## TABLE OF CONTENTS

### VOLUME 1: DIVISIONS 1 - 14

#### INTRODUCTORY INFORMATION

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>000110</td>
<td>Table of Contents</td>
</tr>
</tbody>
</table>

#### GENERAL REQUIREMENTS SUBGROUP

### DIVISION 01 - GENERAL REQUIREMENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>011000</td>
<td>Summary</td>
</tr>
<tr>
<td>012500</td>
<td>Substitution Procedures</td>
</tr>
<tr>
<td></td>
<td>Substitution Request Form</td>
</tr>
<tr>
<td>012600</td>
<td>Contract Modification Procedures</td>
</tr>
<tr>
<td></td>
<td>Change Order Request</td>
</tr>
<tr>
<td></td>
<td>Proposal Worksheet Summary</td>
</tr>
<tr>
<td></td>
<td>Proposal Worksheet Detail</td>
</tr>
<tr>
<td>012900</td>
<td>Payment Procedures</td>
</tr>
<tr>
<td>013100</td>
<td>Project Management and Coordination</td>
</tr>
<tr>
<td></td>
<td>Request for Interpretation (RFI)</td>
</tr>
<tr>
<td>013200</td>
<td>Construction Progress Documentation</td>
</tr>
<tr>
<td>013250</td>
<td>Network Analysis and Project Schedules</td>
</tr>
<tr>
<td>013300</td>
<td>Submittal Procedures</td>
</tr>
<tr>
<td></td>
<td>Submittal Transmittal</td>
</tr>
<tr>
<td>013516</td>
<td>Alteration Project Procedures</td>
</tr>
<tr>
<td>014000</td>
<td>Quality Requirements</td>
</tr>
<tr>
<td>014500</td>
<td>Quality Control</td>
</tr>
<tr>
<td>015000</td>
<td>Temporary Facilities and Controls</td>
</tr>
<tr>
<td>015639</td>
<td>Temporary Tree and Plant Protection</td>
</tr>
<tr>
<td>016000</td>
<td>Product Requirements</td>
</tr>
<tr>
<td>017123</td>
<td>Field Engineering</td>
</tr>
<tr>
<td>017300</td>
<td>Execution</td>
</tr>
<tr>
<td>017329</td>
<td>Cutting and Patching</td>
</tr>
<tr>
<td>017400</td>
<td>Cleaning and Waste Management</td>
</tr>
<tr>
<td>017416</td>
<td>Storm Water Pollution Prevention Plan</td>
</tr>
<tr>
<td>017500</td>
<td>Starting and Adjusting</td>
</tr>
<tr>
<td>017700</td>
<td>Closeout Procedures</td>
</tr>
<tr>
<td>017800</td>
<td>Closeout Submittals</td>
</tr>
<tr>
<td>018317</td>
<td>Exterior Wall Performance Requirements</td>
</tr>
</tbody>
</table>
FACILITY CONSTRUCTION SUBGROUP
DIVISION 02 - EXISTING CONDITIONS

024116 Demolition

DIVISION 03 - CONCRETE

031000 Concrete Formwork
031116 Architectural Cast-In-Place Concrete Forming
032000 Concrete Reinforcement
033000 Cast-In-Place Concrete
033500 Concrete Sealers

DIVISION 04 - MASONRY

042100 Brick Veneer
042200 Concrete Unit Masonry

DIVISION 05 - METALS

050510 Metal Finishes
051200 Structural Steel Framing
051210 Welding
051700 Welded Stud Connectors
053100 Metal Floor and Roof Decking
054000 Cold-Formed Structural Metal Framing
054300 Slotted Channel Framing
055000 Metal Fabrications
055100 Metal Stairs
055133 Ladders
055134 Premanufactured Aluminum Ladders
055200 Metal Railings
055800 Formed Metal Fabrication

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

061053 Miscellaneous Rough Carpentry
061643 Gypsum Sheathing
062000 Finish Carpentry
064116 Plastic Laminate Clad Wood Cabinets
064200 Wood Paneling
068200 Glass Fiber Reinforced Plastic (FRP)
DIVISION 07 - THERMAL AND MOISTURE PROTECTION

070850  Air Barrier Systems Performance Requirements
071113  Bituminous Dampproofing
071300  Sheet Waterproofing
072100  Thermal Insulation
072600  Vapor Retarders
072700  Air Barrier
074247  Ultra-High Performance Concrete (UHPC) Wall Panels
075419  Polyvinyl Chloride Roofing
076000  Flashing and Sheet Metal
077000  Roof and Wall Specialties and Accessories
077233  Roof Hatches and Vents
078100  Applied Fireproofing
078123  Intumescent Fireproofing
078400  Firestopping
079200  Joint Sealants
079513  Expansion Joint Cover Assemblies

DIVISION 08 - OPENINGS

081100  Metal Doors and Frames
081400  Wood Doors
083100  Access Doors and Panels
083323  Overhead Coiling Doors
083473  Sound Control Door Assemblies
084413  Glazed Aluminum Curtain Walls
085619  Interior Aluminum Windows
085623  Projection Port Windows
087100  Door Hardware / Gate Hardware
087154  Security Key Keeper (Knox Box)
088000  Glazing
088300  Mirrors
089100  Louvers

DIVISION 09 - FINISHES

090000  Finish List
090001  Exterior Finish List
092400  Portland Cement Plastering (Stucco)
092900  Gypsum Board Assemblies
093000  Tiling
095100  Acoustical Ceilings

Estancia High School Theater Project
Newport-Mesa Unified School District 000110-3
Pfeiffer Partners Project # 6164

Summary
August 10, 2021
DSA Backcheck
<table>
<thead>
<tr>
<th>Division</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>095140</td>
<td>Cementitious Wood Fiber Panels</td>
</tr>
<tr>
<td>096430</td>
<td>Resilient Stage Flooring</td>
</tr>
<tr>
<td>096500</td>
<td>Resilient Flooring</td>
</tr>
<tr>
<td>096713</td>
<td>Elastomeric Liquid Coating</td>
</tr>
<tr>
<td>096800</td>
<td>Carpeting</td>
</tr>
<tr>
<td>096813</td>
<td>Tile Carpeting</td>
</tr>
<tr>
<td>097723</td>
<td>Fabric Wrapped Panels</td>
</tr>
<tr>
<td>098100</td>
<td>Acoustical Insulation</td>
</tr>
<tr>
<td>098413</td>
<td>Sound Absorptive Panels</td>
</tr>
<tr>
<td>098447</td>
<td>Modular Metal Wall System</td>
</tr>
<tr>
<td>099000</td>
<td>Painting and Coating</td>
</tr>
</tbody>
</table>

**DIVISION 10 - SPECIALTIES**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>101400</td>
<td>Signs</td>
</tr>
<tr>
<td>102114</td>
<td>Phenolic Toilet Compartments</td>
</tr>
<tr>
<td>102600</td>
<td>Wall and Door Protection</td>
</tr>
<tr>
<td>102813</td>
<td>Toilet Accessories</td>
</tr>
<tr>
<td>102813.1</td>
<td>Toilet Accessory Product Data Sheets</td>
</tr>
<tr>
<td>104400</td>
<td>Fire Protection Specialties</td>
</tr>
<tr>
<td>105153</td>
<td>Locker Room Benches</td>
</tr>
</tbody>
</table>

**DIVISION 11 - EQUIPMENT**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>111313</td>
<td>Dock Bumpers</td>
</tr>
<tr>
<td>115213</td>
<td>Motorized Projection Screens</td>
</tr>
<tr>
<td>116133</td>
<td>Theatrical Rigging</td>
</tr>
</tbody>
</table>

**DIVISION 12 - FURNISHINGS**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>122413</td>
<td>Rolling Window Shades</td>
</tr>
<tr>
<td>123663</td>
<td>Solid Surfacing Fabrications</td>
</tr>
<tr>
<td>124663</td>
<td>Waste Receptacles</td>
</tr>
<tr>
<td>125219</td>
<td>Upholstery</td>
</tr>
<tr>
<td>126100</td>
<td>Fixed Audience Seating</td>
</tr>
<tr>
<td>129300</td>
<td>Site Furnishings</td>
</tr>
</tbody>
</table>

**DIVISION 13 - SPECIAL CONSTRUCTION**

NOT USED

**DIVISION 14 - CONVEYING EQUIPMENT**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>142000</td>
<td>Hydraulic LU/LA Elevator</td>
</tr>
</tbody>
</table>
VOLUME 2: DIVISIONS 21-33

FACILITY SERVICES SUBGROUP
DIVISION 21 – FIRE SUPPRESSION

210000  Fire Protection Cutsheets
210518  Escutcheons for Fire Suppression Piping
210523  General-Duty Valves for Fire Protection Piping
210548  Vibration and Seismic Controls for Fire Suppression Piping
210553  Identification for Fire Suppression Piping and Equipment
211100  Facility Fire Suppression Water Service Piping
211110  Fire Department Connections
211313  Wet-Pipe Sprinkler Systems

DIVISION 22 - PLUMBING

220000  Plumbing
224000  Plumbing Fixtures
224000.1 Plumbing Product Data Sheets

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

230000  Heating, Ventilation and Air Conditioning
        Roof Top Unit Cutsheets
        Split System Cutsheets
        Inline Exhaust Fan Cutsheets
        IAC Cutsheets
        Supply Fan Cutsheets

DIVISION 25 – INTEGRATED AUTOMATION

NOT USED

DIVISION 26 - ELECTRICAL

260000  General Electrical Requirements
260534  Raceways and Back-Boxes for Audio-Video Systems
260943  Network Lighting Controls
264173  Lighting Inverter
265100  Light Fixture Product Data
265561  Theatrical Lighting

DIVISION 27 - COMMUNICATIONS

270000  Communications Systems
271343  Data Network and Network Wire Cabling System
274100  Audio-Video Systems
275126  Assistive Listening Systems
### DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>283100</td>
<td>Fire Alarm System</td>
</tr>
<tr>
<td></td>
<td>Fire Alarm Product Data</td>
</tr>
</tbody>
</table>

### SITE AND INFRASTRUCTURE SUBGROUP

### DIVISION 31 – EARTHWORK

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>311000</td>
<td>Site Clearing</td>
</tr>
<tr>
<td>312000</td>
<td>Earth Moving</td>
</tr>
<tr>
<td>312200</td>
<td>Grading</td>
</tr>
<tr>
<td>312313</td>
<td>Excavation and Fill</td>
</tr>
<tr>
<td>312316</td>
<td>Excavation and Fill for Pavement</td>
</tr>
<tr>
<td>312319</td>
<td>Excavation and Fill for Structures</td>
</tr>
<tr>
<td>312323</td>
<td>Excavation and Fill for Utilities</td>
</tr>
<tr>
<td>312326</td>
<td>Base Course</td>
</tr>
</tbody>
</table>

### DIVISION 32 – EXTERIOR IMPROVEMENTS

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>320117</td>
<td>Asphalt Pavement Repair</td>
</tr>
<tr>
<td>321216</td>
<td>Asphalt Paving</td>
</tr>
<tr>
<td>321236</td>
<td>Seal for Bituminous Surfacing</td>
</tr>
<tr>
<td>321313</td>
<td>Site Concrete Work</td>
</tr>
<tr>
<td>321314</td>
<td>Concrete Paving</td>
</tr>
<tr>
<td>321315</td>
<td>Joint Sealants</td>
</tr>
<tr>
<td>321400</td>
<td>Unit Pavers - Mortar Set</td>
</tr>
<tr>
<td>321723</td>
<td>Pavement Marking</td>
</tr>
<tr>
<td>323120</td>
<td>Decorative Metal Fences and Gates</td>
</tr>
<tr>
<td>328400</td>
<td>Planting Irrigation - Domestic Water</td>
</tr>
<tr>
<td>329100</td>
<td>Landscape Preparation</td>
</tr>
<tr>
<td>329113</td>
<td>Soil Preparation</td>
</tr>
<tr>
<td>329320</td>
<td>Plants</td>
</tr>
<tr>
<td>329343</td>
<td>Palm Trees</td>
</tr>
</tbody>
</table>

### DIVISION 33 – UTILITIES

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>331100</td>
<td>Site Water Distribution Utilities</td>
</tr>
<tr>
<td>333030</td>
<td>Site Sanitary Sewer Utilities</td>
</tr>
<tr>
<td>334000</td>
<td>Storm Drainage Utilities</td>
</tr>
</tbody>
</table>

### VOLUME 3: APPENDIX

Geotechnical Investigation, Dated 9/18/2019
Addendum to Geotechnical Report, Dated 10/8/2019

END OF TABLE OF CONTENTS
SECTION 01 7416
STORM WATER POLLUTION PREVENTION PLAN
(FOR PROJECTS WITH LAND DISTURBANCE OF ONE ACRE OR MORE)

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Storm water permitting and certification in compliance with state and local regulations, including payment of application and annual fees and electronic filing, through SMARTS website.
   2. Preparation, implementation, upkeep and monitoring of Storm Water Pollution Prevention Plan (SWPPP)
   3. Control runoff and pollutants from the site during construction activities.
B. Related Requirements:
   1. Division 01 – General Requirements.
   2. Section 33 4000 – Storm Drainage Utilities.

1.2 ACRONYMS AND DEFINITIONS

BMP       Best Management Practice.
CAN       Corrective Action Notice.
CASQA     California Stormwater Quality Association.
COI       Change of Information.
DWQ       Division of Water Quality.
CGP       NPDES General Permit for Storm Water Discharges Associated with Construction Activities.
ELAP      Environmental Laboratory Accreditation Program.
LARWQCB   Los Angeles Regional Water Quality Control Board.
LRP       Legally Responsible Person (OWNER).
NOI       Notice of Intent.
NOT       Notice of Termination.
NPDES     National Pollutant Discharge Elimination System.
OEHS      LAUSD Office of Environmental Health and Safety.
PRDs      Permit Registration Documents, including NOI, Risk Assessment, Site Map, SWPPP, Annual Fee, Signed Certification Statements.
REAP      Rain Event Action Plan.
RISK LEVEL As defined by CGP.
QSD  Qualified SWPPP Developer.
QSP  Qualified SWPPP Practitioner.
QRE  Qualifying Rain Event, is an event that produces 0.5 inches of precipitation with a 48 hour or more period between rain events.

SMARTS  Storm Water Multiple Application and Report Tracking System (smarts.waterboard.ca.gov).

SWPPP  Storm Water Pollution Prevention Plan.
SWRCB  State Water Resources Control Board.
WPCD  Water Pollution Control Drawings.
WDID  Waste Discharge Identification Number.

1.3  SWPPP REQUIREMENTS
A. CONTRACTOR shall assign a QSD and QSP, who shall be in charge of work of this section.
B. Prior to start of Construction, CONTRACTOR shall:
   1. Submit QSD and QSP qualifications.
   2. Incorporate SWPPP activities into the Project Schedule.
   3. Develop new SWPPP or update SWPPP if provided by ARCHITECT to reflect CONTRACTOR’s proposed construction stage, phasing, schedule and other construction activities. SWPPP shall be certified by QSD.
   4. Complete the following on the SMARTS website under project application started by OWNER LRP. CONTRACTOR shall provide SMARTS user name to OAR/LRP in order to be linked to the application.
      a. NOI forms.
      b. Upload SWPPP certified by QSD.
      c. Risk Level Calculation.
      d. Post Construction Water Balance Calculation provided by ARCHITECT
   5. Inform OAR/LRP to review and certify the NOI application and PRDs on SMARTS at least 10 days prior to soils disturbance.
   6. Submit NOI fee statement along with payment to SWRCB at least 7 days prior to start of construction to obtain a WDID number.
   7. Secure and pay for deposits, permits and inspection fees to local jurisdiction, if required.
   8. Inform CONTRACTOR and Subcontractors personnel on the BMP procedures to prevent pollutants from entering the storm drain system, before they start construction activities.
C. During Construction:
   1. Implement, install and maintain BMPS. Ensure that BMPs are designed to protect all exposed portions of the site.
   2. Retain copy of the SWPPP, monitoring records, and PRD on site until Substantial Completion.
   3. Conduct and document storm water pollution prevention training of CONTRACTOR site personnel and provide records of training to OAR.
   4. Monitor the Project Site per the CGP requirements.
      a. Conduct site inspection of pollution prevention controls and provide Site Monitoring Reports per the CGP and SWPPP. Prepare and maintain, at the Project site, a log of each inspection using Site Monitoring Report forms. Inspections shall include, at a minimum
         1) At least weekly.
         2) Within 48 hours prior to a QRE.
3) Within 48 hours after a QRE, conduct a post-storm event inspection to identify weather BMPs are adequately designed, implemented, and effective and identify any additional BMPs necessary and revise the SWPPP accordingly.

4) At least once each 24 hours during extended storm events.

5) Conduct quarterly non-storm water inspections.

b. Conduct sampling and reporting as directed by CGP and outlined in the SWPPP Construction Site Monitoring Plan.

c. For Risk Level 2 and 3 sites only, prepare a REAP a minimum of 48 hours prior to a likely precipitation event with over a 50% or greater chance of producing precipitation on the project area.

d. Precipitation forecast information shall be obtained from the National Weather Service Forecast Office. [http://www.srh.noaa.gov/]

5. Participate in quarterly SWPPP inspections with representative from OWNER’s OEHS. Correct CAN items issued by OEHS.

6. Non-compliance with the CGP and Unauthorized Discharges shall be reported to OAR immediately, who will notify OEHS.

7. Provide verification annually that construction activities are in compliance with SWPPP. Submit Annual Report Compliance Certification to OAR and complete Annual Report on SMARTS by July 15 of each year, for review and certification. Annual Report will be certified by OWNER’s LRP.

