as detailed along all new irrigation mainline piping on bottom of trench, carefully run to avoid stress from backfilling and shall be continuous throughout the mainline pipe runs. Fasten tracer wire to mainline at eight (8) foot intervals with tape. Take precautions to ensure tape is not damaged or misplaced during backfill operations.

B. Tracer wire shall follow mainline pipe and branch lines, originating in irrigation valve box at gate, ball or remote control valve located closest to irrigation point of connection and run to ball, gate and/or remote control valves at the end of mainline runs or shall loop entire system where mainlines are looped.

C. Record locations of tracer wire origin and terminations on project record drawings.

## 3.7 DETECTABLE WARNING TAPE

A. Install tape with printed side up, directly over mainline pipe and on top of sand backfill, 18 inches below grade. Take precautions to ensure tape is not damaged or misplaced during backfill operations.

## 3.8 JOINT CONSTRUCTION

~~A. Refer to Division 22 Section "Piped Utilities -- Basic Materials and Methods" for basic pipe joint construction.~~

B. Install threaded pipe joints as follows:

1. Use pipe joint sealant for all plastic to plastic and plastic to steel joints, do not apply to sprinkler inlet ports.

2. For PVC, hand tighten only. Do not over tighten threaded joints. Thread until fitting stops, then add a half turn.

3. Use pipe joint compound and/or Teflon tape for all steel to steel joints.

C. Install gasketed joint per manufacturer recommendations (printed on pipe material) and using the lubricant supplied with the pipe.

## 3.9 SPRINKLER INSTALLATION

A. Locate part-circle sprinklers to maintain a minimum distance of six (6) inches from adjacent paving and edges and twelve (12) inches clearance from walls, fences and other structures, unless otherwise indicated on Drawings.

B. Spray sprinklers shall not be installed less than 24” from non-permeable surfaces unless the adjacent non-permeable surface is constructed to drain entirely to the landscape area.

C. Swing Joint Assembly:

1. Install triple swing joint at all sprinkler heads and quick couplers.

2. Elbows shall be PVC Class 1220, Schedule 40.

3. Install as follows:

a. Screw 2 inch long nipple horizontally into plastic tee or ell at lateral line.

b. Screw on elbow and a 6 inch long nipple.

c. Screw on another elbow and a 2 inch long nipple.

d. Screw on another elbow and install riser vertically to head, or quick coupler valve.

e. Swing joint must offset to the right.

D. Sprinkler Installation:

1. Install sprinklers heads as shown on drawings and details.

2. Install plumb to finish grade.

3. Tool tighten all sprinkler body covers and nozzles.

## 3.10 DRIP/EMITTER INSTALLATION

A. Minimum cover sub-surface drip tubing: Drip and/or emitter lines shall be installed as detailed on Drawings and below the mulch top dressing layer.

B. Minimum cover of tubing to individual shrubs: Shrub bubbler tubing shall be installed to a depth of (4) inches and rising to the surface at target shrub rootball. No more than one (1) inch of tubing shall be exposed at shrub rootball.

C. Backfill after lines have been reviewed, tested for leaks and approved by Owner's Representative.

D. Assembling drip system shall keep pipe and tubing free from dirt and debris, pipe ends shall be cut square, deburred and cleaned.

E. Flush piping prior to installing remote control valve assembly (control zone kit assembly).

F. Follow manufacturer recommendations.

3.11 AUTOMATIC-CONTROL SYSTEM INSTALLATION:

A. Exact location of controllers shall be reviewed and approved by Owner's Representative.

B. Provide connection to nearest available 110 volt electrical service.

C. Prior to installation of hardscape, coordinate and install electrical supply and control wire conduit, size and quantity as required for each controller and spare wiring. Install pull boxes and conduit from clock location.

D. Contractor shall install grounding system per manufacturer recommendations.

E. Control wiring shall be neatly coiled beneath controller terminal strip and labeled with corresponding station number. Controller terminal strip cover plate shall fasten securely in place.

F. Contractor is responsible to provide fully automatic system operated by specified controller(s). Contractor shall install quantity of red wiring equal to the number of stations on the specified irrigation controller(s), plus five (5) yellow spare control wires for each controller, a common white wire and a spare common black wire. Example, 24 station clock shall have 24 control wires, 5 spare control wires and 2 common wires installed with mainline and running through all associated valve boxes. Wires shall be installed per plans and details from remote control valve(s) to controller(s).

G. Example of mainline that is not looped and terminates in 3 locations with a 24 station clock and 18 stations used:

1. Wire quantities shall be:

- 18 red control wires for stations 1-18
- 6 red control wires for un-used stations 19-24
- 1 white common wire
- 1 black spare common wire
- 5 yellow spare wires

2. Wire runs:
    - 18 red control wires (stations 1-18) shall run from controller to corresponding valve.
    - 6 red control wires (un-used stations 19-24) shall run from controller and loop through each valve box associated with that controller.
    - 1 white common wire shall run from controller and connect to each valve associated with that controller.
    - 1 black spare common wire shall run from controller and connect to each valve associated with that controller.
    - 5 yellow spare control wires shall run from controller and loop through each valve box associated with that controller.
3. Contractor shall label all wires with water-proof marking with corresponding station number or as spare control wire, spare common wire or spare stations 19-24.

H. Wiring path is not shown on drawings and shall run from specified controller(s) to irrigation pull box if shown, then to the nearest irrigation mainline location, follow mainline (existing and/or new) to each remote control valve. Indicate wire location on record drawings where it does not follow mainline. Common and spare wires shall loop through entire system. Wiring may be shown on drawings only where required for future irrigation extensions.

I. Wiring may be shown on drawings only where required for future irrigation extensions.

J. Irrigation Central Control system is standard for this project.

K. Irrigation Central Control System must be compatible with owners central control software and hardware. Contractor shall ensure controller communicates properly with project central computer and receives daily downloads for weather updates.

## 3.12 CONNECTIONS/ELECTRICAL WIRING

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Ground equipment according to Division 26 Section.

C. Connect wiring according to Division 26 Section.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

E. 24 volt splices to be made with 3M Co. #3577 splice kit, as to manufacturer’s instructions. Splices to be made only at valve box or pull box.

## 3.13 REMOTE CONTROL VALVE WIRING

A. Wires shall be installed in gray UL approved electrical conduit between controller and pull box. Pull box to be located in ground nearest controller. Top of box to be flush with finish grade.

B. Provide separate irrigation wire sleeves under concrete or asphalt for irrigation wires, size and quantity as required, three (3) inches minimum in diameter, 24” minimum cover in planting areas and 36” minimum cover under fire lanes and pavements.

C. Wires from the pull box to remote control valves shall be direct burial. The wiring shall be bundled and secured to the lower side of the irrigation pipe at ten (10) foot intervals with plastic electrical tape. Sufficient slack shall be left in the wire to provide for expansion and contraction.

D. Provide 24 inches excess of coil of control wires in each 100 feet of run to controller.

E. Provide 24 inches excess of coil of control wires in each valve box and pull box.

F. Control wires to be buried a minimum of 24 inches below finish grade.

G. Wiring shall be tested for continuity, open circuits and unintentional grounds prior to connecting to equipment.

H. Install irrigation wire splice boxes where wire splices are necessary.

## 3.14 LABELING AND IDENTIFYING

A. Valve Identification Tags: Install valve identification tag on each remote control valve with corresponding controller station number.

## 3.15 FIELD QUALITY CONTROL

A. Manufacturer's Field Service for irrigation pumps and central control systems: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including mounting, electrical connections, water connections, grounding and proper communication on site, with hand-held remotes and with central computer software. Make repairs and/or adjustments as recommended. Submit factory-authorized service representative’s written approval of installation at Substantial Completion.