8. Maintain, Report, and update SWPPP and PRDs on the SMARTS website, including items listed below.

a. Upload SWPPP amendments.

b. Complete Ad-Hoc Reports for all sampling events. Non-Visible, Effluent Monitoring, and Exceedance Results must be reported electronically by deadlines per CGP.

c. Provide COI in SMARTS to reflect changes to construction site area, schedule, and risk level. COI shall be submitted to OAR/LRP for certification.

9. Pay annual fees related to the CGP up until the date of Substantial Completion.

10. Pay fines and penalties from regulatory agencies against OWNER due to CONTRACTOR’s non-compliance with storm water regulations. OWNER shall recover costs of fines and penalties by appropriate OWNER assessment. Review of the SWPPP and inspection log by OAR shall not relieve CONTRACTOR from liabilities arising from non-compliance of storm water pollution regulations.

11. Update Post Construction BMP Installation and Maintenance Log and complete Maintenance Plan, provided by ARCHITECT, to reflect actual products installed.

D. At Substantial Completion.

1. Provide SWPPP, Site Monitoring Reports, and record documents to OAR.

2. Handover the maintenance log and maintenance plan to OAR. OWNER will maintain prevention controls left in place.

3. Conduct Post-Construction BMP training of OWNER personnel.

4. Notify OAR to schedule a meeting with OEHS to confirm Substantial Completion of SWPPP.

5. Submit to OAR Substantial Completion Certification that the Project has met all of the conditions of the CGP. Post-construction storm water operation and management plan as mentioned in the compliance certifications shall be in place at Substantial Completion.

6. Prepare the final Annual Report and NOT to terminate permit coverage. Submit NOT electronically with required attachments through the SMARTS system. NOT will be certified by the OWNER’s LRP.

7. OWNER Maintenance and Operations will maintain prevention controls left in place after CONTRACTOR receives Substantial Completion.

E. Project Inspector and OEHS Inspector will conduct inspection and examination of the SWPPP.

1.4 SUBMITTALS

A. Submit the following:

1. Qualifications and experience of QSD and QSP for OWNER’s review and acceptance.

2. Two electronic copies of SWPPP updated and certified by QSD.

3. NOI application to OAR/LRP for review and certification through SMARTS.
4. NOI fee statement along with payment to SWRCB.
5. Documentation in accordance with CGP requirements for SWPPP, including:
   a. BMP material quality, grade, type as specified in the CASQA BMP Handbook.
   b. Electronic Copies of weekly and quarterly inspections, annual reports, compliance certifications, and test results.
   c. Proof of filing with the Water Board; copies of PRDs and all attachments.
   d. Training records of CONTRACTOR site personnel.
   e. BMP implementation schedule.
   f. WPCD revisions.

B. SWPPP Closeout Documents: At Substantial Completion provide one hard copy and two CD's with electronic files of the documents listed below to OAR. OAR will forward records electronically to OWNER Supervising Civil Engineer for retention period of three years.
   1. Copy of SWPPP and PRDs, including NOI, Monitoring Program, Inspection Records, Annual Reports, Compliance Certifications, and supporting documents.
   2. Updated and signed SWPPP amendments and amendment log.
   3. Storm and non-storm water sampling records and test results, including Noncompliance Reports, when limits are exceeded.
   4. Maintenance records for post construction BMP.
   5. Updated Post-Construction Storm Water Management Plan to reflect ‘As-Built’ conditions.
   7. Signed Substantial Completion Certification that the Project has met all of the conditions of the CGP.

1.5 QUALITY ASSURANCE
   A. Comply with the following regulatory requirements:
      2. Regulations of the California Environmental Protection Agency, State Water Resources Control Board; Santa Ana Regional Water Control Board, and local ordinances.
      4. Local jurisdiction stormwater management (SWPPP) and erosion control ordinances.
   B. Qualifications: CONTRACTOR's QSP/QSD shall meet the following qualifications:
      2. Two years minimum experience in erosion and sediment control and knowledgeable in the requirements of SWPPP, Best Management Practices and GCP.

1.6 STORAGE AND PROTECTION
   A. Provide proper storage of materials and equipment to prevent rain and storm water runoff to come in contact with pollutants, such as soil stabilizers, paint or fluids from vehicles.

1.7 TRAINING OF OWNER PERSONNEL
   A. Training of OWNER's personnel shall include 8 hours of on-site overview and maintenance of the following Post Construction BMPs:
      2. Vegetated Swales, Vegetated Filter Strips and Green Roofs.
      3. Sand Filters and Cartridge Media Filters.
      4. Infiltration Trenches, Dry Wells, Proprietary Infiltration Devices and Permeable Pavement.
   B. Training of OWNER's personnel on the Post Construction BMPs shall be per Section 33 4000, Storm Drainage Utilities.
PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide quality, grade and type of materials specified in the CASQA BMP Handbook.

B. Provide and have available on-site during construction activities a non-stormwater sampling kit suitable for obtaining storm water and non-stormwater quality grab samples. Kit shall include containers and preservatives appropriate for the pollutants known or expected to be in the stormwater. Required sampling equipment shall be adequate to capture and transport samples to a local ELAP State certified water testing lab.

C. Provide a rain gauge on site to record readings during site inspections.

PART 3 - EXECUTION

3.1 IMPLEMENTATION

A. Install perimeter controls prior to starting work at the Project site.

B. Implement BMPs as specified in the SWPPP to contain on-site storm water on the Project site. Provide storm drain inlet protection. Do not drain on-site water directly into the storm drain without proper BMPs in place. If an Active Treatment System (ATS) is used, comply with the design storm specified in the CGP (10-year, 24-hour event).

C. Prevent pollutant discharges into the storm drain system. Prevent storm water from coming into contact with pollutants, such as material spills, or leakage from storage tanks, waste containers or transfer areas. In the event contamination is found CONTRACTOR shall immediately notify OAR who will contact the OEHS.

D. Protect exposed dirt, such as stockpiles, landscaping areas, and hillsides.

E. Properly manage non-storm water discharges such as ground water, broken utility lines and fire hydrant testing per CGP requirements.

F. Adjust BMP’s locations and layouts in accordance to construction progress to assure compliance to regulations.

G. Conduct inspections of pollution prevention controls and provide Site Monitoring Report to OAR immediately if pollutants are discharged into the site runoffs. CONTRACOTR shall sample and remediate contaminated water.

H. Upon Substantial Completion: Maintain and leave post-construction storm water pollution prevention controls in place and remove those that are not needed as determined by the QSD and OAR.

3.2 SWPPP CLOSEOUT

A. Verify the following prior to Substantial Completion of SWPPP.

1. Elements of the SWPPP have been completed.

2. Final stabilization of site, as defined by the GCP, has been demonstrated.

3. There is no potential for construction related storm water pollutants to be discharged into site runoff.

4. Construction related equipment and temporary BMPs have been removed from site.

5. Rubbish, debris, and waste materials have been removed and legally disposed of off the Project site.

6. OEHS CAN items have been closed and signed-off.

7. Post-Construction BMP Maintenance Plan has been established.

END OF SECTION
SECTION 042100
BRICK VENEER

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes: Full brick veneer as part of fence and gate post/pier assembly.
B. Products Furnished But Not Installed Under This Section:
   1. Section 031000 - Concrete Formwork and Concrete Accessories: Deliver dovetail slots to
      concrete trade for building into formwork.
C. Related Sections:
   1. Section 042200 – Reinforced Concrete Masonry Units.

1.2 SUBMITTALS
A. General: Submit in accordance with Section 013300.
B. Product Data: Submit product data for each type masonry unit, accessory, mortar, mix design,
   admixtures, masonry cleaning agent and other proprietary products.
C. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test
      according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention,
      and ASTM C91/C91M for air content.
D. Samples:
   1. Brick: 3 sets of 5 individual units of each type illustrating extreme variations in color and texture
      in manufacturer’s standard range.
E. Shop Drawings: Show sizes, profiles, coursing, and interface with decorative metal fencing and
   gates.

1.3 QUALITY ASSURANCE
A. Single Source Responsibility:
   1. Obtain brick of uniform texture and color, or uniform blend within ranges accepted for these
      characteristics, from one manufacturer for each product required.
   2. Obtain mortar ingredients from one manufacturer for each cementitious component and from
      one source and producer for aggregate.

1.4 FIELD SAMPLES
A. General: Comply with provisions of Section 014500.
B. Sample Installation:
   1. Construct typical brick column as shown on Drawings.
   2. Clean one-half of exposed faces of field sample with masonry cleaner as indicated.
   3. Sample is for color, texture and blending of masonry units; relationship of mortar and sealant
      colors to masonry unit colors; tooling of joints; interface with decorative metal fencing material,
      aesthetic qualities of workmanship.
   4. Locate on site where directed.
   5. Subject to compliance with requirements, approved field samples may become part of the
      finished Work.
C. Obtain Architect’s approval of field samples prior to constructing project masonry.

1.5 PRE-INSTALLATION CONFERENCE
A. Conduct pre-installation conference in accordance with Section 013100.
B. Review requirements of Contract Documents and submittals.
C. Review requirements for inspection and testing, forecasted weather conditions, governing regulations, insurance requirements, and proposed installation procedures and sequencing.
D. Review anchor, tie, and flashing installation requirements.
E. Review requirements of field sample on site.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Comply with requirements of Section 016000.
B. Masonry:
   1. Store masonry units off ground to prevent contamination by mud, dust or materials likely to cause staining or other defects.
   2. Cover materials to protect from elements.
   3. Handle units on pallets or flat bed wheel barrows.
   4. Do not permit free discharge from conveyor units or transporting loose in mortar trays or buggies.
C. Mortar Materials:
   1. Protect packaged products against contamination and moisture.
   2. Stockpile and handle aggregates to prevent contamination from foreign materials.
   3. Store admixtures to prevent contamination or damage from excessive temperature changes.
   4. Keep water free of harmful materials.
D. Accessories: Protect from damage, moisture, weather, distortion, and from being coated with foreign material.

1.7 PROJECT CONDITIONS
A. Environmental Requirements: Comply with TMS 60/ACI 530.1/ASCE 6 or more stringent of the following:
   1. Cold Weather Requirements:
      a. Follow construction and protection requirements in Brick Industry Association (BIA) Technical Note No. 1, “Cold and Hot Weather Construction” if surrounding air temperature falls below 40 degrees F.
      b. Mortar setting accelerators and admixtures for cold weather construction are not permitted.
   2. Hot Weather Requirements:
      a. Protect masonry construction from direct exposure to wind and sun when erected in ambient air temperature of 99 degrees F or greater in the shade with relative humidity less than 50 percent.
      b. When ambient air temperature exceeds 99 degrees F, or 90 degrees F with wind velocity in excess of 8 mph, limit installation of mortar to 4 feet ahead of masonry and install masonry within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 BRICK
A. Face Brick:
   2. Grade: MW
   3. Type FBS
   4. Initial Rate of Absorption: Less than 30 grams per 30 square inches when tested according to ASTM C7.
   5. Efflorescence: Tested according to ASTM C67 and is rated “not effloresced”.
   6. Size, Color, and Texture: As indicated on Drawings or, if not indicated, as selected by Architect from manufacturer’s full range.
B. Special Shapes:
   1. Where indicated and for application requiring masonry of form, size and finish on exposed surfaces which cannot be produced from standard brick sizes by sawing.
2. Provide 100 percent solid units without core holes where core holes or "frogs" would be exposed to view or weather when in final position.
3. Schedule delivery of special shapes with that of other brick.

### 2.2 CONCRETE MASONRY UNITS

A. Concrete Masonry Units (CMU): Refer to Section 042200

### 2.3 MORTAR AND GROUT MATERIALS

A. Proprietary Masonry Cement: Not permitted.

B. Portland Cement: ASTM C150, normal-Type I or II. Natural color or white cement as required to produce mortar color indicated.
   1. Alkali content shall not be more than 0.1 percent when tested according the ASTM C114.

C. Hydrated Lime: ASTM C207, Type S.

D. Precolored Blend Portland Cement and Lime Mortar:
   1. Standards:
      b. Hydrated lime: ASTM C207, Type S.
   2. Color: As necessary to match Architect's selected color.

3. Acceptable Products:
   a. Color Mortar Blend, Glen-Gery Corporation, Wyomissing, PA.
   b. Centurion Colorbond PL, Lehigh Portland Cement Co.
   d. AMX 400 Series Portland Lime Colored Mortar, AmeriMix.
   e. Spec-Mix Portland Lime & Sand Mortar, Spec-Mix.
   f. Or equal.

E. Mortar Aggregate: ASTM C144, except graded to pass No. 16 sieve for joints 1/4 inch or less.

F. Grout Aggregate: ASTM C404, sizes #1, #8, or #89.

G. Water: Clean and drinkable.

### 2.4 MORTAR AND GROUT MIXES

A. Mortar:
   1. ASTM C270 using Proportion Method or BIA M1 Proportion Method.
   2. Limit cementitious materials to portland cement and hydrated lime.
   3. Use Type N for brick locations, unless noted otherwise.

B. Site Mixed Mortar: Combine and thoroughly mix cement, aggregates, color admixture, and water in mechanical batch mixer. Use proportion measuring method to ensure accuracy and consistency; shovel method is not acceptable.

C. Grout:
   1. Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
   2. ASTM C476, fine aggregate in spaces less than 2 inches.
   3. Proportion to produce 2500 psi compressive strength at 28 days with 9-1/2 inch slump when placed.

D. Do not use calcium chloride in mortar or grout.

### 2.5 MASONRY CLEANER

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

   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:
PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine conditions and proceed with work in accordance with Section 017300.
B. Verify items provided by other Sections of work are properly sized and located.
C. Examine foundations and supporting members to ensure surfaces are within tolerances, at proper elevations, and are free from dirt or other deleterious matter.

3.2 PREPARATION
A. Receive approval for required field sample before proceeding masonry work.
B. Establish lines, levels, and coursing; protect from disturbance.
C. Provide temporary supports under masonry support systems when necessary. Retain in place until mortar has attained adequate strength.
D. Wetting Masonry:
   1. Brick:
      a. Wet brick made from clay or shale which have initial rates of absorption (suction) of more than 30 grams per 30 square inches per minute when tested in accordance with ASTM C67.
      b. Use wetting methods recommended by manufacturer to achieve optimum bonding with mortar.

3.3 INSTALLATION
A. Tolerances: Remove work not conforming to specified tolerances and reconstruct to proper tolerances.
   1. Variation from Plumb: 1/4 inch per story non-cumulative; 3/8 inch maximum in two stories or more.
   2. Variation from Level Coursing: 1/8 inch in 3 feet; 1/4 inch in 10 feet; 1/2 inch maximum.
   3. Variation from Unit to Adjacent Unit: 1/32 inch maximum.
   4. Variation from Plan Location: 1/4 inch in 10 feet and 1/2 inch maximum in 20 feet or more.
   5. Variation in Sizes of Wall Openings: Minus 0 inch to plus 1/4 inch.
   6. Variation in Location of Wall Openings: Plus or minus 1/4 inch.
   7. Variation of Joint Thickness: 1/8 inch in 3 feet.
   8. Maximum Variation from Cross Sectional Thickness of Walls: Plus or minus 1/4 inch.
B. General:
   1. Except as indicated otherwise, place masonry in full bed of mortar, properly jointed with other work, to lines and levels indicated. Align head joints plumb within vertical tolerance.
   2. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.
   3. Apply mortar to obtain full vertical head joints.
   4. Slushing of head joints or furrowing of bed joints is prohibited.
   5. Lay brick in running bond unless otherwise detailed on Drawings.
   6. Fully bond intersections, external corners and internal corners, except where indicated otherwise.
   7. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.
   8. Remove excess mortar as work progresses.
   9. Perform Project site cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.
11. Provide pressure relieving joints at top of non-loadbearing walls by placing continuous joint filler (no mortar) in horizontal joint immediately beneath shelf angle or structure.
12. Provide pressure relieving joints by placing continuous joint filler (no mortar) in horizontal joint immediately beneath shelf angle.
13. Place joint filler in brick expansion joints.
14. Do not install cracked, broken, or chipped masonry.

3.4 FIELD QUALITY CONTROL
A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
B. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C67 for compressive strength.
C. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for mortar air content and compressive strength.

3.5 ADJUSTING
A. Cut out and repoint defective mortar joints to match adjacent work.
B. During toothing of joints, enlarge voids and holes and completely fill with mortar matching adjacent.
C. Remove and replace masonry units which are loose, chipped, broken, stained, or otherwise damaged. Provide new units to match adjoining units and install in fresh mortar pointed to eliminate evidence of replacement.

3.6 CLEANING
A. After mortar has set dry brush brick face to remove excess mortar, smears and stains prior to end of each work day.
B. Test cleaning products at field sample panel or other location as directed.
C. Clean stained surfaces with non-acidic solution of type which will not harm masonry or adjacent materials. Follow manufacturer's instructions. Consult masonry manufacturer for acceptable cleaners.
D. Do not allow cleaning solution to etch mortar joints, masonry, foundations, or windows.
E. Cleaning tools: Non-metallic.
F. Clean-up debris and refuse created by masonry work and remove from site.

3.7 PROTECTION
A. Protect finished work from damage due to construction operations.
B. General:
   1. Prevent mortar from staining exposed brick faces. Immediately remove grout, mortar, and soil that come in contact with masonry.
   2. Protect sills, ledges, and projections from mortar droppings or other damage during construction.
   3. Maintain protective boards at exposed external corners, sills, ledges, and projections to avoid damage by construction activities.
C. Wall Covers:
   1. Cover partially completed walls with impervious sheets when work is not in progress.
   2. Extend cover down 24 inches minimum on both sides of wall and secure in-place to prevent moisture infiltration and protect from weather.
D. Protect wall at scaffold work platform. Turn-up scaffold boards at end of day to reduce mortar stains on walls during wet weather.
E. After completion of masonry work protect top of walls until wall cap and flashings are in place.