B. After substantial completion, for landscapes 2,500 square feet and larger, Contractor shall schedule an Irrigation Audit to be performed by a third-party certified landscape irrigation auditor. Contractor shall make necessary adjustments, if any, during maintenance period and provide written certification of installation from certified landscape irrigation auditor as part of final completion and end of maintenance.

C. Perform the following field tests and inspections in the presence of the Inspector and/or Owner’s Representative with 72 hours advance notice. Contractor shall record date, time,

names of those present and results and submit to Owner's Representative prior to requesting substantial completion review:

1. Leak test of pressurized mainline: After installation of mainline and prior to installing remote control valves, quick coupling valves or other valve assemblies and prior to backfilling trenches, test the mainline for leaks as follows:
    a. Testing shall occur with trenches open. Center load piping with small amounts of backfill between fittings to prevent pipe displacement, arching or slipping. Fittings to be visible for testing.
    b. Exercise care in filling the system with water to prevent excessive surge pressure and water hammer
    c. Test pressurized mainline piping under hydrostatic pressure of 125 psi for eight (8) continuous hours, minimum. Coordinate with Owner's Representative for initial observation of beginning test and observation after test. Install two (2) pressure gauges at opposite ends of mainline system. Pressurize system up to a minimum of 125 psi the day preceding the scheduled test and verify the pressure is holding at both ends. Inspect system early the following day in the presence of the Owner's Representative and note pressure. One hour later, verify pressure has not dropped more than five (5) psi in the presence of the Owner's Representative.
    d. Correct deficiencies revealed by test and repeat pressure test to the satisfaction of the Owner's Representative.
2. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
3. Coverage Test: When the irrigation system has been completed, the Contractor, in the presence of the Architect and Owner's Representative, shall perform a Coverage Test to determine if the coverage of water is complete and adequate, the sprinkler heads and/or emitters function according to manufacturers' data and according to the intent of the construction documents. Replace irrigation components not performing satisfactorily and/or respace sprinklers and/or nozzles and/or emitters as necessary to provide complete irrigation coverage of plant material.
    a. For new turf areas, Contractor shall demonstrate irrigation coverage over amended soil and prior to installation of sod and/or seeded turf.
4. Substantial Completion Review: At substantial completion of this Section, work shall be reviewed for conformance with the Drawings and Contractor shall make recommended repairs and/or corrections in a timely manner and prior to final completion.
    a. At substantial completion, contractor shall submit Certified Landscape Irrigation Auditor preliminary report on irrigation system for landscapes 2,500 square feet and larger.
    b. At substantial completion, Contractor shall submit documentation per 1.5 "submittals at substantial completion" to Architect for review and acceptance.
    c. At substantial completion, Contractor shall deliver spare parts to District Representative per 1.5 "Submittals at substantial completion".

5. Final Completion Review: After substantial completion repairs and/or corrections have been completed and at the end of the maintenance period, work shall be reviewed for final completion and approved by Owner's Representative in writing.

    a. At final completion, for landscapes 2,500 and larger, Contractor shall submit Certified Landscape Irrigation Auditor final report confirming irrigation installation is compliant with DSA MWELO requirements.

## 3.16 CLOSING IN UN-INSPECTED WORK

A. The Contractor will pay all costs necessitated by required opening, restoration and correction of all work closed in or concealed before inspection, testing as required, and approval by authorized inspections.

## 3.17 STARTUP SERVICE

A. Verify that controllers are installed and connected according to the Contract Documents.

B. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 16 Sections.

C. Complete startup checks according to manufacturer's written instructions.

## 3.18 MAINTENANCE SCHEDULE

A. Fine tune and adjust irrigation system weekly coinciding with the landscape and/or turf planting maintenance period.

B. Adjust settings of controllers within WELO water budget and with seasonal changes.

C. Adjust automatic control valves to provide flow rate of rated operating pressure required for each sprinkler circuit.

D. Adjust sprinklers so they will be flush with, or not more than 1/2 inch above, finish grade.

E. Fill irrigation trenches due to settling.

## 3.19 CLEANING

A. Completely flush dirt and debris from piping before installing sprinklers and other devices.

B. After completion, cleanup and remove all resultant debris from site.

## 3.20 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain controller and automatic control valves. Refer to “Demonstration and Training."

3.21 GUARANTEE (Project Close-out Item)

A. Furnish a written Guarantee to the Owner, dated from the date of Final Acceptance, against defective workmanship, materials or components and guaranteeing repair or replacement for a period of 1 year; further guarantee restoration of all damage caused by leaks in the Irrigation System for a like period.

B. Guarantee that the entire installation was made in accordance with the drawings, specifications and manufacturer’s recommendations, using designated materials and installation procedures.

C. Submit duplicate copies of the Guarantee for approval by the Owner’s Representative. Approval is mandatory before final payment and acceptance.

D. The guarantee for the irrigation system shall be made in accordance with the form attached at the end of this Section. The guarantee form shall be retyped onto the Contractors letterhead and contain the information shown.

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse or neglect excepted.

We agree to repair or replace any defects in materials and workmanship which may develop during the period for one (1) year from the date of acceptance and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice.

The Owner reserves the right to make temporary repairs as necessary to keep the irrigation system and equipment in operating conditions. This shall not relieve the Contractor of his responsibilities under this Guarantee.

In the event of failure to make such repairs or replacements within a reasonable time after receipt of written notice form the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

Project:_____

Location:_____

_____

Name of Contractor:_____

Signed: (Authorized Signature)_____

Print Name of Authorized Signature_____

Address:_____

_____

Phone:_____ Date of Acceptance:_____

END OF SECTION

SECTION 329000

PLANTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Trees.
2. Shrubs.
3. Ground cover.
4. Vines.
5. Edgings.
6. Planters.
7. Bio-retention Basin.

B. Related Sections include the following:

1. Specification Section 015639 “Temporary Tree and Plant Protection”.
2. Specification Section 310513 “Earthwork” for excavation, filling and rough grading and for subsurface aggregate drainage and drainage backfill materials.
3. Specification Section 328400 “Planting Irrigation”.

1.3 DEFINITIONS

A. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.

B. Finish Grade: Elevation of finished surface of planting soil.

C. Import Topsoil: Shall be obtained from a local source and coming from a site with similar soil characteristics as the project site. Topsoil shall be fertile, friable, natural loam surface

soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter and free of roots, stumps, stones and rocks and other extraneous or toxic matter harmful to plant growth.

D. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

E. On-site Topsoil: Naturally occurring, on-site, surface soil, usually occurring in the top four (4) to twelve (12) inches of original, undisturbed surface soil containing organic material, micro-organisms, necessary nutrients and minerals to sustain plant growth and be approved to sustain plant life by an approved soil analysis laboratory.

F. Planting Soil: On-site topsoil, import topsoil or manufactured topsoil.

G. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

H. Plant material: Exterior plants contained within the planting plan legend in categories of Trees, Shrubs, Vines, Perennials, Annuals and/or Ground Covers.

I. Substantial completion for landscape and irrigation: Work shall be considered substantially complete when irrigation, planting, turf planting and seeding are installed correctly per plans and specifications with only minor adjustments required and approval has been submitted in writing by Owner's Representative.

J. Final completion for landscape and irrigation: Work shall be considered complete when irrigation, planting, turf planting and seeding are installed correctly per plans and specifications and the maintenance period has been completed per plans and specifications and approval has been submitted in writing by Owner's Representative.

## 1.4 SUBMITTALS

A. Product, Material Data and/or Samples: For each type of product specified. Submit manufacturer’s technical data and installation instructions for landscape products conforming to requirements of Submittals, Shop Drawings and Product Data to include, but not be limited to:

1. Samples for the following:
    a. Organic mulch top dressing (1/2 c.f. each)
    b. Edging materials and accessories, of manufacturer's standard size, to verify color selected.
2. Manufacturer's certified analysis for standard products.
3. Material Test Reports: For on-site topsoil, import topsoil and/or manufactured soil proposed for use on this project.
4. Planting soil amendments as recommended by soil analysis laboratory.
5. Qualification Data: For landscape Installer in compliance with “Quality Assurance”.

B. Plant Materials List: Submit confirmation from supplier 30 days prior to planting that all plant material has been ordered.

C. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer shall be delivered to Owner's Representative upon delivery.

D. Qualification Data: For landscape Installer prior to performing work.

E. Planting Schedule: Indicating anticipated planting dates for each type of planting.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Experience: The landscape installation firm shall have contracted for and successfully completed construction of a minimum of five (5) California public school district construction projects, approved by the Division of the State Architect (DSA), within the past five (5) years of similar size, complexity, budget and scope.

2. Licensure: The landscape installation firm shall hold a current, active C27 "Landscaping Contractor" license classification by the California State License Board that has been consistently active for at least five (5) years and that has not been suspended or revoked.

3. Supervision: The landscape installation firm shall have a qualified and experienced landscape technician on site during landscape installation.

B. Soil Analysis Laboratory Qualifications: Testing laboratory shall be Lucchesi Plant and Soil Consulting, LLC., www.lucchesiconsulting.com,(408) 337-2575, or approved equal independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Soil Analysis: Furnish soil analysis by a qualified soil analysis laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity (CEC) or total exchangeable cations (TEC); sodium absorption ratio; deleterious material; pH; soluble salts, boron, mineral and plant-nutrient content of planting soil.

1. Report suitability of planting soil for plant growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory planting soil.

D. Protect existing to remain and newly installed lawn and/or landscape areas from damage or trespass by maintaining construction fencing during construction and maintenance.

E. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."

1. Selection of exterior plants purchased under allowances will be made by Owner's Representative, who will tag plants at their place of growth before they are prepared for transplanting.

F. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above ground for trees up to 4-inch caliper size, and 12 inches above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

G. Observation: Owner's Representative may observe trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Owner's Representative retains right to observe trees and shrubs further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Owner's Representative of sources of planting materials 30 days in advance of delivery to site.

2. Prior to Owner's Representative review of plant material, trees shall be neatly spaced approximately 5' apart (minimum) to allow for access in and around each tree and far enough to visually review each tree canopy without obstruction from other tree and/or shrub canopies.

H. Pre-installation Conference: Conduct conference at Project site with General Contractor and/or Owner's Representative to comply with requirements "Project Management and Coordination."

I. Protect all planting areas from trespass or damage by installing temporary barriers or protective fencing during construction. Barrier and/or fencing material and installation method shall be approved by Owner's Representative prior to installation.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Notify Owner's Representative fourteen (14) days prior to anticipated plant material delivery to schedule review of plant material prior to installation.

B. Do not prune trees and shrubs before delivery, except as approved by Owner's Representative. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.

C. Handle planting stock by root ball.

D. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist.

1. Do not remove container-grown stock from containers before time of planting.

2. Water root systems of exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

## 1.7 PROJECT/SITE CONDITIONS

A. Prior to placing topsoil, Contractor shall collect and submit soil samples representative of on-site topsoil and/or import topsoil proposed for use in all planting and lawn areas to a soil analysis laboratory for analysis and soil amending recommendations. Submit test results analysis and recommendations to Owner's Representative for review and approval prior to beginning work.

B. Weather Limitations: Proceed with planting only when weather conditions permit.

C. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns, unless otherwise acceptable to Owner's Representative.

1. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

D. Irrigation system shall be installed and operative before beginning planting operation.

E. Contractor shall protect new plantings and/or delay planting in event of forecasted freezing temperatures.

## 1.8 WARRANTY

A. Special Warranty: Warrant the following exterior plants, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner or users, or incidents that are beyond Contractor's control.

1. Warranty Period for Trees, Shrubs, Vines, Lawns and Ground Covers: One year from date of Final Completion.

2. Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.

3. Replace exterior plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.

4. A limit of one replacement of each exterior plant will be required, except for losses or replacements due to failure to comply with requirements.

## 1.9 MAINTENANCE

A. Plant Material and Planting Areas: Maintain for the following maintenance period by pruning, cultivating, watering, weeding, fertilizing, restoring planting basins, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Refer to "Maintenance Schedule."

1. Maintenance Period: Ninety (90) days from date of Owners Representative's written approval of Substantial Completion of the planting and irrigation.

2. In the event plant material fails during the maintenance period due to Contractor negligence, the maintenance period shall extend until 90% of the plant material is established as determined by the Owner's Representative.

## PART 2 - PRODUCTS

### 2.1 TREE, SHRUB AND VINE MATERIAL

A. General: Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

B. Grade: Provide trees and shrubs of sizes and grades complying with ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Owner's Representative, with a proportionate increase in size of roots or balls.

C. Label at least one tree and one shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.

D. If formal arrangements or consecutive order of trees or shrubs is shown, select stock for uniform height and spread, and number label to assure symmetry in planting.

E. Provide plant material as specified on the Drawings including size, genus, species and variety.

### 2.2 SINGLE-TRUNK AND MULTI-TRUNK TREES

A. Trees: Single-trunk or multi-trunk trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, complying with ANSI Z60.1 for type of trees required.

1. Branching Height: typical of tree species and container size, single trunk unless specified as multi-trunk on Planting Plan Legend. Select branching height in accordance with planting location. Low branching trees shall not be planted in conflict with pathways, driveways and/or structures.

2. Single-stem trees shall have straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, complying with ANSI Z60.1 for type of trees required.

3. Multi-stem trees shall branch naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1.

### 2.3 GROUND COVER PLANTS

A. Ground Cover: Provide ground cover of species indicated, established and well rooted in pots or similar containers, and complying with ANSI Z60.1.

2.4 PLANTS

A. Annuals: Provide healthy, disease-free plants of species and variety shown or listed. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud and bloom.

B. Perennials: Provide healthy, field-grown plants from a commercial nursery, of species and variety shown or listed, remove dead flowers.

2.5 TOPSOIL

A. Prior to placing bid, Contractor to coordinate with General Contractor, Demolition and/or Grading Contractors and verify quantity and source of planting soil for all planting areas. Identify Contractor responsible for stockpiling on-site topsoil and/or acquiring import planting soil and installing a minimum of twelve (12) inches of planting soil in all landscape planting areas and any raised planters and rough grading in accordance with these specifications, details, notes, grading and drainage plans.

B. Coordinate with General Contractor, Demolition and/or Grading Contractors for removal and replacement of lime treated soils and replacement with planting soil prior to planting to depth required to remove lime treatment. In event trees are planted in lime treated soils, trees shall have a minimum six (6) inch layer of planting soil below their rootball to provide a suitable substrate to root into for establishment.