END OF SECTION
SECTION 05 17 00
WELDED STUD CONNECTORS

PART 1 - GENERAL

1.1 SUMMARY
A. This Section covers the technical requirements for welded stud connectors and forms a part of all other Sections which require stud connectors, anchor studs, stud shear connectors, and similar items to be provided in accordance with this Section.
B. Related Work Specified Elsewhere:
   1. Structural Steel, Section 05 12 00.
   2. Metal Deck, Section 05 31 00.
   3. Concrete, Section 03 30 00.

1.2 REFERENCES, CODES AND STANDARDS: The following references, codes and standards are hereby made a part of this Section shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Latest adopted edition of references and codes adopted by the Governing Agency shall apply. Nothing contained herein shall be construed as permitting work that is contrary to code requirements.
A. American Welding Society – Structural Welding Code (AWS D1.1).
C. International Building Code (IBC) with the State of California Amendments (CBC).

1.3 SUBMITTALS
A. Comply with all pertinent provisions of Section 01 33 00.
B. Product Data: Submit following items for review; maintain copies of the following readily available at the site whenever welded stud connectors are being installed:
   1. Certified evidence stud bases are qualified in accordance with CBC.
   2. Stud manufacturer's installation instructions with a complete listing, by manufacturer and model, of stud welding equipment approved by stud manufacturer.
C. Samples: Submit samples as may be requested.

1.4 QUALITY ASSURANCE
A. General: Furnish studs and stud bases currently qualified in accordance with CBC, AWS D1.1, latest revision, and install in accordance with the procedures and quality control requirements of AWS D1.1, latest revision. Employ welding mechanics that are skilled and experienced in installing required studs and currently qualified in accordance with AWS D1.1, latest revision.
B. Comply with all pertinent provisions of Section 01 45 00 – Contractor Quality Control Program.

1.5 PRODUCT DELIVERY, HANDLING AND STORAGE
A. Comply with all pertinent provisions of Section 01 60 00.
B. Protect materials from damage during shipping, handling, and storage at the site. Deliver studs to site in unbroken sealed packages bearing manufacturer's name and label identifying the contents.
PART 2 - PRODUCTS

2.1 STUD CONNECTORS

Standard product steel stud units intended for welding by automatically timed stud-welding equipment, furnished complete with an arc shield (ferrule) of heat-resistant ceramic or equivalent for all studs and, for studs 5/16" diameter or larger, a deoxidizing and arc stabilizing flux; no studs painted, galvanized, or cadmium plated prior to welding and all finished by cold heading, cold rolling, or machining; all of uniform quality and condition, free of injurious laps, fins, seams, cracks, twists, bends not indicated, rust, rust pits, scale, oil, or other injurious defects or substances.

A. Stud Steel: Furnish end-welding studs manufactured of steel conforming to ASTM A29, Grade 1010 through 1020 cold-drawn steel of minimum 60,000 psi tensile strength with 20% elongation in 2".

B. Manufacturer: Nelson Stud Welding of TRW Nelson Division, KSM Division of Omark Industries, TruWeld of Tru-Fit Products or approved equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that galvanizing on steel deck does not exceed the zinc coating approved for stud installation. Report in writing all conditions that prevent or interfere with the proper installation of studs including loose steel decking or improper fitting.

3.2 PREPARATION

A. Conform to AWS D1.1, approved submittals, and requirements herein.

B. Cleaning: Clean surfaces to receive the studs of paint, scale, rust, and other injurious substances by wire brushing, peening, prick-punching, grinding, or other method as required to produce clean bare substrates.

C. Preparation for Replacement Studs and Repairs: Repair steel surfaces as follows wherever a defective stud is removed. Make area where a stud is removed flush and smooth if the surface remains exposed in the Work. Complete repairs before installing a replacement stud on a defect area.

1. Areas Subject To Tensile Stress: Make the area flush and smooth. If the base metal is pulled out by stud removal, fill pocket by shielded metal-arc welding conforming to AWS D1.1, latest revision, using low-hydrogen electrodes, and grind the weld surfaces flush.

2. Areas Subject To Compression: Where any stud failures are confined to shanks or fusion zones of the studs, a new stud may be installed adjacent to the defective area in lieu of repairing defective area and installing a replacement stud, subject to approval. If metal is pulled out of base metal, fill pocket as specified above for tensile stress areas except, if the defect depth is not more than the lesser of 1/8" or 7% of base metal thickness, the defect may be faired by grinding in lieu of weld filling.

3.3 STUD WELDING

A. Conform to AWS D1.1, approved submittals, and requirements herein.

B. Welding Equipment: Furnish automatically timed stud-welding equipment and a suitable power source, of type and manufacturer listed as approved by the stud manufacturer. Interlock the welding equipment supplying current to two or more stud-welding guns so that only one gun can operate at a time and so power source has fully recovered from making one weld before another weld is started.
C. Installation: Do not install studs on wet surfaces, nor any studs showing defects, rust, rust pits, scale, oil, or other deleterious substance. Hold the steel decking tight to the supports prior to stud installation. Install studs promptly after cleaning and preparation. Hold welding gun in correct position and without movement until the weld metal has solidified. Break and remove arc shields after welding. Produce welded studs free from any defect or substance that interferes with intended functions.

1. Placing Locations: Singly space shear stud connectors along the beam centerline with excess double studs spaced symmetrically from each end of the beam. Place adjacent studs on centers not closer than 3" transversely and not closer than 4-1/2" longitudinally, on centers. Provide minimum distance between edges of the shear stud bases and flange edges equal to the stud diameter plus 1/8", but minimum 1-1/2" clearance wherever possible. Location accuracy of other types of studs shall permit the assembly of attachments without alterations or reaming.

2. Stud Lengths: Stud lengths indicated or noted are minimum acceptable net lengths after welding. If reduction in length of a stud as it is welded is such that length of the stud is more than 1/16" greater than that specified by stud manufacturer, discontinue stud installation until the cause is determined and eliminated and pre-production testing is satisfactorily repeated.

3. Defective Fillets: Any stud not showing a full 360° weld fillet after welding may be repaired by welding a 3/16" fillet weld in lieu of missing weld fillet in accordance with AWS D1.1, latest revision using low-hydrogen electrodes.

D. Studs On Metal Decking: Exercise extreme care to prevent defective welds or damage to or excessive burning of decking when welding through metal decking.

3.4 FIELD QUALITY CONTROL

A. Comply with all pertinent provisions of Section 01 40 00.

B. Inspection: Perform pre-production shop and field welded stud installation and testing under continuous inspection of a qualified welding inspector approved by the city. In addition to the verified report, welding inspector's reports shall detail the location of all defective studs with the repair or replacement action taken.

C. Inspection Procedure: Welding equipment type and capacity shall be in accordance with manufacturer's recommendations and shall be checked and approved by the welding inspector. At beginning of each day's work, a minimum of two test studs shall be made with the equipment to be used to metal which is the same as the actual work piece. Test studs shall be subjected to 90 degree bend test by striking them with a heavy hammer; after this test, the weld section shall not exhibit any tearing out or cracking.

D. Pre-Production Testing: The following tests are required for each welding equipment power source at start of each production period (time interval from start-up to any shutdown of any stud-welding equipment), at the start of any new welding procedure, and after any change in the welding procedure.

1. Pre-Production Tests - Stud Shear Connectors: After cooling, test the first two studs on a member by hammer bending to a 45 degree angle. If failure occurs in the weld zone of either stud, correct the procedure, and weld and bend test two more studs on the member. If either of the second two studs fails, continue additional welding on separate materials until two consecutive studs are tested and found satisfactory. Then weld two studs to the same member, bend test, and find satisfactory before any more studs are welded to the member.

2. Pre-Production Tests for Studs Other Than Shear Connectors: Weld two studs to separate material in the same general position (such as flat, vertical, sloping, or overhead) and of similar steel material and thickness as members to receive studs. After cooling, hammer bend the studs to a 30 degree angle. If failure occurs in any stud shank, ascertain and correct the cause before making further welds. If failure occurs in the weld zone of either stud, correct the procedure and successfully weld and test two successive studs before any studs are welded to members.
E. Production Inspection and Testing:

1. Inspection of Stud Shear Connectors: After cooling, test at least one stud on each steel member by hammer bending to a 15 degree angle, or test each stud by striking twice with a 6-pound hammer to verify that quality welds are obtained. If failure occurs either in weld zone or stud shank, follow method of correction as required herein for pre-production testing until successful installations are produced, and replace all defective studs. Test all those studs (a) not showing full 360 degree fillet weld or (b) are repaired by welding, (c) replacement studs, and (d) in which the reduction in length is less than correct by hammer bending to a 15 degree angle. For studs showing less than a 360 degree weld fillet, bend the stud in the direction opposite to missing fillet metal. Remove and replace studs that crack in the weld zone, base metal, or the shank under inspection and testing or under subsequent straightening.

F. Straightening: Leave in a bent condition those stud shear connectors and shear transfer devices that are bent less than 15 degrees and are free of any failure provided no part of studs is within 1" of an exposed concrete surface. Perform stud bending and straightening without heating and before the completion of each day's welding operations. Obtain inspection and approval of straightened studs before covering.

G. Load Testing: Testing Laboratory shall load test studs to the extent and by the methods directed.

END OF SECTION
SECTION 05 40 00
COLD-FORMED STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes: This section covers load bearing cold-formed structural metal framing, including all design, engineering, materials, labor, equipment and services necessary for the complete fabrication, assembly, delivery, anchorage and erection of the exterior light gauge metal framing system.

B. Related Work Specified Elsewhere:
   1. Light gauge non-structural metal framing, furring and suspension systems - Section 09 29

1.2 REFERENCES, CODES AND STANDARDS: The following latest edition of the references, codes and standards are hereby made a part of this Section and work shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Latest adopted edition of references and codes adopted by the Governing Agency shall apply. Nothing contained herein shall be construed as permitting work that is contrary to code requirements.

A. American Iron and Steel Institute (AISI) Specification for Design of Cold-Formed Steel Structural Members.


C. American Society of Testing and Materials (ASTM) Reference Numbers:
   1. ASTM A1003, Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
   2. ASTM C955, Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.

D. International Building Code (IBC) with State of California Amendments (CBC)

1.3 SUBMITTALS:
A. Product Data: Submit complete material list for all work of this section. Include ICC evaluation reports.

1.4 QUALITY ASSURANCE:
A. Code: Conform all fabrications and installations to code. In case of conflict between contract documents and code, the more stringent requirements shall govern. Conform fire resistance rated construction to requirements of California State Fire Marshal.

B. Qualifications of Fabricator/Erector: The firm manufacturing and installing the work of this section shall have had not less than 5 years experience in work of similar nature and complexity to that required under this contract.
C. Design Criteria: Drawings indicate general arrangement, aesthetic requirements and minimum sizes of principal members only. Contractor shall complete the design and provide wall framing of the design indicated, constructed to withstand a uniform wind load as required by the applicable codes described in Section 1.02. Use exposure category C, Importance Factor of 1.0, and a Basic Wind Speed of 110 mph per the requirements of the Code. Limit deflections to a maximum of L/240 unless the architect specifically approves a variance. Seismic loads shall be based on weights of materials and items attached to the framing, site seismic force levels and height within the building.

D. Tolerances: Erect walls and partitions on straight lines, plumb, free of twists or other defects, and contacting a 10-foot straigntedge for its entire length at any location within a 1/8” tolerance. Erect horizontal framing level within a tolerance of 1/8” in 12-feet in any direction. Erect sloped framing in true planes to same tolerance as horizontal framing.

1.5 PRODUCT DELIVERY AND HANDLING:
A. Delivery and Handling: Protect all materials from damage during shipping, handling and storage on the site. Studs showing deformations, weathering, or other defects are not acceptable.

B. Welding Electrodes: Deliver to the site in unbroken packages bearing the manufacturer's name and label identifying the contents.

1.6 PROJECT SITE CONDITIONS:
A. Site Measurements: Take field measurements as required. Report any major discrepancy between drawings and field dimensions.

B. Protection of Floors: Use caution to protect floor or roof slab and adjacent work from damage.

C. Temporary Flooring: Provide necessary temporary planking, scaffolding, and flooring for erection of load bearing metal studs as necessary. Conform use of temporary floors to code.

PART 2 - PRODUCTS

2.1 MATERIAL
A. Light gauge metal framing: Conform to ASTM C955. Yield strength shall be 33 ksi for 20 gage (33 mils) and thinner, 50ksi for 18 gage (43 mils) and thicker. Framing shall be manufactured by Cemco, ClarkDietrich, SSMA, or approved equal.

B. Gages and properties of studs shall be as indicated and approved on shop drawings.

C. Mechanical anchors to concrete and masonry shall be not less than 3/8-inch in diameter threaded bolt head type. Anchor bolts to be set in concrete shall be headed type 1/2 inch diameter or more.

D. Mechanical anchors to metal framing shall be No. 8 self tapping and self drilling wafer head screws minimum.

E. Accessories: Special top tracks, angles, fasteners, strips of gypsum wallboard, fire safing and mineral wool as required for fire rating assembly required at each condition as specified by the Architect.
F. Backing Plates: Galvanized sheet metal for attachment and support of products to be attached to framing.
   1. 16 gage (54 mils) material covering full width of stud spacing by 6-inches wide minimum with 4 - #8 screws to each stud minimum.
   2. 6-inch by 1-1/4 inch by 14 gage (68 mils) track with flanges cut to clear stud, folded flat and screwed to each stud with 6 - #8 screws minimum.
   3. As indicated on Drawings.

2.2 FABRICATION
A. The work shall be fitted, shop assembled and ready for erection.
B. Provide cutting, tapping and drilling of metal framing for installation or attachment of work of other sections.
C. Exposed joints shall be made where least conspicuous in final product.
D. Provide plates and mountings for items of finish hardware to the metal framing.

2.3 WELDING
A. Welding shall be in accordance with applicable Codes and the AWS Standards for fusion and gas cutting or welding.
B. Welding shall be done on the unexposed sides to prevent pitting, discoloring, weld-halo and other surface imperfections.
C. Welding electrodes: As permitted by AWS D1.3.

PART 3 - EXECUTION
3.1 INSTALLATION
A. Install structural studs where indicated on drawings, spaced at 16" centers, 12" on center in plumbing walls and at walls receiving ceramic tile, unless otherwise indicated, complete with tracks and shoes. Allow for deflection of structure above. Provide doubled studs or bearing studs at jambs of all openings more than 24" wide, and at all door frames.
B. Tracks shall be securely anchored to the supporting structure as detailed on approved shop drawings or at 24" on center, maximum. At track butt joints, abutting pieces of track shall be anchored to a common structural element, or they shall be butt-welded or spliced together.
C. Studs shall be plumbed, aligned and attached to the flanges or webs of both upper and lower tracks with #8 screws at each flange. All studs shall have full bearing on bottom tracks. Splicing of studs will not be permitted.
D. Jack studs or cripples shall be installed below window sills, above window and door heads, at free standing stair rails, and elsewhere to furnish support and shall be anchored to supporting members.
E. Stud Bracing: For wall studs without sheathing attached to both flanges, cut bridging to fit between, and connected to, studs or inserted through cutouts in the web of each stud. Provide bridging as follows:

<table>
<thead>
<tr>
<th>Wall/Partition Height</th>
<th>Bridging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 8 feet</td>
<td>1 row at approximately 1/2 span</td>
</tr>
<tr>
<td>10 to 15 feet</td>
<td>2 rows at approximately 1/3 span</td>
</tr>
<tr>
<td>15 to 20 feet</td>
<td>3 rows at approximately 1/4 span</td>
</tr>
<tr>
<td>20 to 25 feet</td>
<td>4 rows at approximately 1/5 span</td>
</tr>
</tbody>
</table>

F. Make provision for structure vertical movement with vertical slide clips or other method as indicated on approved submittals.

G. Where framing is subject to vertical loads, provide uniform and level bearing support for bottom track. Provide all additional studs to resist horizontal components as required.

H. Joists Installation: Align joists with stud framing to avoid joists bearing on unsupported stud track. Provide doubled joists over all partitions running parallel with the joists. Joists shall have at least 1-1/2 inches of bearing and shall be reinforced over bearings to prevent web crippling.

I. Joist Bracing: Provide manufacturers standard lateral bracing for joists as follows:

<table>
<thead>
<tr>
<th>Clear Span</th>
<th>Bridging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 14 feet</td>
<td>One row near center</td>
</tr>
<tr>
<td>14 to 20 feet</td>
<td>Two rows at 1/3 of span</td>
</tr>
<tr>
<td>20 to 26 feet</td>
<td>Three rows at 1/4 points of span</td>
</tr>
<tr>
<td>26 to 32 feet</td>
<td>Four rows at 1/5 points of span.</td>
</tr>
</tbody>
</table>

J. Install supporting members, fastenings, frames, hangers, bracing, brackets, bolts, angles and other items as required to set and connect the metal framing to the concrete or steel structural framing.

K. Backing and Blocking: Install sheet metal backing as indicated and as required to support all products attached to wall or ceiling after completion of finish surface, including toilet and bath accessories, plumbing and electrical fixtures, electrical panels, toilet partitions, casework, hardware, handrails and trim.

L. All welded connections are to be made in accordance with AWS D1.3.

3.2 CONNECTIONS TO METAL DECKING:

A. Provide premolded neoprene filler strips matching the flute profile for non-fire-rated walls and partitions covered on one or both sides up to metal decking.