C. On-site topsoil: Re-use existing topsoil or existing surface soil, top twelve (12) inches excavated and stockpiled on-site. Verify suitability of existing and/or stockpiled surface soil to produce planting soil by submitting a sample to a soil analysis laboratory. Acceptable on-site topsoil shall be ASTM D 5268, pH range of 5.5 to 7.5 (5.8 to 7.8 for predominantly California native plant species), representative of productive soils in the vicinity, a range of 4 to 15 percent organic material content; free of stones one (1) inch or larger in any dimension, roots, plants, sod, clay lumps and other extraneous materials harmful to plant growth. Sodium absorption rate (SAR) shall not exceed 5.0, conductivity of the saturation extract solution shall not exceed 3.0, and boron concentration in the saturation shall not exceed 1.0 ppm. Fine gravel (2-5 mm) and coarse gravel (5-12 mm) content shall not exceed 30%.

D. Import Topsoil: Supplement with imported or manufactured topsoil from off-site, local sources, when quantities of on-site topsoil are insufficient. Do not obtain topsoil from bogs or marshes. If soil is obtained from agricultural land, Contractor shall submit proof soil is nematode free. Import topsoil shall meet the following requirements:

1. USDA Classification of fraction passing 2.0 mm sieve: sandy loam, sandy clay loam or loam.

2.

| Class | Particle size range | maximum, % | minimum, % |
|---|---|---|---|
| Coarse Sand | 0.5 – 2.0 mm | 15 | 0 |
| Silt | .002-.05 mm | 30 | 10 |
| Clay | <.002 mm | 25 | 10 |
| Other Classes | | | |

| | | | |
|---|---|---|---|
| Gravel | 2-13 mm | 15 | 0 |
| Rock | ½-1 inch | 5% by volume with | none >1 inch |
| Organic | | 15 | 4 |

3. Chemistry – Suitability Considerations
   Salinity: Saturation Extract Conductivity (ECe)
   Less than 3.0 dS/m @ 25 degrees C.
   Sodium: Sodium Adsorption Ratio (SAR)
   Less than 6 ppm
   Boron: Saturation Extract Concentration
   Less than 1.00 ppm
   Reaction: pH of Saturated Paste: 5.5 – 7.5 without high lime content.

4. Soil to contain sufficient quantities of available nitrogen, phosphorus, potassium, calcium and magnesium to support normal plant growth. In the event of nutrient inadequacies, provisions shall be made to add required materials prior to planting.

5. Soil Analysis: Contractor shall submit to the Owner's representative for approval, certification from an agricultural soils analysis laboratory that the import topsoil provided conforms to the specifications prior to delivery of import or placement on on-site topsoil. Soil analysis shall have been performed on import topsoil source within the previous year.

## 2.6 BIO-RETENTION BASIN

A. Refer to civil drawings for construction of bio-retention basin swales.

B. Line bio-retention basin swale with Lenox Blend soil mixture available from LH Voss Materials, Inc. 2445 Del Vista Monte, Concord, CA 94520, www.lhvoss.com, (800) 660-8677, Rob Hawkins x 108, Butch Voss x 109. Depth shall be a minimum of 18" unless specified otherwise within plans and/or details.

## 2.7 FERTILIZER AND SOIL AMENDMENTS

A. Contractor shall collect and submit sample of proposed planting soil, representative of the top eight (8) inches of planting soil, to a locally known soil analysis laboratory, soil analysis laboratory for analysis and amendment recommendations. Sample shall be representative of typical on-site topsoil proposed for use in planting areas.

B. If import topsoil is proposed, import topsoil sample shall be submitted to a soil analysis laboratory locally known for analysis, amendment recommendations and installation recommendations.

C. Contractor shall provide soil analysis laboratory, the following information when submitting soil for analysis:

1. Project type (public school, commercial building, etc.).
2. Anticipated maintenance (regular, low, none, etc.).
3. Irrigation water source (potable or recycled).

4. Proposed plant material type such as California native plants, turf, shrub and ground covers.

5. Copy of this specification.

D. Fertilizers: All fertilizers shall be of an approved brand with a guaranteed chemical analysis as required by USDA regulations and shall be dry and (except for plant tabs) free flowing.

E. Nitrogen Stabilized Organic Amendment: 0-1/4 inch nitrogen-stabilized organic amendment contributing at least 270 pounds of organic matter per cubic yard. Consider using Composted Greenwaste Organic Soil Amendment, such as Z-Best Organic Compost from Zanker Landscape Materials (www.zankerlandscapematerials.com) or equal, if recommended by soil analysis laboratory. Compost shall be obtained from a supplier participating in the Seal of Testing Assurance (STA) program of the U.S. Composting Council.

1. In order to comply with MWELO 492.6, 3. (C). Soil Preparation, Mulch and Amendments, at a minimum, compost shall be applied at a rate of four (4) cubic yards per 1,000 square feet of permeable area incorporated to a depth of six (6) inches into the soil. Soils with greater than 6% of organic matter in the top six (6) inches are exempt from adding compost.

2. Nitrogen stabilized sawdust shall not be used.

F. Soil Preparation: The following materials and quantities are given for bidding purposes only and Contractor shall amend soil using products, quantities and methods specified by soil analysis laboratory.

1. Nitrogen stabilized organic amendment.

2. All-purpose granular fertilizer (6-20-20).

3. Soil sulfur.

G. Planting Tablets: 21 gram controlled release fertilizer supplying nitrogen for up to 1 ½ years and 20-10-5 content.

H. Backfill Mix: Shall be a mixture of on-site or import topsoil, nitrogen stabilized organic amendment and fertilizer. For bidding purposes, backfill mix shall include 2/3 topsoil and 1/3 nitrogen stabilized organic amendment with 6-20-20 granular fertilizer, quantity per manufacturer, according to container or root stock size, mixed thoroughly.

## 2.8 MULCHES

A. Due to variation in mulch sizes, Contractor shall remove large bark mulch in excess of approximately ¾” x ½” x 6” in size of 2.5 cubic inches in volume.

B. Organic Mulch for non-bio-retention planting areas: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of organic bark from Republic Services (contact Michael Cappello, Compost Solutions Representative at (408) 618-4773), Pro-Chip decorative mulch, Republic Services, Newby Island Recyclery, Milpitas, CA (408) 945-2836. Color to be mahogany. Submit sample to Owners Representative’s for review and approval.

C. Organic Mulch for Bio-retention basin swales: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of organic shredded cedar bark from Pacific Landscape Supply (209) 593-1199, www.pacificlandscapesupply.com, or equal. Submit sample to Owners Representative's for review and approval.

2.9 HERBICIDES

A. Pre-emergent: Ronstar-G, or approved equal.

B. Selective and non-selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

C. Contact Owner and obtain School District, Local, State and Federal policies and procedures for regulating application of chemical controls. Contractor shall comply with all applicable policies and/or procedures for application, posting and notifications.

2.10 STAKES AND GUYS

A. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, redwood, or pressure-preservative-treated Douglas Fir or Lodgepole Pine, free of knots, holes, cross grain, and other defects, two (2) inches in diameter by length required, and pointed at one end.

B. Guy and Tie Wire: ASTM A 641/A 641M, Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch in diameter.

C. Guy Cable: 5-strand, 3/16-inch- diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.

D. Tree Ties: Z-Strap tree ties, or equal, made of one (1) inch wide by on-quarter (1/4) inch thick, black recycled tire rubber with pre-punched nail holes. Contact Sullivan & Mann Lumber Company, Inc. (800) 847-6562 (www.sullivanandmann.com).

E. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.

2.11 LANDSCAPE EDGINGS/HEADERBOARD

A. Wood Strip Edging, unless indicated otherwise on Drawings, shall be as follows:

1. Species: Construction Heart Redwood, size per detail.
2. Stakes: Construction heart redwood, size per detail, with galvanized nails for anchoring edging.
3. Splice Plate: Same species as edging, 1 by 6 by 24 inches long in nominal size, with galvanized nails for securing in place.

2.12 WATER

A. Water shall be suitable for irrigation and free from ingredients harmful to planting areas.

2.13 POTTING SOIL

A. Potting soil shall be Supersoil® or equal potting soil, blend of organic materials, natural and traditional fertilizers, formulated for outdoor container plants with no fertilizing required for up to ninety (90) days after planting.

2.14 MISCELLANEOUS PRODUCTS

A. Tree Trunk Guard: nine (9) inch high by four (4) inch diameter plastic, corrugated tube, Arbor Guard + or equal.

B. Tree Root Barriers: 18" high by 24" wide, interlocking panels of not less than 0.080" (2.032 mm) thickness, black in color, at least 50% recycled material, injection molded plastic product for linear applications with ultra-violet inhibitors with anti-lift ground lock tabs, vertical root deflecting ribs and double top edge consisting of two parallel, horizontal ribs on the top.

C. Jute Netting: Biodegradable in two (2) to three (3) years from installation, absorbing water four to five times fabric weight, open area 60% to 65%, available in rolls four (4) feet in width. Use galvanized steel staples as recommended by manufacturer to secure netting in place.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Planting operations shall be performed when weather and soil conditions are suitable for planting.

3.2 PREPARATION

A. 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.

B. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.

C. Install protective barriers and/or fencing as necessary.

D. Contact and obtain Owner's Representative, Local, State and Federal policies and procedures for regulating application of fertilizers, fungicides, insecticides, pesticides and herbicides. Contractor shall comply with all applicable policies and/or procedures for application, posting and notifications.

E. Do not excavate, place soils or amend soils during wet or saturated conditions.

F. If lime treated soils have not been removed from proposed planting areas, remove and replace with acceptable topsoil.

G. Verify depth of planting soil in proposed planting areas. If depth of planting soil is less than twelve (12) inches in depth, install additional planting soil to ensure twelve (12) inch minimum depth of topsoil.

H. Import topsoil Installation:

1. Remove and disposed of stones larger than one (1) inch in any dimension, vegetation and foreign inorganic material from surface to receive import topsoil.

2. Scarify or plow the subgrade by crossripping or equivalent to a minimum depth of four (4) inches until it is loose and uncompacted to provide bonding of imported planting soil layer to subgrade.

3. Place planting soil on loosened material in four (4) inch layers. Crossrip first import planting soil layer to a depth of eight (8) inches and blend import planting soil with loose native surface soil. Roll lightly with appropriate lawn roller to consolidate soil and compact to 85% density.

4. Continue placement of planting soil after blending first layer with native soil in four (4) inch layers and rolling lightly to consolidate and compact each layer of soil and compact to 85% density.

5. Place topsoil to the lines and grades in accordance with grading Drawings.

I. Verify rough grading is completed to proper slopes and elevations.

J. Verify installation of topsoil to a minimum depth of twelve (12) inches and rough grading is completed to proper slopes and elevations.

3.3 SOIL AMENDING AND FINE GRADING (Amend per Soil analysis laboratory recommendations. The following amendment recommendations are given for bidding purposes only.) Contractor shall prepare and amend soil over entire planting areas and as recommended for backfill at individual planting pits.

A. Soil Preparation: Loosen subgrade of planting beds by crossripping or equivalent cultivation to a minimum depth of ten (10) inches. Remove stones larger than one (1) inch in any dimension and sticks, roots, rubbish, and other extraneous matter in the top six (6) inches of soil and legally dispose of them off Owner's property.

B. Soil Amending: (Amend per soil Analysis laboratory recommendations. The following recommendations are provided for bidding purposes only. Contractor shall amend soil for over-all preparation and amendment recommendations and for planting pit preparation,

amendments and backfill) Add the following and thoroughly till into the top eight (8) inches of planting soil at the following rates per 1,000 square feet. Till planting soil to a homogeneous mixture of fine texture, free of lumps, clods, stones, roots and other extraneous matter. Float, rake and roll all planter areas to establish finished grades, maintaining drainage patterns and swales for grading and drainage plans, creating smooth, uniform surface plane.

1. 6 cubic yards nitrogen stabilized organic amendment per 1,000 square feet.
2. 14 pounds all-purpose granular fertilizer (6-20-20) per 1,000 square feet.
3. 15 pounds soil sulfur per 1,000 square feet.

C. Fine Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Refer to civil grading plans and conform to designed grades, drainage patterns, swales, and ridges.
There shall be no areas that hold water or drain toward buildings or structures, unless designed per civil grading plans.

1. In planting areas, set finish grade of soil one and one half (1 1/2) inches below adjacent paved surfaces, utility boxes, tops of curbs, and the like to allow for installation of organic mulch top dressing above.
2. Regrade as necessary to restore grades and drainage patterns after installation of plant material.

## 3.4 BIO-RETENTION SOIL AND INSTALLATION

A. Preparation:

1. Prior to installation of bio-retention soil, protect native soil at excavated bio-retention area from compaction by preventing traffic and installing a fence or covering with plywood.
2. Protect bio-retention soil stockpile from compaction and contamination from foreign matter by covering with a protective tarp.
3. Verify installation of subsurface and surface drainage with Civil Engineer prior to placing bio-retention soil.
4. Drainage should be directed away from bio-retention soils until upslope areas are stabilized and compacted.

B. Bio-Retention Soil Mixing and Placing:

1. Do not excavate, place soils or amend soils during wet or saturated conditions.
2. Operate equipment adjacent to bio-retention area and not in bio-retention area to avoid compaction.
3. If machinery must operate in the bio-retention area or adjacent planting area, use light weight, low ground-contact pressure equipment.
4. Where bio-retention soil meets native soil, rip or scarify the bottom native soils of the bio-retention area to a depth of four (4) inches.

5. If mixing bio-retention soil and amendments on-site, use an adjacent impervious area or plastic sheeting to prevent intrusion of foreign material.
6. Place bio-retention soil in 12” lifts. Do not place or work bio-retention soil if it is saturated or raining.
7. Allow bio-retention soil lifts to settle naturally, boot pack (walk around to compact) lifts to achieve 85% compaction or compact by lightly watering until soils are just saturated and allow bio-retention soils to dry between lifts.
8. Verify bio-retention soil elevations comply with grading design prior to applying mulch or installing plants.
9. After all lifts are placed, wait three (3) days to check for settlement, and add additional bio-retention soil as needed.

## 3.5 EDGING/HEADERBOARD INSTALLATION

A. Redwood Headerboard: Install wood headers or edgings where indicated. Anchor with wood stakes spaced per detail, driven at least 1 inch below top elevation of header or edging. Use 2 galvanized nails per stake to fasten headers and edging; length as needed to penetrate both members and provide 1/2-inch clinch at point. Chamfer top of stakes as indicated on detail and pre-drill stakes if needed to avoid splitting.

## 3.6 PLANT MATERIAL EXCAVATION

A. Lay out individual tree and shrub locations and areas for multiple exterior plantings. Stake locations, outline areas, adjust locations when requested, and obtain Owner’s Representative's acceptance of layout before planting. Make minor adjustments as required.

B. Lay out exterior plants at locations directed by Owner’s Representative. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

C. Pits and Trenches: Excavate circular pits with sides sloped inward. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation.

1. Excavate approximately planting pit sizes as indicated on planting details.
2. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots.
3. Set rootball onto compacted native soil so that rootball sits one (1) inch above adjacent finish grade.