B. The top runner track of fire-rated partitions shall be a minimum of 20 gauge (33 mils) and attached to the metal deck with approved fasteners at spacing required for fire rating, but in no case over 16" o.c. Areas above the runner shall be friction fit with mineral wool insulation as noted in Architectural drawings. Install required special tracks, angles, fasteners and strips of gypsum wallboard as required to achieve required fire resistance rating.
3.3 CLEANING AND TOUCH-UP:
   A. Remove surplus materials. Clean and touch-up raw edges of studs cut for openings and at welded connections with anodic galvanizing repair paint. Leave decks ready to receive subsequent materials.

3.4 FIELD QUALITY CONTROL:
   A. All cold-formed structural metal framing shall be inspected by project inspector for conformance with the drawings and details including fit-up, bracing, connections, backing plates and finishes.
   
   B. All metal framing welding shall be approved by Inspector before being covered. Welder qualifications and welding inspection shall conform to Code.

END OF SECTION
# SECTION 09 00 01 - EXTERIOR FINISH LIST

## EXTERIOR FINISH LIST

**Note:**

Images included are for reference only. Refer to actual material samples for true color/texture/scale.

Finish materials are occasionally annotated with a specific location for reference only; See drawings for all locations.

<table>
<thead>
<tr>
<th>Abbreviation List (CSI order)</th>
<th>Abbreviation List (Alphabetical order)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CON</td>
<td>BRK</td>
</tr>
<tr>
<td>Brick</td>
<td>Brick</td>
</tr>
<tr>
<td>TRC</td>
<td>CMU</td>
</tr>
<tr>
<td>Terracotta</td>
<td>Concrete Masonry Block</td>
</tr>
<tr>
<td>STN</td>
<td>MTL</td>
</tr>
<tr>
<td>Stone</td>
<td>Metal Panel</td>
</tr>
<tr>
<td>WD</td>
<td>FF</td>
</tr>
<tr>
<td>Wood</td>
<td>Curtainwall System</td>
</tr>
<tr>
<td>WP</td>
<td>IN</td>
</tr>
<tr>
<td>Waterproofing</td>
<td>Insulation</td>
</tr>
<tr>
<td>IN</td>
<td>HPC</td>
</tr>
<tr>
<td>Insulation</td>
<td>High Performance Coating</td>
</tr>
<tr>
<td>SKL</td>
<td>SKL</td>
</tr>
<tr>
<td>Skylight</td>
<td>Skylight</td>
</tr>
<tr>
<td>SL</td>
<td>LVR</td>
</tr>
<tr>
<td>Sealant</td>
<td>Louver</td>
</tr>
<tr>
<td>PLS</td>
<td>UHPC</td>
</tr>
<tr>
<td>Exterior Cement Plaster</td>
<td>Ultra-High Performance Concrete Wall Panel</td>
</tr>
<tr>
<td>WD</td>
<td>WP</td>
</tr>
<tr>
<td>Wood</td>
<td>Waterproofing</td>
</tr>
<tr>
<td>WND</td>
<td>SKL</td>
</tr>
<tr>
<td>Window</td>
<td>Skylight</td>
</tr>
<tr>
<td>LVR</td>
<td>PLS</td>
</tr>
<tr>
<td>Louver</td>
<td>Exterior Cement Plaster</td>
</tr>
<tr>
<td>TRC</td>
<td>UHPC</td>
</tr>
<tr>
<td>Terracotta</td>
<td>Ultra-High Performance Concrete Wall Panel</td>
</tr>
<tr>
<td>UHPC</td>
<td>UHPC</td>
</tr>
<tr>
<td>Ultra-High Performance Concrete Wall Panel</td>
<td>Ultra-High Performance Concrete Wall Panel</td>
</tr>
</tbody>
</table>

Exterior Finish List Date: June 17, 2021

DSA Backcheck: 090001 - 1
### CONCRETE

**CON-01**
- **Material:** Cast-in-place concrete
- **Manufacturer:** Scott System
- **Series:** Urethane Form liner
- **Style/Model:** #102 Cedar 3"
- **Color:** n/a
- **Finish:** anti-graffiti treatment
- **Remarks:** [https://www.scottsystem.com/](https://www.scottsystem.com/)

### METAL

**MTL-51**
- **Material:** Aluminum Panel
- **Manufacturer:**
- **Tile Size:** per plans
- **Thickness:** 4mm
- **Color:** to match PLS-04
- **Finish:** Clear coat over aluminum substrate (factory finish)
- **Fire Rating:** non-combustible
- **Remarks:**

**MTL-52**
- **Material:** Aluminum Break Metal
- **Manufacturer:**
- **Tile Size:** per plans
- **Thickness:** 4mm
- **Color:** to match FF-51,52
- **Finish:** Clear coat over aluminum substrate (factory finish)
- **Fire Rating:** non-combustible
- **Remarks:**

**MTL-53**
- **Material:** Painted Break Metal
- **Manufacturer:**
- **Tile Size:** per plans
- **Thickness:** 4mm
- **Color:** to match MTL-01
- **Finish:** Clear coat over aluminum substrate (factory finish)
- **Fire Rating:** non-combustible
- **Remarks:**

**MTL-54**
- **Material:** Painted Break Metal
- **Manufacturer:**
- **Tile Size:** per plans
- **Thickness:** 4mm
- **Color:** to match UHPC-01
- **Finish:** Clear coat over aluminum substrate (factory finish)
- **Fire Rating:** non-combustible
- **Remarks:**

---

Exterior Finish List Date: June 17, 2021

DSA Backcheck 090001-2
<table>
<thead>
<tr>
<th>RAINSCREEN CLADDING</th>
<th>074247 - ULTRA-HIGH PERFORMANCE CONCRETE (UHPC) WALL PANELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>UHPC-01</td>
<td>Material: Ultra High Performance Concrete</td>
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<tr>
<td></td>
<td>Manufacturer: TAKTL</td>
</tr>
<tr>
<td></td>
<td>Tile Size: per plans</td>
</tr>
<tr>
<td></td>
<td>Thickness: 5/8&quot; (16mm)</td>
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<tr>
<td></td>
<td>Color: TE52</td>
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<tr>
<td></td>
<td>Texture: Smooth</td>
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<tr>
<td></td>
<td>Fire Rating: non-combustible</td>
</tr>
<tr>
<td></td>
<td>Remarks: <a href="https://www.taktl-llc.com/">https://www.taktl-llc.com/</a></td>
</tr>
</tbody>
</table>

|                     | Material: Ultra High Performance Concrete                 |
|                     | Manufacturer: TAKTL                                       |
|                     | Tile Size: per plans                                       |
|                     | Thickness: 5/8" (16mm)                                    |
|                     | Color: TE52                                               |
|                     | Texture: Rough 1                                          |
|                     | Fire Rating: non-combustible                              |
|                     | Remarks: [https://www.taktl-llc.com/](https://www.taktl-llc.com/) |

|                     | Material: Ultra High Performance Concrete                 |
|                     | Manufacturer: TAKTL                                       |
|                     | Tile Size: per plans                                       |
|                     | Thickness: 5/8" (16mm)                                    |
|                     | Color: TE52                                               |
|                     | Texture: Reeds                                            |
|                     | Fire Rating: non-combustible                              |
|                     | Remarks: [https://www.taktl-llc.com/](https://www.taktl-llc.com/) |

<table>
<thead>
<tr>
<th>ROOFING</th>
<th>075419 - POLYVINYL CHLORIDE ROOFING</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFA-01</td>
<td>Material: Polyvinyl Chloride Roofing</td>
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<tr>
<td></td>
<td>Manufacturer: Sika Sarnafil</td>
</tr>
<tr>
<td></td>
<td>Series: SARNAFIL ADHERED SYSTEMS</td>
</tr>
<tr>
<td></td>
<td>Style/Model: Samafil G 410 membrane</td>
</tr>
<tr>
<td></td>
<td>Color: Tan (EnergySmart Roof® Color)</td>
</tr>
<tr>
<td></td>
<td>Finish:</td>
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<td></td>
<td>Remarks: <a href="https://usa.sika.com/sarnafil/en">https://usa.sika.com/sarnafil/en</a></td>
</tr>
</tbody>
</table>

<p>|                     | Material: Polyvinyl Chloride Roofing                     |
|                     | Manufacturer: Sika Sarnafil                               |
|                     | Series: SARNAFIL ADHERED SYSTEMS                          |
|                     | Style/Model: Samafil G 410 membrane                        |
|                     | Color: Tan (EnergySmart Roof® Color)                     |
|                     | Finish: w/Décor Roof Battens                             |
|                     | Remarks: <a href="https://usa.sika.com/sarnafil/en">https://usa.sika.com/sarnafil/en</a> |</p>
<table>
<thead>
<tr>
<th>Material</th>
<th>Manufacturer</th>
<th>Series</th>
<th>Style/Model</th>
<th>Color</th>
<th>Finish</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>RFA-03</td>
<td>Sika Samafil</td>
<td>SARNAFIL ADHERED SYSTEMS</td>
<td>Sarnafil G 410 membrane</td>
<td>Reflective Gray (EnergySmart Roof® Color)</td>
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<tr>
<td>CURTAINWALL SYSTEM</td>
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<td></td>
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<tr>
<td>CW-51</td>
<td>Arcadia Inc</td>
<td>T500</td>
<td>OPG6000 (Thermal)</td>
<td>Light Champagne AB-1</td>
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<td><a href="https://www.arcadiainc.com/products/systems/Framin-Curtain-wall">https://www.arcadiainc.com/products/systems/Framin-Curtain-wall</a></td>
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<td>OPG6000 (Thermal) SSG</td>
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<tr>
<td>GLASS</td>
<td>Vitro</td>
<td>Solarban 70XL</td>
<td>1&quot;</td>
<td>Clear</td>
<td>Low-E on #2 surface</td>
<td>U-factor = 0.41 SHGC = 0.26 VLT - 50%</td>
</tr>
<tr>
<td>PLASTER</td>
<td>La Habra (PAREX USA)</td>
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<td></td>
<td>Pottery 1566L (31)</td>
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</tr>
<tr>
<td>Material</td>
<td>Manufacturer</td>
<td>Tile Size</td>
<td>Thickness</td>
<td>Color</td>
<td>Finish</td>
<td>Fire Rating</td>
</tr>
<tr>
<td>----------------------------------</td>
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<td>-----------------</td>
<td>-----------------</td>
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<tr>
<td>PLS-02 Lobby Curtain Wall</td>
<td>Exterior Cement Plaster</td>
<td>La Habra (PAREX USA)</td>
<td>-</td>
<td>7/8&quot;</td>
<td>sand fine finish</td>
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<tr>
<td>PLS-03 Green Room Accent</td>
<td>Exterior Cement Plaster</td>
<td>La Habra (PAREX USA)</td>
<td>-</td>
<td>Dove 3003L (53)</td>
<td>sand fine finish</td>
<td>non-combustible</td>
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<td>PLS-04 Exterior Soffit</td>
<td>Exterior Cement Plaster</td>
<td>La Habra (PAREX USA)</td>
<td>-</td>
<td>Basalt 3015L (29)</td>
<td>sand fine finish</td>
<td>non-combustible</td>
</tr>
<tr>
<td>HPC-51 Exterior Trellis</td>
<td>High Performance Coating</td>
<td>~</td>
<td></td>
<td>to match FF-51,52</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>HPC-51 Exterior Cane Rail</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Material:</td>
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<td></td>
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<td>----------------</td>
<td>--------------------------------------------</td>
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</tr>
<tr>
<td>Manufacturer:</td>
<td>Benjamin Moore</td>
<td></td>
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<tr>
<td>Color Name:</td>
<td>to match PLS-01</td>
<td></td>
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</tr>
<tr>
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<td></td>
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<tr>
<td>LRV:</td>
<td>8.48</td>
<td></td>
<td></td>
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<tr>
<td>Remarks:</td>
<td>Exterior Ready Mixed</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

[www.benjaminmoore.com](http://www.benjaminmoore.com)
SECTION 105153
LOCKER ROOM BENCHES

PART 1 - GENERAL

1.1 SUBMITTALS
A. General: Submit in accordance with Section 013300.
B. Product Data: Submit technical data and descriptive literature for each product.
C. Samples:
   1. Submit selection samples of each finish color in manufacturer’s standard color range for
      Architect’s selection.
      a. Where normal color variations are expected, include additional samples illustrating range
         of variation.
D. Manufacturer’s Instructions: Submit detailed installation instructions.
E. Closeout Submittals
   1. Submit under provisions of Section 017800.
   2. Maintenance Data: Submit manufacturer’s printed, recommended maintenance data.

1.2 QUALITY ASSURANCE
A. Regulatory Requirements: Comply with Authorities Having Jurisdiction and Americans with
   Disabilities Act (ADA) including ADA Accessibility Guidelines to accommodate barrier free design.

PART 2 - PRODUCTS

2.1 BENCHES
A. Hardwood Top:
   1. Laminated maple, 24 inch wide by 48 inch long
   2. Round corners, ease edges, and sand smooth.
   3. Acceptable Product: 2 Inch hardwood w/aluminum pedestal from "Lyon Workspace Products"
      OR EQUAL.

B. Pedestals:
   1. Aluminum, bolted to floor.
   2. Overall Height of Pedestals: Manufacturer’s standard.

2.2 FACTORY FINISHES
A. Benches:
   1. Tops: Finish with two coats moisture-resistant, varnish, satin-gloss.
   2. Pedestals: Clear anodized

PART 3 - EXECUTION

3.1 INSTALLATION
A. Examine conditions and proceed with Work in accordance with Section 017300.
B. Install in accordance with Section 017300 and approved shop drawings.

END OF SECTION
SECTION 11 52 13
MOTORIZED PROJECTION SCREENS

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. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. Section Includes: Motorized retractable front and rear projection screens.
C. Related Sections:
   1. Division 26: Section “Raceways and Back-Boxes for Audio-Video Systems”.
   2. Division 27: Section “Audio-Video Systems”.
D. Measurement procedures:
   1. Product quantity is as required.
   2. Some products listed under this section may not be required to fulfill the obligations of the Work.
   3. Portable equipment is specified with specific quantities listed in the specification.
   4. Some equipment quantity is shown on the AVS Category Drawings and some equipment quantity is specifically listed in Section 11 52 13. The total quantity requirement is the sum of the equipment show on the drawings and the specific quantity listed specification section 11 52 13.

1.3 REFERENCES
C. California State Fire Marshall or local regulations: Title 19 Division 1 Chapter 8 – Regulations Relating to Flame-Retardant Chemicals, Fabrics and Application.
D. Underwriters Laboratories:
   1. UL94, (harmonized with IEC 60707, 60695-11-10 and 60695-11-20 and ISO 9772 and 9773), the Standard for Safety of Flammability of Plastic Materials for Parts in Devices and Appliances testing.
   2. UL94 V-0.
   3. UL94 5V

1.4 DEFINITIONS
A. For purposes of the Contract Documents, these words and phrases are defined as follows:
   1. Fully Operational: A system that meets or exceeds the requirements set forth in the Contract Documents and is ready for the Final Observation Inspection.
   2. Fabricator’s Shop: The address listed on the Business License of the entity responsible for fabricating the Work specified in this Section.
4. AV: Audio-Video, Audiovisual.
5. EAV: Audiovisual infrastructure category drawings.
6. AVS: Audiovisual System category drawings.
11. SMPTE: Society of Motion Picture and Television Engineers.
12. UL: Underwriters Laboratories.
13. CE: Conformité Européenne.
14. Gain: The screen's luminance or brightness measured perpendicular to the screen center, measured relative to a block of magnesium carbonate which serves as the standard for 1.0 gain. The gain shall be measured in accordance with SMPTE RP 94-2000.
15. Half Gain Viewing angle: The angle from the perpendicular center of the screen at which the light measured from the screen is equal to one half the values measured in the test for gain.
16. Gain Uniformity: The variation in light intensity measured perpendicular to any point on the screen as a percentage of the light intensity measured perpendicular to the center of the screen. The screen shall be illuminated uniformly by using a collimated light source as simulated by a projector and lens with a throw ratio greater than three and an f stop number greater than f4.0.
17. Ambient Light Reflectivity: The amount of light reflected from the screen from undesirable off axis sources as a percentage of the light incident on the screen. The measurement is taken perpendicular to the screen and the light source is at 45 degrees from the perpendicular. The ambient light reflectivity is an indicator of the potential screen contrast which is independent of projector contrast ratio, room illumination level or room surface reflectivity.

1.5 SYSTEM DESCRIPTION
A. Reference Division 27 Section "Audio-Video Systems" Part 1 “SYSTEM DESCRIPTION”.

1.6 SUBMITTALS
A. General:
1. Submit the following items in accordance with the General Conditions and Division 1.
2. Only complete submittals will be reviewed; incomplete submittals will be rejected without review.
B. Electronic Media:
1. In addition to the requirements in Division 1, submit all material in Portable Document Format (.PDF) file format.
2. In addition to .PDF format submit the Shop Drawings original AutoCAD (.DWG), Revit (.RFA) or Navisworks Drawing (NWD) files.
C. Installer Qualifications:
1. Provide the installer qualification information described in Part 1 Quality Assurance
D. Bill of Quantity:
1. Provide a Bill of Quantity for each item specified in Part 2. Include the manufacturer's name and model number, product description and Quantity.
E. Product Information Sheets:
   1. Submit the Manufacturer’s Product Information Sheets (‘cutsheets’) for each device specified in Part 2.
   2. If more than one product or model option is listed in the Product Information Sheet, identify the product being submitted.
   3. Organize the Product Information Sheets in the same order as they appear in Part 2.