D. Obstructions: Notify Owner’s Representative if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

E. Drainage: Notify Owner’s Representative if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.

F. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

## 3.7 PLANT MATERIAL PLANTING

A. Place planting tablets in hole about one (1) to two (2) inches away from root tips. Refer to manufacturer's recommendation for exact quantity, but not less than:

| Plant size | Quantity | Plant size | Quantity |
|---|---|---|---|
| 1 gallon container | 1 | 7 gallon container | 5 |
| 2 gallon container | 2 | 15 gallon container | 8 |
| 3 gallon container | 3 | 24" box container | 20 |
| 5 gallon container | 3 | 36" box container | 30 |

B. Carefully remove root ball from container without damaging root ball or plant.

C. Set container grown planting stock plumb and in center of pit or trench with top of root ball one (1) inch above adjacent finish grades. Face plant material for best appearance.

D. Place amended backfill mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly.

E. Finish placing remainder of backfill mix. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil.

## 3.8 TREE AND SHRUB PRUNING

A. General Tree Pruning Procedures:

1. Prune trees according to ANSI A300 (Part 1). Prune trees for long term structural integrity.
2. Cut branches with sharp pruning instruments; do not break, tear or chop. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
3. Do not apply pruning paint to wounds.

B. Pruning Goals (Prune as per the following and under the direction of a Certified Arborist):

1. Prune trees to remain to compensate for root loss caused by construction damage. Provide subsequent maintenance during landscape irrigation and planting maintenance period and until "final completion" as recommended by Certified Arborist.
2. Prune to remove dead wood, promote proper structure, thin and open canopy and for general health for the specific tree species.
3. Prune for clearance from structures, pathways and driveways and streets and for a balanced canopy.

C. Shrubs, Vines and Ground Covers:

1. Prune, thin and shape shrubs according to standard horticultural practices.
2. Prune to remove injured or dead branches from shrubs.

## 3.9 GUYING AND STAKING

A. Upright Staking and Tying: Unless detailed otherwise, use a minimum of 2 stakes of length required to penetrate at least six (6) inches below bottom of backfilled excavation and to extend at least 72 inches above grade. Set vertical stakes and space to avoid penetrating root balls or root masses. Brace tree stakes with wood horizontal bracing screwed in place. Support trees with two rubber tree tie sections at contact points with the tree trunk installed in a “figure 8” wrap. Allow enough slack to avoid rigid restraint of tree. Trim stakes below tree canopy and to matching heights. Unless indicated otherwise on Drawings, use the number of stakes as follows:

1. Use 2 stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper.
2. Use 3 stakes for trees more than 12 feet high and greater than 2-1/2 inches in caliper. Space stakes equally around trees.

B. Guying and Staking: Guy and stake trees exceeding 14 feet in height and more than 3 inches in caliper, unless otherwise indicated. Securely attach no fewer than 3 guys to stakes 30 inches long, driven to grade.

1. For trees more than 6 inches in caliper, anchor guys to pressure-preservative-treated deadmen 8 inches in diameter and 48 inches long buried at least 36 inches below grade. Provide turnbuckles for each guy wire and tighten securely.
2. Attach flags to each guy wire, 30 inches above finish grade.
3. Paint turnbuckles with luminescent white paint.

## 3.10 TREE ROOT BARRIERS

A. Install root barriers where trees are planted within six (6) feet of any pavement or structures.

B. A linear root barrier shall be installed flush with the vertical edge of pavement or structure, one half (1/2) inch below the top of the pavement and shall extend six (6) feet in each direction for a total of twelve (12) feet in length. Contractor shall remove concrete spillage if necessary to install barrier flush against vertical concrete edge.

## 3.11 TREE TRUNK GUARD:

A. install to protect newly planted tree trunks planted in lawns according to manufacturer recommendations.

## 3.12 RAISED PLANTERS

A. Fill raised planters with amended planting soil. Place planting soil in twelve (12) inch deep, compacted layers to 85% relative density to an elevation of four (4) inches below the top of the raised planter (unless detailed otherwise on Drawings).

3.13 POTTERY, PLANTING CONTAINERS AND/OR PREFABRICATED PLANTERS

A. Fill pottery, planting containers and prefabricated planters with potting soil. Compact in twelve (12) inch lifts and fill to three (3) inches of the top of the planter.

3.14 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants spaced as indicated on planting legend.

B. Dig holes large enough to allow spreading of roots, and backfill with planting soil.

C. Work planting soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

D. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

E. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.15 PRE-EMERGENT

A. Apply pre-emergent herbicide per manufacturer recommendations in new planting areas.

3.16 JUTE NETTING

A. Install jute netting on slopes exceeding 3:1 ratio slope. Apply jute netting after preparing planting soil for planting and fine grading. Secure jute netting starting at the top of the slope by laying six (6) inches of fabric below grade to a minimum depth of six (6) inches. Roll jute netting down slope and terminate where grade becomes level by folding six (6) inches of fabric underneath. Overlap seems four (4) to six (6) inches. Secure in place using staples placed eighteen (18) inches on center spacing. After completion of planting operations, install top dressing/mulch as specified herein.

3.17 PLANTING BED MULCHING

A. Apply three (3) inch minimum thickness of organic mulch, unless specified otherwise on Drawings, continuously throughout planting areas. Do not place mulch within two (2) inches of stems and six (6) inches of tree trunks.

3.18 CLEANUP AND PROTECTION

A. During exterior planting, keep adjacent paving and construction work area in a clean and orderly condition.

B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation. Treat, repair, or replace damaged exterior planting.

C. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

## 3.19 MAINTENANCE SCHEDULE

A. Protection: Protect work from damage, erosion and trespass. Maintain temporary fencing and/or barriers in proper condition. Remove temporary fencing and/or barriers prior to final completion and at end of maintenance period.

B. Water: Contractor shall be solely responsible for ensuring that all planting is sufficiently watered to promote vigorous growth. Test and inspect irrigation system on a regular basis each week. Adjust and repair the irrigation system and its components as necessary for plant establishment and growth and for watering efficiency. Check and adjust any obstructions to emission devices.

C. Fertilizing (confirm with soil analysis laboratory recommendations): Immediately after completion of planting, fertilize landscape areas with ammonium sulfate (21-0-0) fertilizer at a rate of five (5) pounds per 1000 square feet. Fertilize with specified fertilizer after 45 days, prior to end of maintenance period. After landscape becomes well-established, fertilize in fall and spring with (16-6-8) commercial fertilizer at a rate of six (6) pounds per 1000 square feet.

D. Weed Control: Maintain planting beds (planted or not) in a weed-free condition to be performed weekly during maintenance period. Weeding may be done manually or by the use of selective herbicides. (Contractor shall obtain written approval from project owner prior to application of herbicide) No herbicide shall be used without the Owner Representative’s prior consent. Use only approved herbicides, use in accordance with manufacturer’s recommendations and per Pest Control Advisor’s recommendations. If selective herbicides are used, extreme caution shall be observed so as not to damage any other plants. Spraying shall be done only under windless conditions.

E. Disease, Pest and Insect Control: Disease, pest (including, but not limited to, birds and rodents) and insect damage shall be controlled by the use of fungicides, insecticides pesticides, poisons and/or mechanical means. (Contractor shall obtain written approval from project owner prior to application of fungicides, insecticides or pesticides or mechanical methods). Review and perform weekly during maintenance period.

F. Plant Material: Maintain trees, shrubs and other plants by pruning, cultivating and weeding as required for healthy growth. Restore planting pits as necessary. Tighten and repair stake supports and reset trees and shrubs to proper grades or vertical position as required. Review and perform weekly during maintenance period.

G. Organic Mulch: Re-apply organic mulch top dressing after initial settling and again prior to end of maintenance to ensure specified depth is achieved.

H. End of maintenance shall be reviewed and approved in writing by Owner's Representative. Upon approval, Contractor shall notify Owner's Representative in writing when maintenance is complete with a date which maintenance transfers to Owner.

3.20 FIELD QUALITY CONTROL, SUBSTANTIAL COMPLETION AND FINAL COMPLETION

A. Owner's Representative shall inspect and approve the following prior to proceeding with subsequent work:

1. Preparation: at completion of finish grading and prior to planting, grading tolerances and soil preparation shall be checked for conformance to Drawings and as specified herein.

2. Layout: Layout of all plants, headerboard and other major elements shall be directed and/or approved by Owner's Representative.

3. Substantial Completion Review: At substantial completion of this Section, work shall be reviewed for conformance with the Drawings and Contractor shall make recommended repairs and/or corrections in a timely manner.

4. Final Completion Review: After substantial completion repairs and/or corrections have been completed, work shall be reviewed for final completion and approved by Owner's Representative in writing.

B. Re-inspections required due to Contractor not being prepared or non-conformance to Drawings shall be back charged to the Contractor.

C. Contractor shall remove protective fencing and/or barriers prior to final completion review.

END OF SECTION

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# SECTION 330528 - TRENCHING AND BACKFILLING FOR UTILITIES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Bedding and backfilling materials.

B. Staking and grades.

C. Existing utilities.

D. Trenching and excavating.

E. Bedding and backfilling.

F. Field quality control.

### 1.2 REFERENCES

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

1. ASTM C33 Specification for Concrete Aggregates

B. State of California, Department of Transportation (Caltrans), Standard Specifications, Latest edition

C. State of California Public Utilities Commission (Cal. PUC) G.O. 128: Construction of Underground Electrical Supply and Communications Systems, Rules For.

### 1.3 DESCRIPTION

A. This Section includes specifications for excavating, trenching, and backfilling for utilities, as indicated, including underground electrical conduits, utility boxes, and pull boxes.

1. Trenching and backfilling for utilities includes restoration of existing pavements, where applicable, to the conditions existing before the excavation.

### 1.4 REGULATORY REQUIREMENTS

A. Regulatory requirements that govern the work of this Section include the following governing codes:

1. California Code of Regulations, Title 24, Part 2, California Building Code, Chapter 33, and Appendix Chapter 33, Excavation and Grading, for protection of the public.

2. PG&E Green Book standards for trenching and backfilling including Bulletin TD-2999B-030 or the latest revision

## PART 2 - PRODUCTS

### 2.1 BEDDING AND BACKFILLING MATERIALS

A. Bedding:

1. Sand: Sand for bedding of pipe in utility trenches shall be a clean and graded, washed sand, all passing a No. 4 U.S. Standard sieve, and conforming generally to ASTM C33 for fine aggregate. A finer sand may be used, if convenient, provided the sand is clean and does not contain deleterious substances in excess of the amounts specified in ASTM C33, Table 3.

2. Pea Gravel: Clean and graded, washed river-run gravel, ASTM C33, Size No. 7. Pea gravel may be used in trenches requiring additional drainage and for backfilling above the pipe's upper half (above the horizontal centerline).

B. Backfill Material: Backfill for excavations and trenches under structures and paving shall be Structural Fill as indicated. Common Fill will be permitted only for backfilling of excavations and trenches in open areas and landscaped areas.

## PART 3 - EXECUTION

### 3.1 EXISTING UTILITIES

A. Maintain existing utilities and protect from damage as necessary to satisfy the requirements of jurisdictional utility companies and related codes and regulations.

B. Utilities to be removed shall not be removed until shut-down time can be kept to a minimum. Do not remove an existing utility line or service until the replacement line, crossover, or capping is ready to be performed.

C. Protect active underground utilities from damage. If underground utilities are damaged in any way, notify the Engineer and affected utilities immediately for corrective action.

### 3.2 TRENCHING AND EXCAVATING

A. Comply with CCR, Title 8, Trench Construction Safety Orders, and the California Building Code, Chapter 33 and Appendix Chapter 33, as applicable.

B. Perform trenching and excavating as indicated and required for drainage and utility piping, conduits, and related structures, and provide shoring, bracing, pumping, and planking as required.

C. Excavate to the lines and grades indicated.

D. Excavate trenches for pipes and conduits by the open-cut method, except where

tunneling or jacking are indicated. Hand-excavate for crossing pipelines.

E. In paved areas, cut pavement on the neat lines at the width indicated for the trench. Pavement shall be saw cut. After compacting the backfill, restore pavement to a condition equivalent to that existing at the start of construction. Restore pavement damaged outside the neat lines.

1. Where indicated or required by the governmental authority having jurisdiction, provide slurry cement backfill for trench excavation to underside of pavement.

F. Excavate trenches to the indicated width at all points below a horizontal plane 2 feet above the top of the pipe. Excavation above this plane may exceed the indicated width as required. Where the width is not indicated, make the width not less than 6 inches nor more than 18 inches from the outside of the pipe. If the excavation exceeds permissible dimensions, install higher strength pipe or encase the pipe in Class 3000 concrete.

G. The bottoms of excavations shall be firm, undisturbed earth or cut sub grade, clean and free from loose material, debris, and foreign matter. When bottoms of excavations or trenches are a soft or unstable material, the bed shall be made firm and solid by removing said unstable material to a sufficient depth and replacing same with sand or pea gravel, compacted to at least 90 percent relative compaction.

H. Where water is encountered in the trench, dewater, and provide sand or pea gravel as required to drain the water and stabilize the bed.

I. Bell holes shall be accurately placed and shall not be larger than required to make the joint.

3.3 BEDDING AND BACKFILLING

A. Material for bedding of pipe shall be sand. Minimum thickness of sand bedding under concrete, clay, and cast-iron pipe shall be 2 inches. Provide firm and uniform support of piping at indicated elevations and grades. Tamp sand bedding as required for firm support.

B. Backfill below the horizontal centerline of pipe shall be sand. Backfill to 6 inches above the top of pipe from the horizontal centerline of pipe shall be the material herein specified in Articles 2.1.A.2 and 2.1.B, as applicable.

C. Backfill shall be placed in 6-inch layers, leveled, rammed, and tamped in place. Each layer shall be compacted with suitable compaction equipment to at least 90 percent relative compaction, taking care not to damage or misalign any pipe. The top 12 inches under structures and pavement shall be compacted to at least 95 percent relative compaction.

D. Backfilling for site electrical conduits must conform to the details shown on the Contract Drawings and as specified in the Caltrans Standard Specifications.

3.4 FIELD QUALITY CONTROL

A. Contractor Quality Control: Must perform the following inspections and testing:

1. Density and relative compaction per ASTM D2922. Testing frequency must be not less than one test for every 1,000 square feet of trench, per layer or lift.

END OF SECTION 330528

# SECTION 33 41 00
# STORM UTILITY DRAINAGE PIPING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Provide storm sewerage system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

### 1.2 SUBMITTALS

A. Comply with pertinent provisions of General Conditions.

B. Product data: Within 20 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;

2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;

3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

### 1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

## PART 2 PRODUCTS

### 2.1 PIPE MATERIALS

A. Provide pipe and associated materials of the size indicated on the Drawings and meeting the following requirements.

1. Non reinforced concrete pipe (NRCP): Provide "extra strength" complying with ASTM C14.

2. Reinforced concrete pipe (RCP): Provide "standard strength" (Class III) complying with ASTM C76.

3. Polyvinyl chloride pipe (PVC): Drainpipe shall conform to requirements for ASTM D3034, for SDR-35.
4. Trench Drains: ABT Inc. "Polydrain" precast polymer concrete trench drain system and components, including catch basins with locking devices.