F. Shop Drawings:
   1. General:
      a. Produce the Shop Drawings using the most current version of Building Information Modeling (BIM 360) compatible software - AutoCAD, Revit or Navisworks by Autodesk.
      b. Shop Drawings shall be clear and legible. The character height shall be 1/8-inch high when plotted at full scale. Scale the Drawings to match the Contract Drawings.
   2. Single Line Diagrams:
      a. Separate the Single Line Diagrams into audio, video, control, audio network, production communications, intercom, RF, broadcast and fiber system drawings.
      b. Show the equipment interconnection signal path for each system.
      c. Include the following information for each piece of equipment:
         1) Equipment manufacturer name and model number. No drawing codes from the Contract Documents are permitted.
         2) Specialized part number option.
         3) All input and output connectors whether they are used or unused.
         4) Equipment rack location.
      d. Include the following information for each cable a cable schedule is acceptable:
         1) Equipment manufacturer name.
         2) Equipment manufactures model number.
         3) Cable designation number.
         4) Termination locations.
      e. Include the following information for each field device:
         1) Equipment Rack number.
         2) Intermediate pull-box number.
         3) Field panel number.
         4) Field panel connector number.
         5) Room name and number.
   3. Plan View Drawings:
      a. Coordinate the Plan View Drawings with the Single Line Diagrams.
      b. Show and dimension the location of the field devices.
      c. Detail the conduit fill. For each conduit run show the cable fill, include:
         1) Cable designation.
         2) Cable quantity.
   4. Contractor Fabricated Equipment Drawings: For each contractor fabricated indicate:
      a. All components and equipment, including:
         1) Manufacturer’s name.
         2) Manufacturers model number.
         3) Dimensions.
         4) Component values.
5) Locations.

5. Structural Drawings:
   a. The AVS and EAV Category Drawings are for information only.
   b. Include Structural analysis data signed in blue ink and sealed by the qualified professional
      engineer responsible for their preparation. Include the Structural Engineers Company
      Name and phone number.
   c. For all equipment attached to the building indicate:
      1) All loads.
      2) Location of attachment to building structure.
      3) Dimensions.
      4) Method of connection to building structure.
      5) Details of hardware.
      6) Manufacturer's name.
      7) Manufacturer’s model number.
      8) Engineering calculations.

6. Samples:
   a. Submit a sample for equipment visible in a public area.

G. Substantial Completion Inspection Request:
   1. Submit a Substantial Completion Inspection request letter certifying the criteria defined in the
      Contract Documents has been satisfied and the system is Fully Operational. The Request must
      be written on company letterhead and signed by the Owner, President or Majority Shareholder
      of the Contractor responsible for the Work and must contain the phrase: “I have personally
      verified”.

H. Operations and Service Manual:
   1. General:
      a. Compose the Manual using a single, consistent visual format and writing style.
      c. Portions of the Manual may be derived from the equipment manufacturer's instruction
         manuals and may include reproductions of artwork and other materials.
      d. Manual Organization:
         1) Organize the Manual in a three-ring binder.
         2) Separate each Part with labeled tab dividers.
         3) Tabulate each the Equipment Manual using tab dividers in the same order as each
            item appears in Part 2 of this Section.

   2. Part I – Index, include:
      a. Title page:
         1) Project name.
         2) Date.
         3) Specification reference number.
         4) Installers name and address.
         5) Installers service phone number.

   3. Part II – AV Network Information:
      a. List the IP addresses for each piece of equipment.
      b. List the usernames and passwords for each device.
      c. List the software programming code usernames and passwords.
d. Document the network topology.

4. Part III – System Operating Instructions:
   a. Provide an overview of the System Description that describes the functionality of the system.
   b. Provide comprehensive instructions for the operations of all the systems specified in this Section.
   c. Provide comprehensive control system instructions, include:
      1) A button-by-button description for each menu for each touch panel. At the top half of each page include a ‘screen shot’ of the control system touch panel display being described.
      2) Button panel description for button panel.
      3) Control system help section.
   d. Provide comprehensive system operation instructions, include:
      1) Equipment front panel buttons and displays.
      2) Custom equipment programming instructions.

5. Part IV – Equipment Information:
   a. For each piece of equipment specified in this Section, include:
      1) Manufacturer’s installation, operating and service manual.

I. Record Drawings:
   1. General:
      a. Develop the Record Drawings from the final As-Built condition of the system.
      b. Include the corrections from the Shop Drawing Submittal.
      c. Include the cumulative changes to the Contract Documents.
   2. Mount one full-scale original of the As-Built Drawings plotted on 20 lb. bond paper behind acrylic in the control room for each system.

J. Final Inspection Request:
   1. Submit a Final Inspection Request letter certifying the items listed in the Deficiencies List Report have been corrected and meet the criteria defined in the Contract Documents and the system is Fully Operational. The Request must be written on company letterhead and signed by the Owner, President or Majority Shareholder of the Contractor responsible for the Work and must contain the phrase: “I have personally verified”.

K. Warranties: Special Warranty specified in this Section.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with the latest version of the ANSI, Cal-OSHA, IEC, IEEE, FCC, NEC and NFPA requirements.
   2. Listed and labeled as defined in California Electrical Code by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   3. Equipment and materials shall be UL listed.

B. Installer Qualifications:
   1. The installer shall have the following experience, certifications and requirements:
      a. Authorized representative of equipment manufacturer for both installation and maintenance of equipment required for this Section.
      b. Successfully completed a minimum of three projects of similar scope and size. Provide letters of recommendation from the Owner’s Representative from those three projects.
c. Installation staff: ICIA CTS-I certification. Provide certification from ICIA.

d. Engineering staff: ICIA CTS-D certification. Provide certification from ICIA.

e. Support staff: ICIA CTS certification. Provide certification from ICIA.

2. Submit the following information in accordance with the Instruction to Bidders:

a. A detailed brochure describing its capabilities.

b. Examples of three similar installations within the past two five years.

c. Distribution arrangements with manufacturers.
   1) Franchises.
   2) Dealerships.
   3) Distributorships.

d. Evidence of all necessary licenses and certificates to perform the specified work.

e. Financial capability.

f. Bonding capability.

g. Identify all sources of labor.

h. Identify all local agents.

i. Identify all subcontractors.

j. Personnel experience background for the following people who will be directly responsible for the Work specified herein:
   1) Director of engineering.
   2) Project engineer.
   3) Project manager.
   4) Shop personnel.
   5) Field personnel.

3. This submittal must justify in the judgment of the Owner’s Representative that the Contractor has the capability to manage and install a project of this size and scope and that he is capable of the necessary business and technical arrangements for this installation and the pursuant warranty service.

C. Manufacturer Qualifications:

1. A prime system manufacturer who maintains or sponsors a service center capable of providing training, parts, and emergency maintenance and repairs at Project site with a 24-hour maximum response time.

2. Minimum of 10 years continuous experience in the design and manufacture of audio-video, control, network and optical equipment.

3. ISO 9001 quality certification for a period of 5-years or longer.

D. Substitutions:

1. Model numbers and manufacturers included in this Section are listed as a standard of function, performance and quality.

2. Demonstrate direct A/B equivalency to the Owners Representative for approval prior installation.

E. Source Limitations:

1. Obtain each category of audio-video systems through one source from a single manufacturer. Obtain each piece of equipment as a complete unit, including necessary mounting hardware and accessories.

F. Materials:

1. Provide only new materials and products.
2. If an item specified in Part 2 of this section has been discontinued, submit the manufacturer’s direct replacement for review and approval by the Owner’s representative.

1.8 DELIVERY, STORAGE AND HANDLING
   A. Inspect the Project Screens in the Contractor’s Shop for defects when they are received. If the Projection Screens are defective, start the warranty repair process with the Manufacturer.
   B. Store the projection screens in the Manufacturer’s shipping packaging in a fully enclosed, conditioned space that meets the Manufacturer’s environmental requirements for moisture, humidity, temperature, and contamination.
   C. Deliver portable projection screens to project site in the Manufacturer’s shipping packaging. Store them in a fully enclosed, conditioned space that meets the Manufacturer’s environmental requirements where they will be protected from damage from exposure.
   D. Do not deliver the Projection Screens until the building is enclosed and adjacent construction is complete and ready for the screen installation.

1.9 COORDINATION
   A. Coordinate the Projection Screen installation with the adjacent construction components occupying space: including structural members, pipes, raceways, cable trays and conduit, recessed lighting fixtures, ceiling framing, light fixtures, HVAC equipment, fire-suppression system, and partitions.
   B. Refer to Electrical Drawings for service voltage, power feed. Refer to AVS Category Drawings for control and interlock wiring.

1.10 PROJECT SITE CONDITIONS
   A. Environment Requirements.
      1. The spaces where the Projection Screens are installed shall meet the following requirements:
         a. Free from construction generated dust.
         b. The environmental conditions shall be within the Manufacturer’s recommended operating limits.

1.11 SEQUENCING
   A. General:
      1. Maintain the Project Schedule.
      2. Allow adequate time for corrections to be made after the Submittals, Substantial Completion Inspection and Final Inspection to maintain the Project Schedule.
   B. Sequence the Project Submittals and Inspection Requests as follows:
      1. Installer Qualifications.
      2. Bill of Quantity, Product Information Sheets, Shop Drawings, Contractor Fabricated Equipment Drawings and Structural Drawings:
      3. Substantial Completion Inspection Request.
      4. Substantial Completion Inspection.
      6. Final Inspection Request.
      7. Final Inspection.
      8. Training Request.
     10. Warranties.
11. Warranties

1.12 WARRANTY

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

B. Special Warranty: Warrant the Projection Screens to be free from defects in materials and workmanship for a period of one year from the date of the Final Inspection.

C. The Warranty Period will begin when all of the documented Substantial Completion Inspection Deficiencies have been corrected to the satisfaction of the Owner and the Owner's Representative.

1.13 SYSTEM STARTUP

A. Not Used.

1.14 OWNER’S INSTRUCTIONS

A. Not Used.

1.15 COMMISSIONING

A. Not Used.

1.16 MAINTENANCE

A. Maintenance Service:
   1. Provide one service call to the project site to check and adjust the Projection Screens three months after Final Acceptance.
   2. Provide one service call to the project site to check and adjust the Projection Screens six months after Final Acceptance.
   3. Maintain and monitor the all controllable devices remotely.
   4. Provide a Maintenance Service Agreement Contract to maintain the Projection Screens after the Warranty Period has expired as part of the Bid Documents. Include in the Scope of Services maintenance required to maintain the operation of the Projection Screens so that they function exactly as they did at the time of Final Acceptance.

PART - 2 PRODUCTS

2.1 SURFACE MOUNT MOTORIZED FRONT PROJECTION SCREEN 1.6:1 (16:10) COMPUTER ASPECT RATIO

A. Motorized Projection Screen (SC-ST-BB-22.4X14-1.6):
   1. Manufacturer: Stewart Filmscreen Corporation Model BB – Greyhalk with optional low voltage control or equal (no known equal).

   2. Specification:
      a. Image Height: 14’.
      b. Image Width: 22.4’.
      c. Aspect Ratio: 1.6:1
      d. Top Masking: As shown on Drawings.
      e. Screen Case Color: Black.

2.2 FRONT PROJECTION SCREEN PROJECTION MATERIAL AND VIEWING SURFACE:

A. Low Gain - Wide Angle – Ambient Light Rejection Matte Viewing Surface (Greyhalk):
   1. Manufacturer: Stewart Filmscreen Corporation GrayHawk or equal (no known equal).
2. Features:
   a. High ambient light tolerance.
   b. Increases contrast ratio.
   c. Washable, flame retardant material.

3. Specification:
   a. Screen fabric gain: 0.9.

2.3 INSTALLED CABLE
A. DC Control:
   1. Acceptable: Belden 8461 or equal (no known equal).
   2. Features:
      a. CM rated.
      b. High conductivity.
      c. PVC jacket.
   3. Specification:
      a. Conductor Configuration: 2 unshielded twisted pair.
      c. Shield Coverage: 0%.
      e. Nominal Outside Diameter: .234-inch.

2.4 DC POWER:
A. Acceptable: Belden 8477 or equal (no known equal).
   1. Features:
      a. CM rated.
      b. High conductivity.
      c. PVC jacket.
   2. Specification:
      a. Conductor Configuration: 2 unshielded twisted pair.
      b. Wire Gauge: 12.
      c. Shield Coverage: 0%.
      d. Conductor: Stranded 65x30.
      e. Nominal Outside Diameter: .386-inch.

2.5 PORTABLE CABLE
A. DC Power:
   1. Acceptable: Belden 19228 or equal (no known equal).
   2. Features:
      a. SO-2.
      b. Neoprene jacket.
   3. Specification:
      b. Wire Gauge: 16.
      c. Shield Coverage: Un-shielded.
d. Conductor: Stranded copper (26x30).
e. Nominal Outside Diameter: 0.315-inch.

2.6 CABLE LABELS
A. Installed and Portable Cable
   1. Acceptable:
      a. <0.313-inch cable diameter: Thomas and Betts WES2112 or equal (no known equal).
      b. <0.468-inch cable diameter: Thomas and Betts WES12214 or equal (no known equal).
   2. Features
      a. Printable markers.
      b. WSL self-laminating vinyl.
      c. Maximum protection against most common elements.
   3. Specification:
      a. Thickness: 1 mil.
      b. Color: White
   4. Quantity: Two for each cable supplied minimum.

2.7 ACCESSORIES
A. 12V. Power Supply
   1. Features:
      a. Linear DC power design.
      b. UL Listed
   2. Specification:
      a. Voltage: 12V.
      b. Power Redundancy: 100% extra.
   3. Acceptable: Condor Linear series power supply or equal (no known equal).
B. 24V. Power Supply
   1. Features:
      a. Linear DC power design.
      b. UL Listed
   2. Specification:
      a. Voltage: 24V.
      b. Power Redundancy: 100% extra.
   3. Acceptable: Condor Linear series power supply or equal (no known equal).

2.8 FINISHES
A. Manufacturer’s logos:
   1. Remove all manufacturers’ names, logos, or other symbols from speakers or other objects placed in view of the public.

PART - 3 EXECUTION
3.1 EXAMINATION
A. Examine roughing-in for the audio-video systems to verify actual locations of cable connections before audio-video systems installation.
B. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

C. Examine walls, floors, roofs, equipment bases, and roof supports for suitable conditions where audio-video systems are to be installed.

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

3.2 INSTALLATION

A. General:
1. Install projection screens at locations indicated to comply with screen manufacturer's written instructions.
2. Install front-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.
3. Install low-voltage controls according to NFPA 70 and manufacturer's written instructions.
4. Install projection screen units and accessories at locations shown, in accordance with manufacturer's instructions. Install level, plumb, secure and at proper height.

B. Seismic Restraints:
1. Secure all hanging and freestanding equipment to building structure so that it resists seismic acceleration of 1g in any direction.
2. Comply with the local building codes and the most recent version of the UBC.
3. Submit calculations and detailed details stamped by a registered engineer.
4. The seismic restraints are not shown on the Contract Drawings. It is the Contractor's responsibility to develop shop drawings that reflect the field condition and the seismic requirements.
5. The equipment restraints are not shown on the Contract Drawings. It is the Contractor's responsibility to develop shop drawings that reflect the field condition and the restraint requirements.

3.3 EQUIPMENT MOUNTING.

A. Category AVS Drawings are for information only. Supply Shop Drawings demonstrating the mounting methods stamped by a registered structural engineer prior to installation.

3.4 INSTALLED CABLE

A. Reference Division 27 Section “Audio-Video Systems”

3.5 SYSTEM GROUNDING

A. Reference Division 27 Section “Audio-Video Systems”

3.6 FIELD QUALITY CONTROL

A. The finished installation shall be free from damage, flaws, blemishes or other defects detrimental to appearance; have doors and acoustical overlay at doors in alignment with adjacent acoustical ceiling and be uniform in plane.

B. Provide protection as required to ensure satisfactory operation and appearance at completion of project.

C. Manufacturer's Field Services: Engage a factory-authorized service representative to test and adjust projection screens.
D. Schedule visual and mechanical inspections and electrical tests with at least seven days’ advance notice.

E. Inspect projection screen components for defects, physical damage, testing laboratory labeling, and nameplate compliance with the Contract Documents.

F. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following according to manufacturer’s written instructions:
   1. Continuity tests of circuits.
   2. Operational Tests: Set and operate controls to demonstrate their functions and capabilities in a methodical sequence that reproduces actual operating functions.
   3. Where light balancing or other control involving equipment provided under other Sections is indicated, combine testing required by this Section with that required by Sections specifying other equipment. Test programmable control related to light balancing, occupancy sensing, and other controls under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.

G. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.

H. Project Management:
   1. Participate in all Project Meetings. Be present at the Project site for Substantial Completion Inspection, Final Inspection, approve the operating and maintenance manuals, and provide any additional instruction as needed to designated members of the Owner’s staff.
   2. Be responsible for supervision of all technical work that is part of this Section
   3. Supervise preparation of shop drawings and submittals and sign all submittals.
   4. Supervise shop fabrication and field installation work to assure conformance with the Contract Drawings, the Specifications, and the reviewed Shop Drawings to assure workmanship of the specified quality.
   5. Oversee the testing of all assemblies and sub-assemblies prior to delivery to the Project Site.
   6. Lead in the specified testing of the completed installation to assure the Owner that all Contract Requirements are met. Work with and assist the Owner in the final testing for approval and acceptance of the system for the Owner.

3.7 ADJUSTING AND TESTING

A. General:
   1. Testing will include but is not limited to those listed below in order to verify that the system meets all design and performance requirements. Testing includes pre-installation and post installation testing.
   2. Perform the testing and adjustment prior to scheduling the Owner’s Representative to attend the Substantial Completion Inspection.
   3. Document the test results and submit them in accordance with the submittal procedures. After acceptance, incorporate all test documentation into the system manual.
   4. Assist the Owner’s representative during the Substantial Completion Inspection in performing final system adjustments and acceptance tests. Providing all labor, materials and tools necessary for these tests and adjustments and all necessary test equipment to complete the tests.
   5. When all the tests have been completed and the system is ready for inspection, formally notify the Owner’s Representative at least seven working days prior to Acceptance Testing. Include in this notice copies of all data recorded, date each test was completed and the results of each test. All test data shall be available during the inspection process.
6. Test electrically operated units to verify that screen controls, limit switches, closure, and other operating components are in optimum functioning condition.

7. Test manually operated units to verify that screen operating components are in optimum functioning condition.

B. Verification:

1. Verify that all wiring is installed correctly and completely. Verify that there are no short circuits or open circuits.

2. Prior to energizing or testing the system, ensure the following:
   a. All products are installed in a proper and safe manner per the manufacturer’s instructions.
   b. Insulation and shrink tubing are present where required.
   c. Dust and debris is removed.
   d. Cable is dressed, routed, and labeled.
   e. All labeling has been provided.
   f. Temporary facilities and utilities have been properly disconnected, removed and disposed off-site.
   g. Electronic devices are properly grounded.

3.8 CLEANING

A. Clean the projection screens internally and externally as required according to the Manufacturer’s recommendations.

B. All of the equipment shall be free from dust at the time of the Substantial Completion Inspection and the Final Inspection.

C. Repair damaged finishes.

D. Clean projection screens on both faces immediately before date scheduled for inspection intended to establish date of Substantial Completion. Use methods and cleaning materials recommended by screen manufacturer, taking care not to scratch or damage optical coatings or screen substrates.

3.9 SUBSTANTIAL COMPLETION INSPECTION

A. General:

1. Notify the Owner’s Representative in writing that the system has met all of the requirements for Substantial Completion and is ready for the Substantial Completion Inspection two weeks prior to the Inspection. The notice must be written and signed by the majority shareholder if the company is a closely held corporation or the President in a publically traded company or Sole Proprietorship.

2. Provide the services of the Project Engineer described above, the Project Manager and a field service technician to the Owners Representative to make adjustments during the Substantial Completion Inspection.

3. Assist the Owner’s Representative in performing final system tests and adjustments.

4. Provide all labor, materials, tools and test equipment necessary for these tests and adjustments.

B. System Demonstration:

1. Demonstrate the:
   a. Overall system operation.
   b. Control system operation.
   c. Optics system field performance.
   d. Video system field performance.
C. Loose Equipment and Documentation:
   1. Provide the following items on-site for inspection:
      b. Shop Drawings.
      c. Portable Equipment.
      d. Shop Test Report.
      e. Field Test Report.

D. Deficiencies:
   1. After the Substantial Completion Inspection the Owner’s Representative will issue a report documenting the system deficiencies.

3.10 FINAL INSPECTION AND ACCEPTANCE:
A. Notify the Owner’s Representative in writing that the system has met all of the requirements for Final Inspection and is ready for the Final Inspection two weeks prior to the Inspection and E-mail digital photographs of the corrected deficiencies from the Substantial Completion Inspection.

B. Provide the services of the Project Engineer described above, the Project Manager and a field service technician to the Owners Representative to make adjustments during the Final Inspection.

C. Assist the Owner’s Representative in performing final system tests and adjustments.

D. Provide all labor, materials, tools and test equipment necessary for these tests and adjustments.

E. Final acceptance of the installation will be granted when it is clear to the Owner’s Representative that the following conditions have been met:
   1. All of the deficiencies documented in the Substantial Completion Inspection Report have been corrected.
   2. All fixed equipment has been furnished, programmed and installed according to the drawings and specifications.
   3. All portable equipment has been turned over to the Owner.
   4. All equipment has been tested individually and as a completed assembly performs as specified.
   5. The Operations and Service Manual and As-Built Documentation have been completed, approved and delivered to the Owner.

3.11 DEMONSTRATION
A. General:
   1. Demonstrate the device meets all of the specifications during the Substantial Completion Inspection.
   2. Notify the Owner’s Representative in writing that the system has met all of the requirements for Training and is ready for Training two weeks prior to Training.
   3. Train the Owner after all of the deficiencies documented in the Substantial Completion Inspection have been corrected and observed by the Owner’s Representative.

3.12 PROTECTION
A. General:
   1. After the audio-video system has been installed in the field, protect the audio-video system from damage during construction. If damage occurs despite such protection, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.
2. Provide temporary covering of the audio-video system components until time of Substantial Completion.

3. See Part 1 if this Section for the Project Site Conditions requirements.

3.13 SCHEDULES
   A. Article not used.

END OF SECTION
SECTION 21 05 48
VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

1. PART    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. Elastomeric isolation pads.
   2. Elastomeric isolation mounts.
   3. Restrained elastomeric isolation mounts.
   4. Pipe-riser resilient supports.
   5. Resilient pipe guides.
   6. Elastomeric hangers.
   7. Snubbers.
   8. Restraint channel bracings.
  10. Mechanical anchor bolts.
  11. Adhesive anchor bolts.

1.3 RELATED REQUIREMENTS
A. Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for devices for plumbing equipment and systems.
B. Section 23 05 48 "Vibration and Seismic Controls for HVAC" for devices for HVAC equipment and systems.

1.4 DEFINITIONS
A. CBC: California Building Code.
C. OSHPD: Office of Statewide Health Planning & Development (for the State of California).

1.5 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component required.

(a) Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.

(b) Annotate to indicate application of each product submitted and compliance with requirements.

3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for fire-suppression piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.

B. Qualification Data: For professional engineer and testing agency.

C. Welding certificates.

D. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the CBC unless requirements in this Section are more stringent.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

2. PART PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the CBC: D.

2. Assigned Seismic Use Group or Building Category as Defined in the CBC: III.

(a) Component Importance Factor: 1.25.
Component Response Modification Factor: 6.5.

Component Amplification Factor: 1.0.

3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 1.645 g.

4. Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

5. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they are subjected.

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

1. Manufacturers:
   (a) Mason Industries
   (b) Kinetics Noise Control
   (c) Eaton TOLCO
   (d) Or approved equal

B. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.

C. Size: Factory or field cut to match requirements of supported equipment.

D. Pad Material: Oil and water resistant with elastomeric properties.

E. Surface Pattern: Ribbed or Waffle pattern.

F. Infused nonwoven cotton or synthetic fibers.

G. Load-bearing metal plates adhered to pads.

H. Sandwich-Core Material: Resilient and elastomeric.
   1. Surface Pattern: Ribbed or Waffle pattern.
   2. Infused nonwoven cotton or synthetic fibers.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:

1. Manufacturers:
   (a) Mason Industries
   (b) Kinetics Noise Control
   (c) Eaton TOLCO
   (d) Or approved equal
2. Mounting Plates:
   (a) Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
   (b) Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

3. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts:
   1. Manufacturers:
      (a) Mason Industries
      (b) Kinetics Noise Control
      (c) Eaton TOLCO
      (d) Or approved equal

   2. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
      (a) Housing: Cast-ductile iron or welded steel.
      (b) Elastomeric Material: Molded, oil-resistant rubber, neoprene or other elastomeric material.

2.5 PIPE-RISER RESILIENT SUPPORT

A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch- (13-mm-) thick neoprene.
   1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
   2. Maximum Load Per Support: 500 psig (3.45 MPa) on isolation material providing equal isolation in all directions.

2.6 RESILIENT PIPE GUIDES

A. Description: Telescopic arrangement of two steel tubes or post-and-sleeve arrangement separated by a minimum 1/2-inch- (13-mm-) thick neoprene.
   1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.7 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:
   1. Manufacturers:
2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.

3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.8 SNUBBERS

A. Manufacturers:
   1. Mason Industries
   2. Kinetics Noise Control
   3. Eaton TOLCO
   4. Or approved equal

B. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

C. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.

D. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.

E. Maximum 1/4-inch (6-mm) air gap, and minimum 1/4-inch- (6-mm-) thick resilient cushion.

2.9 RESTRAINT CHANNEL BRACINGS

A. Manufacturers:
   1. Mason Industries
   2. B-line
   3. Eaton TOLCO
   4. Or approved equal

B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.10 SEISMIC-RESTRAINT ACCESSORIES

A. Manufacturers:
1. Mason Industries
2. Kinetics Noise Control
3. B-line
4. Eaton TOLCO
5. Or approved equal

B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.11 MECHANICAL ANCHOR BOLTS

A. Manufacturers:
   1. Mason Industries
   2. Kinetics Noise Control
   3. Eaton TOLCO
   4. Or approved equal

B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.12 ADHESIVE ANCHOR BOLTS

A. Manufacturers:
   1. Mason Industries
   2. Kinetics Noise Control
   3. Eaton TOLCO
   4. Or approved equal

B. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.
3. PART EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

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

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork.

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

C. Comply with requirements in Section 077000 "Roof Accessories" for installation of equipment supports and roof penetrations.

D. Equipment Restraints:
   1. Install seismic snubbers on fire-suppression equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
   2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
   3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.

E. Piping Restraints:
   1. Comply with requirements in MSS SP-127.
   2. Space lateral supports a maximum as indicated on drawings o.c., and longitudinal supports a maximum as indicated on drawings o.c.
3. Brace a change of direction longer than 12 feet (3.7 m).

F. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.

G. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

H. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

I. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

J. Drilled-in Anchors:
   1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
   2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
   3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
   4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
   5. Set anchors to manufacturer's recommended torque, using a torque wrench.
   6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 211313 "Wet-Pipe Sprinkler Systems,"

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:
1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.

2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days’ advance notice.


4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.

5. Test to 90 percent of rated proof load of device.


7. Measure isolator deflection.

8. Verify snubber minimum clearances.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

END OF SECTION
IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

1. PART 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. Equipment labels.
   2. Warning signs and labels.
   3. Pipe labels.
   4. Stencils.
   5. Valve tags.
   6. Warning tags.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Samples: For color, letter style, and graphic representation required for each
   identification material and device.
C. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the
   proposed content for each label.
D. Valve Schedules: Valve numbering scheme.

2. PART PRODUCTS

2.1 EQUIPMENT LABELS
A. Metal Labels for Equipment:
   1. Material and Thickness: Brass, 0.032inch thick, with predrilled holes for
      attachment hardware.
   4. Minimum Label Size: Length and width vary for required label content, but not
      less than 2-1/2 by 3/4 inch.
   5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24
      inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger
      lettering for greater viewing distances. Include secondary lettering two-thirds to
      three-fourths the size of principal lettering.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment-Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, with predrilled holes for attachment hardware.

B. Letter Color: Yellow.

C. Background Color: Red.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.


H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction according to ASME A13.1.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover fully circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
   1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
   2. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.
2.4 **VALVE TAGS**

A. Description: Stamped or engraved with 1/4-inch letters for piping-system abbreviation and 1/2-inch (13-mm) numbers.
   1. Tag Material: Brass, 0.032-inch-thick, with predrilled holes for attachment hardware.
   2. Fasteners: Brass wire-link chain.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
   1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 **WARNING TAGS**

A. Description: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

B. Size: Approximately 4 by 7 inches.

C. Fasteners: Reinforced grommet and wire.

D. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

E. Color: Safety Yellow background with black lettering.

3. **PART EXECUTION**

3.1 **PREPARATION**

A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 **GENERAL INSTALLATION REQUIREMENTS**

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 **EQUIPMENT LABEL INSTALLATION**
A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

B. Near each valve and control device.

C. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.

D. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.

E. At access doors, manholes, and similar access points that permit a view of concealed piping.

F. Near major equipment items and other points of origination and termination.

G. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

H. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

I. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes including pipes where flow is allowed in both directions.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in fire-suppression piping systems. List tagged valves in a valve-tag schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below:

C. Valve-Tag Size and Shape:

D. Wet-Pipe Sprinkler System: 2 inches, square.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
2. Removal of concrete and bituminous surfaces.
3. Removal of existing fences and gates.
B. Related Requirements:
1. Division 01 - General Requirements.
2. Section 31 2200 – Grading.
3. Section 31 2313 – Excavation and Fill.
4. Section 31 2316 – Excavation and Fill for Pavement.
5. Section 31 2319 – Excavation and Fill for Structures.
7. Section 31 2326 – Base Course.
8. Section 32 3120 – Decorative Metal Fences and Gates.
9. Section 32 9300 – Planting.

1.2 SUBMITTALS
A. Shop Drawings: Submit site plan indicating extent of site clearing.

1.3 QUALITY ASSURANCE
A. Comply with Standard Specifications for Public Works Construction, current edition, as a minimum requirement.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 TREE AND STUMP REMOVAL
A. Remove trees and stumps indicated or required to be removed. Remove trees, together with bulk of roots, to a minimum depth of 4 feet below required grade, and within a radius of approximately 7 feet beyond perimeter of trunk at grade.
B. Fill and compact excavation from tree and stump removal. Fill in horizontal loose layers approximately 6 to 8 inches thick, each compacted to 90 percent of maximum density in accordance with ASTM D1557.
1. Back filling shall not commence until the excavation is inspected and tested.

3.2 CONCRETE AND BITUMINOUS SURFACING REMOVAL
A. Break up and completely remove existing concrete surfacing, curbs, gutters, walks and bituminous surfacing to indicated limits. Cutting shall be performed to a neat and even line with proper tools or a concrete cutting saw. Minimum depth of cut shall be 1 1/2-inch, unless otherwise indicated. Remove concrete broken beyond the indicated limits to the nearest joint or score line and replace with new concrete to match existing.

3.3 FENCING
A. Existing fences scheduled to remain may be removed to facilitate the Work, provided they are installed to their original condition in accordance with requirements of Section 32 3113 - Chain Link Fences and Gates.
B. Fencing indicated to be removed and not reinstalled shall be completely removed, including footings. Fill and compact excavations.
C. Install chain link fencing indicated to be relocated or reset in accordance with applicable requirements specified under Section 32 3113 - Chain Link Fences and Gates.

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

END OF SECTION
SECTION 312000
EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1.2 SUMMARY
A. Section Includes:
   1. Preparing sub-grades for walks and pavements.
   2. Excavating and backfilling for buildings and structures.
   3. Drainage course for concrete slabs-on-grade.
   4. Sub-base course for concrete walks and pavements.
   5. Sub-base course for asphalt paving.
   6. Subsurface drainage backfill for walls and trenches
   7. Excavating and backfilling trenches for utilities and pits for buried utility structures
B. Related Requirements:
   1. Section 01 3200 – Construction Progress Documentation.
   2. Section 01 5000 – Temporary Facilities and Controls.
   3. Section 03 3000 – Cast-in-Place Concrete.
   4. Divisions 21, 22, 23, 26, 27, 28, and 33 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.
   5. Section 31 1000 – Site Clearing.
   6. Section 32 9300 – Planting.
   7. Section 33 4000 – Storm Drainage Utilities.

1.3 UNIT PRICES
A. Work of this Section is affected by unit prices for earth moving required in Division 01 Section "Unit Prices."
B. Quantity allowances for earth moving are included in Division 01 Section “Allowances.”
C. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following. Unit prices for rock excavation include replacement with approved materials.
   1. 24 inches (600 mm) outside of concrete forms other than at footings.
   2. 12 inches (300 mm) outside of concrete forms at footings.
   3. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
   4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
   5. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
   6. 6 inches (150 mm) beneath pipe in trenches, and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

1.4 DEFINITIONS
A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.
B. Base Course: Aggregate layer placed between the sub-base course and hot-mix asphalt paving.
C. Bedding Course: Aggregate layer placed over the excavated sub-grade in a trench prior to laying pipe.
D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
F. Excavation: Removal of material encountered above sub-grade elevations and to lines and dimensions indicated.
   1. Authorized Additional Excavation: Excavation below sub-grade elevations or beyond indicated lines and dimensions as directed by Construction Manager. Authorized additional excavation and replacement material will be paid for according to Contract provisions for [unit prices] [changes in the Work].
   2. Bulk Excavation: Excavation more than 10 feet (3 m) in width and more than 30 feet (9 m) in length.
   3. Unauthorized Excavation: Excavation below sub-grade elevations or beyond indicated lines and dimensions without direction by Construction Manager. Unauthorized excavation, as well as remedial work directed by Construction Manager, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
   1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp (103-kW) flywheel power with bucketcurling force of not less than 28,700 lbf (128 KN) and stick-crowd force of not less than 18,400 lbf (82 KN) with extra-long reach boom; measured according to SAE J-1179.
   2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp (172-kW) flywheel power and developing a minimum of 47,992-lbf (213.3-kN) breakout force with a general-purpose bare bucket; measured according to SAE J-732.

I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. (0.57 cu. m) or more in volume that exceed a standard penetration resistance of 100 blows/2 inches (97 blows/50 mm) when tested by a geotechnical testing agency, according to ASTM D 1586.

J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

K. Sub-base Course: Aggregate layer placed between the sub-grade and base course for hot-mix asphalt pavement, or aggregate layer placed between the sub-grade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

L. Sub-grade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below sub-base, drainage fill, drainage course, or topsoil materials.

M. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 SUBMITTALS

A. Product Data: For each type of the following manufactured products required:
   1. Geotextiles.
   2. Controlled low-strength material, including design mixture.
   3. Geofoam.
   4. Warning tapes.

B. Samples for Verification: For the following products, in sizes required below:
   1. Geotextile: 12 by 12 inches (300 by 300 mm).
   2. Warning Tape: 12 inches (300 mm) long; of each color.

C. Qualification Data: For qualified testing agency.

D. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
   1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 698 or ASTM D 1557.

E. Seismic survey report from seismic survey agency.

F. Pre-excavation Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

A. Comply with Standard Specifications for Public Works Construction, "Greenbook".

B. Comply with the recommendations in the Geotechnical Report.

C. Seismic Survey Agency: An independent testing agency, acceptable to the City and/or authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:
   1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on the Project site and adjacent properties.
   2. Seismographic monitoring during blasting operations.

D. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

E. Pre-excavation Conference: Conduct conference at the Project site.

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 the City and the City and/or authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by the City or the City and/or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining the City's property will be obtained by the City prior to award of Contract.
   1. Do not proceed with work on adjoining property until directed by Construction Manager.

C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on the City's premises.

D. Utility Locator Service: Notify Call Before You Dig for area where the Work is located prior to site clearing.

E. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.

F. 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. Excavation or other digging unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
   1. Liquid Limit: Refer to Geotechnical Report
   2. Plasticity Index: Refer to Geotechnical Report.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 or a combination of these groups.
   1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Sub-base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

H. Drainage Course: Narrowly graded mixture of [washed] crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.

J. Sand: ASTM C 33; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Grab Tensile Strength: 157 lbf (700 N); ASTM D 4632.
   3. Sewn Seam Strength: 142 lbf (630 N); ASTM D 4632.
   4. Tear Strength: 56 lbf (250 N); ASTM D 4533.
   5. Puncture Strength: 56 lbf (250 N); ASTM D 4833.
   6. Apparent Opening Size: No. 40 (0.425-mm) sieve, maximum; ASTM D 4751.
   7. Permittivity: 0.5 per second, minimum; ASTM D 4491.
   8. UV Stability: 50 percent after 500 hours’ exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Grab Tensile Strength: 247 lbf (1100 N); ASTM D 4632.
   3. Sewn Seam Strength: 222 lbf (990 N); ASTM D 4632.
   4. Tear Strength: 90 lbf (400 N); ASTM D 4533.
   5. Puncture Strength: 90 lbf (400 N); ASTM D 4833.
   6. Apparent Opening Size: No. 60 (0.250-mm) sieve, maximum; ASTM D 4751.
   7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
   8. UV Stability: 50 percent after 500 hours’ exposure; ASTM D 4355.
2.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting, low-density, flowable concrete material produced from the following:
   1. Portland Cement: ASTM C 150, Type II.
   2. Fly Ash: ASTM C 618, Class C or F.
   5. Water: ASTM C 94/C 94M.

B. Produce low-density, controlled low-strength material with the following physical properties:
   1. As-Cast Unit Weight: 30 to 36 lb/cu. ft. (480 to 576 kg/cu. m) at point of placement, when tested according to ASTM C 138/C 138M.
   2. Compressive Strength 140 psi (965 KPa), when tested according to ASTM C 495.

C. Produce conventional-weight, controlled low-strength material with 140-psi (965-kPa) compressive strength when tested according to ASTM C 495.

2.4 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored as follows:
   2. Yellow: Gas, oil, steam, and dangerous materials.
   3. Orange: Telephone and other communications.
   4. Blue: Water systems.
   5. Green: Sewer systems.

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:
   2. Yellow: Gas, oil, steam, and dangerous materials.
   3. Orange: Telephone and other communications.
   4. Blue: Water systems.
   5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect sub-grades and foundation soils from freezing temperatures and frost. Remove temporary protection prior to placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared sub-grades, and from flooding the Project site and surrounding area.

B. Protect sub-grades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
3.3 EXCAVATION, GENERAL
A. Unclassified Excavation: Excavate to sub-grade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
   2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
      a. 24 inches (600 mm) outside of concrete forms other than at footings.
      b. 12 inches (300 mm) outside of concrete forms at footings.
      c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
      d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
      e. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
      f. 6 inches (150 mm) beneath pipe in trenches, and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.
B. Classified Excavation: Excavate to sub-grade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Construction Manager. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.
   1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.
      a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
   2. Rock excavation includes removal and disposal of rock. Remove rock to lines and sub-grade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
      a. 24 inches (600 mm) outside of concrete forms other than at footings.
      b. 12 inches (300 mm) outside of concrete forms at footings.
      c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
      d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
      e. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
      f. 6 inches (150 mm) beneath pipe in trenches, and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

3.4 EXCAVATION FOR STRUCTURES
A. Excavate to indicate elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
   2. Pile Foundations: Stop excavations 6 to 12 inches (150 to 300 mm) above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
   3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS
A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and sub-grades.

### 3.6 EXCAVATION FOR UTILITY TRENCHES

#### A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

#### B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.

1. **Clearance:** 12 inches (300 mm) each side of pipe or conduit.

#### C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape sub-grade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench sub-grade.

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed sub-grade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed sub-grade.
4. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

#### D. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

### 3.7 SUBGRADE INSPECTION

#### A. Notify Construction Manager when excavations have reached required sub-grade.

#### B. If Construction Manager determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

#### C. Proof-roll sub-grade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes) to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated sub-grades.

1. Completely proof-roll sub-grade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Construction Manager, and replace with compacted backfill or fill as directed.

#### D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

#### E. Reconstruct sub-grades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Construction Manager, without additional compensation.

### 3.8 UNAUTHORIZED EXCAVATION

#### A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Construction Manager.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Construction Manager.

### 3.9 STORAGE OF SOIL MATERIALS
A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL
A. Place and compact backfill in excavations promptly, but not prior to completing the following:
   1. Construction below finish grade including, where applicable, sub-drainage, damp-proofing, waterproofing, and perimeter insulation.
   2. Surveying locations of underground utilities for Record Documents.
   3. Testing and inspection underground utilities.
   4. Removing concrete formwork.
   5. Removing trash and debris.
   6. Removing temporary shoring and bracing, and sheeting.
   7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.11 UTILITY TRENCH BACKFILL
A. Place backfill on sub-grades free of mud, frost, snow, or ice.
B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."
D. Trenches under Roadways: Provide 4-inch- (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete prior to backfilling or placing roadway sub-base course. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."
E. Backfill voids with satisfactory soil while removing shoring and bracing.
F. Place and compact initial backfill of sub-base material, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.
   1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
G. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches (300 mm) over the pipe or conduit. Coordinate backfilling with utilities testing.
H. Place and compact final backfill of satisfactory soil to final sub-grade elevation.
I. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final sub-grade elevation.
J. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below sub-grade under pavements and slabs.

3.12 SOIL FILL
A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
B. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material.
   2. Under walks and pavements, use satisfactory soil material.
   3. Under steps and ramps, use engineered fill.
C. Place soil fill on sub-grades free of mud, frost, snow, or ice.

3.13 GEOFOAM FILL
A. Place a leveling course of sand, 2 inches (50 mm) thick, over sub-grade. Finish leveling course to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.
   1. Place leveling course on sub-grades free of mud, frost, snow, or ice.
B. Install geofoam blocks in layers with abutting edges and ends and with the long dimension of each block at right angles to blocks in each subsequent layer. Offset joints of blocks in successive layers.
C. Install geofoam connectors at each layer of geofoam to resist horizontal displacement according to geofoam manufacturer’s written instructions.
D. Cover geofoam with sub-drainage or separation geotextile before placing overlying soil materials.

3.14 SOIL MOISTURE CONTROL
A. Uniformly moisten or aerate sub-grade and each subsequent fill or backfill soil layer prior to compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS
A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
   1. Under structures, building slabs, steps, and pavements, scarify and re-compact top 12 inches (300 mm) of existing sub-grade and each layer of backfill or fill soil material at 95 percent.
   2. Under walkways, scarify and re-compact top 6 inches (150 mm) below sub-grade and compact each layer of backfill or fill soil material at 90 percent.
   3. Under turf or unpaved areas, scarify and re-compact top 6 inches (150 mm) below sub-grade and compact each layer of backfill or fill soil material at 85 percent.
   4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.16 GRADING
A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish sub-grades to required elevations within the following tolerances:
   1. Turf or Unpaved Areas: Plus or minus 1 inch (25 mm).
   2. Walks: Plus or minus 1 inch (25 mm).
   3. Pavements: Plus or minus 1/2 inch (13 mm).
C. Grading inside Building Lines: Finish sub-grade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.17 SUBSURFACE DRAINAGE
A. Sub-drainage Pipe: Specified in Division 33 Section “Sub-drainage.”
B. Sub-surface Drain:  Place subsurface drainage geotextile around perimeter of sub-drainage trench. Place a 6-inch (150-mm) course of filter material on subsurface drainage geotextile to support sub-drainage pipe. Encase sub-drainage pipe in a minimum of 12 inches (300 mm) of filter material, placed in compacted layers 6 inches (150 mm) thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).
   1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.
C. Drainage Backfill:  Place and compact filter material over subsurface drain, in width indicated, to within 12 inches (300 mm) of final sub-grade, in compacted layers 6 inches (150 mm) thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).
   1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.
   2. Place and compact impervious fill over drainage backfill in 6-inch- (150-mm-) thick compacted layers to final sub-grade.

3.18 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS
A. Place sub-base course and base course on sub-grades free of mud, frost, snow, or ice.
B. On prepared sub-grade, place sub-base course and base course under pavements and walks as follows:
   1. Install separation geotextile on prepared sub-grade according to manufacturer's written instructions, overlapping sides and ends.
   2. Place base course material over sub-base course under hot-mix asphalt pavement.
   3. Shape sub-base course and base course to required crown elevations and cross-slope grades.
   4. Place sub-base course and base course 6 inches (150 mm) or less in compacted thickness in a single layer.
   5. Place sub-base course and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
   6. Compact sub-base course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
C. Pavement Shoulders: Place shoulders along edges of sub-base course and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each sub-base and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.19 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE
A. Place drainage course on sub-grades free of mud, frost, snow, or ice.
B. On prepared sub-grade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
   1. Install sub-drainage geotextile on prepared sub-grade according to manufacturer's written instructions, overlapping sides and ends.
   2. Place drainage course 6 inches (150 mm) or less in compacted thickness in a single layer.
   3. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
   4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.20 FIELD QUALITY CONTROL
A. Special Inspections:  The City will engage a qualified special inspector to perform the following special inspections:
1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: The City will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test sub-grades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
   1. Paved and Building Slab Areas: At sub-grade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than three tests.
   2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet (30 m) or less of wall length, but no fewer than two tests.
   3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet (46 m) or less of trench length, but no fewer than two tests.

E. When testing agency reports that sub-grades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; re-compact and retest until specified compaction is obtained.

3.21 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   1. Scarify or remove and replace soil material to depth as directed by Construction Manager; reshape and re-compact.

C. Where settling occurs prior to Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off the City's property.

B. Transport surplus satisfactory soil to designated storage areas on the City's property. Stockpile or spread soil as directed by Construction Manager.
   1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off the City's property.

END OF SECTION
SECTION 312200
GRADING

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. General exterior grading, cutting and filling, including grading for building area, paving, planting areas, banks and hillsides.
B. Related Requirements:
   1. Division 01 - General Requirements.
   2. Section 31 1000 – Site Clearing.
   3. Section 31 2313 – Excavation and Fill.
   4. Section 31 2316 – Excavation and Fill for Pavement.
   5. Section 31 2319 – Excavation and Fill for Structures.
   7. Section 31 2326 – Base Course.
   8. Section 32 9300 – Planting.

1.2 PROJECT REQUIREMENTS
A. General:
   1. Fees: Pay as required by authorities having jurisdiction over the area.
   2. Bonds: Post as required by authorities having jurisdiction over the area.
   3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.
   4. Before grading, contact Underground Service Alert of Southern California (USASC) for information on public buried utilities and pipelines. Retain the services of an underground utility locator for on-site utilities.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Materials shall conform to requirements specified in this and related sections.

PART 3 - EXECUTION

3.1 PREPARATION
A. Protect and maintain installed stakes until their removal is required for the Work. Provide replacement grade or location stakes lost or disturbed.
B. Install grade stakes and compare to indicated grades. If discrepancies are found between existing grades and grades indicated on Drawings, do not proceed until discrepancies are resolved.

3.2 ROUGH AND FINE GRADING
A. Rough grade area sufficiently high to require cutting by fine grading:
   1. Grade area for bituminous surfacing and other paving to the indicated grades, equal to the section of the indicated base and pavement.
   2. Slope banks to required finish grades as cut progresses or leave cuts full and finish grade by mechanical equipment to provide grades and soil densities indicated on the Drawings.
   3. Rough grade, fill and compact banks beyond indicated finish grades. Finish grade banks and slopes to indicated grades and specified soil densities.
   4. Grade Only Areas: In areas not indicated to receive pavement, rough grade to approximate finish grades and then scarify, moisten and roll to obtain required density and indicated finish grades.
5. Tolerances: Finish grades shall be within a tolerance of 0.05 inch per foot above or below grades indicated. Provide an average grade as indicated.

B. Base or Subgrade:
   1. After subgrade has been constructed to approximate required grades, scarify to a depth of at least 12 inches:
      a. After scarifying, process loosened material to a finely divided condition and adjust moisture content to optimum condition by addition of water, addition and blending of dry suitable material, or by drying of existing material.
      b. Subgrade material shall be compacted by tamping, sheepsfoot rollers or pneumatic tire rollers. Required relative compaction shall be 90 percent minimum for the top 12 inches below subgrade.
      c. Install base course in accordance with Section 31 2326 - Base Course.
   2. Tolerance of completed grades of base or subgrade shall not vary more than 0.03 inch per foot from grades indicated. Provide an average grade as indicated.

3.3 SHORING
   A. Provide shoring as necessary to properly and safely support earth sides of excavations, and existing curbs, sidewalks, gutter, drives and stairs, against movement and collapse.
   B. Design and Calculations: Provide in accordance with requirement of CalOHLSA.
   C. Remove shoring upon completion of the Work of this section or when no longer needed unless required otherwise by authorities having jurisdiction.

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

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

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Excavating, filling, backfilling, and compacting for Project site pavement, planting areas, buildings, and other structures.
   2. Trenches for utility lines such as water, gas, irrigation, storm drain and sewer lines, concrete-encased conduits, manholes, vaults, valve boxes, catch basins, underground tanks, thrust blocks, yard boxes, pull boxes, and other utility appurtenances.

B. Related Requirements:
   1. Division 01 - General Requirements.
   2. Section 31 1000 – Site Clearing.
   3. Section 31 2200 – Grading.
   4. Section 31 2326 – Base Course.
   5. Section 32 0117 – Asphalt Pavement Repair.
   6. Section 32 1313 – Site Concrete Work.
   7. Section 32 3113 – Chain Link Fences and Gates.
   8. Section 32 9300 – Planting.
   9. Section 33 1100 – Site Water Distribution Utilities.
   10. Section 33 3000 – Site Sanitary Sewer Utilities.
   11. Section 33 4000 – Storm Drainage Utilities.
   12. Division 22 - Plumbing.

1.2 PROJECT REQUIREMENTS
A. Import and Export of Earth Materials:
   1. Fees: Pay as required by authorities having jurisdiction over the area.
   2. Bonds: Post as required by authorities having jurisdiction over the area.
   3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.3 SUBMITTALS
A. Imported Soils: A geotechnical engineer, retained by the Owner as an Owner Consultant, shall obtain initial product Sample for testing in accordance with the terms of Article 3.05 of this section.
B. Shoring calculations as required in Article 3.03 of this section.

1.4 QUALITY ASSURANCE
B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with the recommendations found in the Geotechnical Report. Initial sampling shall be performed by a geotechnical engineer, retained by the Owner as an Owner Consultant, before importing material to the Project site.

1.5 PROJECT CONDITIONS
A. Information on Drawings or in soil investigation report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.
B. A copy of the foundation investigation and soils report is available for examination at the Architect’s office during regular office hours of Architect.
PART 2 - PRODUCTS

2.1 FILL AND BACKFILL MATERIALS
A. Fill and backfill material shall be a granular material previously removed from excavation or imported fill material, free of clods and stones larger than 3 inches, (2½ inches for utility trenches) foreign materials, vegetable growths, sod, expansive soils, rubbish and debris. Material shall conform to these specified requirements and related sections.

B. Fill material exhibiting a wide variation in consistency and moisture content shall be blended and aerated to stabilize and upgrade the material.

C. Bedding material from trench bottom to one foot above the pipe:
   1. Sand, gravel, crushed aggregate or native free-draining granular material providing a sand equivalent of at least 30 or a coefficient of permeability greater than 1.4 inches per hour.
   2. Sand complying with the Specifications for cement concrete aggregates.

D. Other Fill Materials: Brick rubble and broken concrete originating from the Project site may be legally disposed of off the Project site, or incorporated in fill, if reviewed by a geotechnical engineer, retained by the Owner as an Owner Consultant. Unless otherwise indicated, no such material shall be imported from outside the Project site.

E. Permeable Backfill:
   1. Provide permeable backfill material behind retaining structures consisting of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations of these materials conforming to the following gradations:

<table>
<thead>
<tr>
<th>Sieve Size:</th>
<th>Percentage Passing:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 inch (19mm)</td>
<td>100</td>
</tr>
<tr>
<td>3/8 inch (10mm)</td>
<td>80 to 100</td>
</tr>
<tr>
<td>No. 100</td>
<td>0 to 8</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 to 3</td>
</tr>
</tbody>
</table>

   2. Those portions of fill material passing a No. 4 sieve shall provide a sand equivalent of at least 60.
   3. Provided backing for weep-holes shall consist of two cubic feet of aggregate in burlap sacks, securely tied. Aggregate shall conform to requirements for No. 3 concrete aggregate as specified in subsection 200-1.4 of the Standard Specifications for Public Works Construction.
   4. Permeable Backfill Alternate Materials: Instead of the materials specified for retaining structures backfill, a drainage matting system Miradrain by Mirafi, Inc., American Wick Drain, JDR Enterprises, or equal, may be provided if reviewed by the Architect.