### 2.2 DRAINAGE STRUCTURES

General:

1. Construct manholes, inlets, and junction structures of reinforced concrete or precast reinforced concrete, complete with metal frames and covers or gratings, and with fixed ladder rungs where indicated on the Drawings or required by codes.

2. Individual wall mounted aluminum, plastic covered steel, or galvanized steel rungs are acceptable.

Materials:

1. Concrete: Comply with provisions for a minimum of 2500-psi concrete specified in Section 033001.

2. Mortar for pipe joints and connections to other drainage structures, and manhole construction:

a. Comply with requirements of ASTM C270, type M, except the maximum placement time shall be one hour.

b. Hydrated lime complying with ASTM C141, type B, may be added to the mixture of sand and cement in an amount equal to 25% of the volume of cement used.

c. Provide a quantity of water in the mixture sufficient to produce a stiff workable mortar, which shall be clean and free from harmful acids, alkalis, and organic impurities. Use the mortar within 30 minutes after water is added to the mix.

3. Precast reinforced concrete manholes:

a . Comply with ASTM C478, precast rings and cone sections.

b. Fully bed the joints between precast concrete risers and tops in mortar, and smooth both interior and exterior surfaces uniformly.

c. Acceptable products:
(1) Manufactured by Ameron Pipe Products Group, El Monte, California.

4. Reinforcement: Provide intermediate grade billet steel complying with ASTM A615, grade 40.

5. Frames and covers or gratings:

a. Provide all gratings or covers from the same manufacturer.

b. Provide standard black finish, supplied as a total unit, sized as shown on the Drawings or larger sizes except where in a pavement area, and with the wording "STORM DRAIN" cast into the cover.

c. Acceptable products:
(1) Manufactured by Alhambra Foundry, Alhambra, California.
(2) Manufactured by NEENAH Foundry Company, Neenah, Wisconsin.

6. Precast concrete catch basins:

a. Provide reinforced and bottom open for field pouring to ensure slope through the structure.

b. Contractor may select this option in lieu of cast in place concrete catch basins.

c. Precast concrete, Christy Products "U" Series.

d. All products shall conform to ADA standards.

**PART 3 EXECUTION**

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 EXCAVATING, TRENCHING, AND BEDDING

A. Excavate, trench, and bed for site drains in accordance with pertinent provisions of Section 312333, and the following.

B. Movement of construction machinery:

1. Use means necessary to avoid displacement of, and injury to, pipe and structures while compacting by rolling or operating equipment parallel to the pipe.

2. Movement of construction machinery over a culvert or storm drain at any stage of construction is solely at the Contractor's risk.

Bedding:

1. Provide a bedding surface for the pipe with a firm foundation of uniform density throughout the entire length of the pipe.
2. Bed the pipe carefully in a soil foundation accurately shaped and rounded to conform to the lower 1/4 of the outside perimeter of circular pipe, or set the pipe in a bed of sand.

3. Tamp bedding where necessary.

4. Provide bell holes and depressions for pipe joints of only the length, depth, and width required for making the particular pipe joint properly.

5. Where plastic pipe is used, provide a minimum of 4" of sand bedding over the top and under the pipe.

3.3 INSTALLING PIPE

General:

1. Carefully examine each pipe prior to placing.

a. Promptly set aside defective pipe and damaged pipe.

b. Clearly identify defects.

c. Do not install defective pipe or damaged pipe.

2. Place pipe to the grades and alignment indicated, with a tolerance of one in 1000 vertical and one in 500 horizontal, unless otherwise directed by the Architect.

3. Provide adequate facilities for lowering pipe safely into the trenches.

4. Do not place pipe in water, or place pipe when trench or weather is unsuitable for such work.

Concrete pipe: Place by proceeding upgrade with the tongue ends of tongue and groove pipe, pointing in the direction of flow.

3.4 JOINTS

Joining concrete pipe:

1. Use the specified mortar ingredients.

2. Use the mortar within 60 minutes from the time water is first added to the mix.

3. Wipe the inside of the joint clean and smooth. Perform wiping by dragging a suitable swab or long handled brush through the pipe as installation progresses.

4. Protect the mortar bead on the outside from air and sun with suitable covering until cured.

5. Unless otherwise directed by the Architect, use one of the following methods of jointing for tongue and groove pipe:

a. Cement mortar tongue and groove joint:
(1) Bed the first pipe to the established gradeline, with the groove end placed upstream.
(2) Clean surface of groove with wet brush, and fill lower portion with mortar to such depth as to bring the inner surfaces of the abutting pipes flush and even.
(3) Clean the tongue end of each subsequent pipe with a wet brush, and uniformly match the groove so that the sections are closely fitted.
(4) After laying each section, fill remainder of joint with mortar, and form a bead around the outside of the joint with mortar.
(5) Use the specified mortar. If mortar can slump before setting, wrap or bandage the outside of the joint with cheesecloth to retain mortar in place.

b. Flexible watertight joints:
(1) Use the specified materials. Equal materials may be used when specifically approved in advance by the Architect.
(2) Install gaskets and joint materials in accordance with the manufacturers' recommendations as approved by the Architect.
(3) Protect from sun, blowing dust, and other deleterious agents at all times.
(4) Align the pipe with previously installed pipe, and pull the joint together. If, while making the joint, the gasket or jointing material becomes loose and can be seen through exterior joint recess when joint is pulled to within 1" of closure, remove pipe and remake the joint.
(5) Inspect gaskets, and replace loose and improperly affixed gaskets and jointing materials.

B. Polyvinyl chloride pipe joints: Install with the specified materials and in accordance with the manufacturers' recommendations as approved by the Architect, applying solvent cement to pipe and fitting as recommended in ASTM D2564.

C. Joining pipe of different materials: Provide fittings or couplings made for the pipe material jointing, or provide a concrete collar as approved by the Architect.

D. Joining pipe of different sizes:

1. Provide reducer fittings to the larger pipe.

2. Where pipes are different materials as well as different sizes, use the same material for reducer fitting as in the larger pipe.

3. Use saddle connection when branch lines join a main or collector main.

4. Use eccentric collar joint when the slope of the pipe is less than 1%.

## 3.5 DRAINAGE STRUCTURES

A. Install drainage structures in accordance with the Drawings and with the manufacturers' recommendations as approved by the Architect.

## 3.6 BACKFILLING

A. Backfill and compact in accordance with pertinent provisions of Section 31 23 00.

## 3.7 TESTING AND INSPECTING

A. Provide personnel and equipment necessary, and perform tests required to demonstrate that the work of this Section has been completed in accordance with the specified requirements.

Hydrostatic test on watertight joints:

1. Make a hydrostatic test on each watertight joint. Test one sample of each type watertight joint used. If one sample fails because of faulty workmanship, test an additional joint.

2. Demonstrate that joints in reinforced and unreinforced concrete pipe comply with ASTM C443.

3. Make tests in concrete pipe at an internal hydrostatic pressure of 10 psi for 24 hours.

4. Only joints within ten feet of exterior walls or faces of the buildings need be tested.

5. Replace or repair joints found to be faulty. Repeat the test and repair cycle until joints are demonstrated to meet the specified requirements.

**END OF SECTION 33 41 00**