F. Cement-sand slurry shall be provided with one sack of cement per cubic yard of the mixture.

2.2 BASE MATERIALS
A. Concrete Slabs on Grade: Provide “Crushed Aggregate Base” as specified in Standard Specifications for Public Works Construction, Section 200 - Rock Materials, with 3/4 inch maximum size aggregates. Provide 3 inch thick base, unless noted otherwise.

B. Bituminous Surfacing: Provide as indicated on Drawings and specified in Section 31 2326 Base Course.

PART 3 - EXECUTION

3.1 GENERAL
A. Before excavation, contact Underground Service Alert of Southern California (USASC) for information on buried public utilities and pipelines. For onsite utilities retain an underground utility identification service.

B. Where the Work includes a building extension or addition on an occupied Project site, perform Work in such a manner, and at such times, as not to disrupt performance of existing utility services to existing Project site facilities. Where an interruption is necessary, obtain review from the OAR before proceeding.
C. Remove concrete or bituminous pavement to straight lines by saw cutting.

3.2 PROTECTION
A. Protect and guard excavations against danger to life, limb, and property as required by, but not limited to, OSHA regulations.
B. Protect existing improvements including landscaping against damage. Repair or replace damaged items.
C. Protect existing utility services and distribution systems from damage or displacement.
D. Remove conduits or pipes not in service, exposed during Work, unless a minimum cover of two feet is provided. Remove concrete, clay or other non-metallic pipe over 8 inches in diameter, unless otherwise indicated.
E. Shore, crib, or lag excavations and earthen banks as necessary to prevent cave in, erosion or gullying of sides.
F. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. If soil becomes soft, soggy, or saturated, excavate to firm undisturbed earth and fill as required. Slope adjacent grades away from excavations to minimize entry of water.

3.3 SHORING
A. Provide shoring as necessary to properly and safely support earth sides of excavations, and existing curbs, sidewalks, gutter, drives and stairs, against movement and collapse.
B. Design and Calculations: Provide in accordance with requirement of governing Cal-OSHA requirements.
C. Remove shoring upon completion of the Work of this section or when no longer needed unless required otherwise by authorities having jurisdiction.

3.4 EXCAVATION
A. Unclassified Excavations: Comply with the Standard Specifications for Public Works Construction, Section 300: "Earthwork", except as modified herein.
B. Form sides of footings, pads, grade beams, and slab foundations, unless otherwise indicated. Provide excavations of sufficient size to permit installation and removal of forms and other required Work.
C. Machine-drill excavation for round footings to size and depth indicated. Provide a collar or casing, or other adequate protection, to exclude dirt and debris. Protect excavations with plank covers until concrete is placed.
D. Provide excavation bottoms level and free from loose material. Excavate to indicated or required elevations of undisturbed earth.
E. Barricade trenches, ditches, pits, sumps, and similar Work outside the barricaded working area with chain link fence as specified in Section 01 5000 - Construction Facilities and Temporary Controls, and in accord with Cal-OSHA standards and requirements.
F. Trenches over five feet in depth shall comply with the Construction Safety Orders of the California Division of Industrial Safety.
G. Where indicated or required to excavate in lawn areas, protect adjoining lawn areas outside of the Work area. Replace or install removed sod upon completion of backfill by installing sod level with adjacent lawns. If installation of removed sod fails, furnish sod and install to match existing lawns.
H. For Structures:
   1. Calculate excavation quantities based on elevations or depths indicated on Drawings.
   2. Provide 2,000 psi concrete for backfill of over-excavated areas to indicated or required elevations.
   3. Special preparation of bottom of excavated planes areas: Excavate areas shown on Drawings as bottom of excavated planes (B.E.P.), by excavating and filling to indicated grades and elevations.
I. For Utilities:
1. Excavate trenches to required depth for utility lines, such as pipes, conduits, and tanks, with minimum allowance of 6 inches at the bottom and 6 inches at the sides for bedding or concrete encasement as indicated on Drawings. Grade bottom of trenches to a uniform smooth surface. Remove loose soil from the excavation before placing sand bedding or concrete encasement.

2. Do not install piping lengthwise under concrete walks without review by the Architect.

3. Do not excavate trenches parallel to footings closer than 18 inches from the face of the footing or below a plane having a downward slope of one horizontal to one vertical, from the bottom of any existing foundation.
   a. Unless otherwise indicated on Drawings, depth of excavations outside buildings shall provide for a minimum coverage above top of piping, tank or conduit measured from the lowest adjoining finished grade, as follows:

<table>
<thead>
<tr>
<th>Material</th>
<th>Depth Below Finished Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel Pipe</td>
<td>24 inches</td>
</tr>
<tr>
<td>Copper Water Tube</td>
<td>18 inches</td>
</tr>
<tr>
<td>Cast-Iron, Pressure Pipe</td>
<td>36 inches</td>
</tr>
<tr>
<td>Plastic Pipe (other than waste)</td>
<td>30 inches</td>
</tr>
<tr>
<td>Tanks or other structure</td>
<td>36 inches</td>
</tr>
<tr>
<td>Soil, sewer and storm drain</td>
<td>Minimum 18 inches</td>
</tr>
<tr>
<td>Irrigation Pipe:</td>
<td>Non-pressure pipe - 24 inches</td>
</tr>
</tbody>
</table>

   b. Trench width shall provide space for fitting and joining. Excavate for piping bells and fittings, bell and spigot pipe and other fittings.

4. Where portions of existing structures, walks, paving, or other improvements are removed or cut for piping or conduit installation, replace the material with equal quality, finished to match adjoining existing improvements. Repair pavement as specified in Section 32 0117 - Pavement Repair.

5. Provide a minimum clear dimension of 2 inches from sides of wall excavation to outer surfaces of buried pipes or conduits placed in the same trench or outside surfaces of containers and tanks.

3.5 IMPORT/EXPORT OF MATERIALS

A. Unclassified Fill and Compaction: Comply with the Standard Specifications for Public Works Construction, Section 300 - Earthwork, except as modified herein. Install and compact fill in horizontal loose layers approximately 6 to 8 inches thick.

B. Provide fill materials as specified in Part 2- Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.

C. Imported fill materials shall be sampled by a geotechnical engineer, retained by the Owner as an Owner Consultant, for compliance with the requirements of Part 2 of this section.

D. A geotechnical engineer, retained by the Owner as an Owner Consultant, shall submit the samples to an independent DSA approved testing laboratory for testing.

E. Initial sampling and testing shall be performed before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and entity responsible for the source site. A geotechnical engineer, retained by the Owner as an Owner Consultant, shall obtain both the initial and additional samples from the identified site and submit samples for required testing.

F. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.
G. The independent approved testing laboratory shall perform the required tests and report results of tests noting if the tested material passed or failed such tests and shall furnish copies to the Project Inspector, Architect, OAR, DSA, Contractor, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents, California Building Code, and the DSA. Upon completion of the Work of this section, the independent testing laboratory and geotechnical engineer shall submit a verified report to the DSA as required by the CBC.

H. Bills of lading or equivalent documentation will be submitted to the Project Inspector on a daily basis.

I. Upon completion of import operations, provide the OAR a certification statement attesting that imported material has been obtained from the identified source site.

3.6 INSTALLATION OF MATERIALS

A. Pavement: Fill or backfill materials shall be installed in loose horizontal layers of approximately 6 to 8 inches, unless otherwise required. Each layer shall be evenly placed and moistened or aerated as necessary. Unless otherwise reviewed by the geotechnical engineer, retained by the Owner as an Owner Consultant, each layer of fill material shall cover the length and width of the area to be filled before the next layer of material is installed. Top surface of each layer shall be installed to an approximate level with a crown or crossfall of at least 1 in 50, but not more than 1 in 20. Provide adequate drainage at all times during installation of the Work of this section.

B. Structures:
   1. After concrete has been placed, forms removed, and concrete Work inspected, backfill excavations with earth to indicated or required grades. Backfill simultaneously on each side of walls or grade beams. Remove rubbish, debris and other waste materials from excavations before placing backfill.
   2. Before placing backfill, adequately cure concrete and provide bracing, if required to stabilize structure. Protect waterproofing or damp-proofing against damage during backfilling operations, with required protection board. Remove bracing as backfill operation progresses.
   3. Do not furnish or install expansive soils for retaining wall backfill.
   4. Rigidly control the amount of water to be installed to provide optimum moisture content for type of fill material furnished. Do not over-saturate or compact by flooding or jetting.
   5. Install wall backfill before installing railings and fences on walls.
   6. Install weep hole drainage at the backside of walls so the backing completely covers the weep holes, is horizontally centered and extends at least 12 inches above the bottom of the weep opening. Provide an 8-inch square section of 1/4 inch galvanized or aluminum screen, with a minimum wire diameter of 0.03 inch, and install at the backside of each weep hole before installing the backfill material.
   7. Where a reviewed drainage matting system is provided instead of permeable backfill for retaining structures, install in accordance with the manufacturer recommendations.

C. Utilities:
   1. Do not install backfill until the Work of this section has been inspected and tested. Do not furnish or install materials excavated from the Project site containing materials not permitted for backfill.
   2. Backfill electrical or other excavated utility trenches located outside of barricaded installation areas within 24 hours after inspection by the IOR.
   3. Install backfill in layers not exceeding 4 inches in thickness, except cement-sand slurry.
   4. If materials excavated from the Project site are not permitted for trench backfill in paved areas, backfill trenches with a cement-sand slurry mix. Install backfill to an elevation of the existing undisturbed grades plus one inch.

3.7 COMPACTING

A. Each layer of fill material shall be compacted by tamping, sheepsfoot rollers, or pneumatic-tired rollers to provide specified relative compaction. At inaccessible locations, provide specified compaction by manually held, operated and directed compaction equipment.
B. Install and compact sand bedding to provide a uniform bearing under the full length of piping and conduits.

C. Unless otherwise indicated, compact each layer of fill material to a relative compaction of at least ninety percent. For fill material under paving, compact to a relative compaction of at least ninety-five percent.

D. When fill materials, or a combination of fill materials, are encountered or provided which develop densely packed surfaces as a result of installation or compacting operations, scarify each layer of compacted fill before installing the next succeeding layer.

3.8 INSPECTION AND TESTING
A. The geotechnical engineer, retained by the Owner as an Owner Consultant, will inspect and test excavations, sample material quality for testing as set required in Part 2, and observe installation and compaction of fill materials.

B. The geotechnical engineer, retained by the Owner as an Owner Consultant, will sample imported fill materials from their designated source and submit samples to the independent approved testing laboratory before delivery to the Project site.

C. Installation of backfill shall be observed by the geotechnical engineer, retained by the Owner as an Owner Consultant.

D. The geotechnical engineer, retained by the Owner as an Owner Consultant, will inspect and test excavation Work before the installation of fill and other materials.

E. Compaction: Test compaction in accordance with ASTM D1557, Method C.

F. The Project Inspector will inspect foundation excavations when completed and ready for forms, after forms are in place, and before first placement of concrete.

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

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

END OF SECTION
SECTION 312319
EXCAVATION AND FILL FOR STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Excavating, backfilling, and compacting for buildings and structures.
   2. Fill materials.
B. Related Requirements:
   1. Division 01 - General Requirements.
   2. Section 31 1000 – Site Clearing.
   3. Section 31 2200 – Grading.
   4. Section 31 2316 – Excavation and Fill for Pavement.
   5. Section 31 2323 – Excavation and Fill for Utilities.

1.2 PROJECT REQUIREMENTS
A. Import and Export of Earth Materials:
   1. Fees: Pay as required by authorities having jurisdiction over the area.
   2. Bonds: Post as required by authorities having jurisdiction over the area.
   3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.3 SUBMITTALS
A. Imported Soils: A geotechnical engineer, retained by the Owner as an Owner Consultant, shall obtain initial product sample for testing in accordance with the terms of Article 3.05 of this section.
B. Shoring calculations as required in Article 3.03 of this section.

1.4 QUALITY ASSURANCE
A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition, except as modified herein.
B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with the recommendations found in the Geotechnical Report. Initial sampling shall be performed by a geotechnical engineer, retained by the Owner as an Owner Consultant, before importing material to the Project site.

1.5 PROJECT CONDITIONS
A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.
B. A copy of the foundation investigation and soils report is available for examination at the Architect's office during regular office hours of Architect.

PART 2 - PRODUCTS

2.1 FILL AND BACKFILL MATERIALS
A. Fill and backfill materials shall be a granular material previously removed from excavation, or imported fill material, free of large clods and stones larger than 3 inches, foreign materials, vegetable growths, sod, expansive soils, rubbish and debris. Material shall conform to these specified requirements and related sections.
B. Fill material exhibiting a wide variation in consistency and or moisture content shall be blended and/or aerated to stabilize and upgrade the material.

C. Imported Fill Material:
   1. Provide suitable materials obtained from Project site excavations for earthwork and fill materials. If excavated materials are not of suitable quality or sufficient quantity, import additional materials as necessary.
   2. Imported fill shall be a granular material with sufficient binder to form a firm and stable unyielding subgrade and shall not have more than 60 percent of fines passing 200 mesh sieve. Material shall have a coefficient of expansion of not more than two percent from air dry to optimum moisture content and not more than six percent from air dry to saturation. Imported material shall be clean and free of rubbish, debris and toxic or hazardous contaminants. Adobe or clay soils are not permitted.

D. Other Fill Materials: Brick rubble and broken concrete originating from the Project site may be legally disposed of off the Project site, or incorporated in fill, if reviewed by the geotechnical engineer, retained by the Owner as an Owner Consultant. Unless otherwise provided, no such materials may be imported from outside the Project site.

E. Permeable Backfill:
   1. Provide permeable backfill material behind retaining structures consisting of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations of these materials conforming to the following gradations:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percentage Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 inch</td>
<td>100</td>
</tr>
<tr>
<td>3/8 inch</td>
<td>80 to 100</td>
</tr>
<tr>
<td>No. 100</td>
<td>0 to 8</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 to 3</td>
</tr>
</tbody>
</table>

   2. Those portions of fill material passing a No. 4 sieve shall provide a sand equivalent of at least 60.
   3. Provided backing for weep-holes shall consist of two cubic feet of aggregate in burlap sacks, securely tied. Aggregate shall conform to requirements for No. 3 concrete aggregate as specified in subsection 200-1.4 of the Standard Specifications for Public Works Construction.
   4. Permeable Backfill Alternate Materials: Instead of the materials specified for retaining structures backfill, a drainage matting system, Miradrain by Mirafi, Inc., or equal, may be provided if reviewed by the Architect.

PART 3 - EXECUTION

3.1 SITE PREPARATION
   A. Clear the Project site as required in Section 31 1000 - Site Clearing.

3.2 PROTECTION
   A. Protect and guard excavations against danger to life, limb, and property as required by, but not limited to, Cal-OSHA regulations.
   B. Protect adjacent existing improvements including landscaping against damage.
   C. Shore, crib, or lag excavations and earthen banks as necessary to prevent caving-in, erosion or gullying of sides.
   D. Divert or de-water excavations until concrete is placed, forms are removed, and backfilling is complete.

3.3 SHORING
   A. Provide shoring as necessary to properly and safely support earth sides of excavations, curbs, sidewalks, gutter, drives and stairs, against movement and collapse.
   B. Design and Calculations: Provide in accordance with requirement of Cal-OHSA. Remove shoring upon completion of Work, or when no longer needed.
3.4 EXCAVATION
A. Form sides of footings, pads, grade beams, and slab foundations, unless otherwise indicated. Provide excavations of sufficient size to permit installation and removal of forms and other Work as required.
B. Machine-drill excavation for round footings to size and depth indicated. Provide a collar or casing, or other adequate protection, to exclude dirt and debris. Protect excavations with plank covers until concrete is placed.
C. Provide excavation bottoms level and free from loose material. Excavate to indicated or required elevations of undisturbed earth.
D. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. If soil becomes soft, soggy, or saturated, excavate to firm undisturbed soil and fill as required. Slope adjacent grades away from excavations to minimize entry of water.
E. Calculate excavation quantities based on elevations or depths indicated on Drawings.
F. Provide 2,000 psi concrete for backfill of over-excavated areas to indicated or required elevations.
G. Special preparation of bottom of excavated planes areas: Excavate areas designated on Drawings as bottom of excavated planes (B.E.P.), by excavating and filling to indicated grades and elevations.

3.5 IMPORT/EXPORT OF MATERIALS
A. Provide fill materials as specified in Part 2- Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.
B. Imported fill materials shall be sampled by the geotechnical engineer, retained by the Owner as an Owner Consultant, for compliance with the requirements of Part 2 of this section.
C. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall submit all samples to a DSA approved independent testing laboratory for testing.
D. Initial sampling shall be performed by a geotechnical engineer, retained by the Owner as an Owner Consultant, before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and/or entity responsible for the source site. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall obtain both the initial sample and additional samples from the identified site and shall submit samples to the approved independent testing laboratory for testing.
E. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1,000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1,000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.
F. The independent approved testing laboratory shall perform the required tests and report results of tests noting if the tested material passed or failed such tests and shall furnish copies to the Project Inspector, Architect, OAR, DSA, Contractor, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents, CBC and the DSA. Upon completion of the Work of this section, the independent testing laboratory and geotechnical engineer shall submit a verified report to the DSA as required by CBC.
G. Bills of lading or equivalent documentation will be submitted to the Project Inspector on a daily basis.
H. Upon completion of import operations, provide the OAR a certification statement attesting that all imported material has been obtained from the identified source site.

3.6 BACKFILLING
A. After concrete has been placed, forms removed and concrete Work inspected, backfill excavations to indicated or required grades. Backfill simultaneously on each side of walls or grade beams. Remove rubbish, debris, and other waste materials from excavations before placing backfill.

B. Before installing any backfill, adequately cure concrete and provide bracing to stabilize structures. Protect waterproofing or dampproofing against damage during backfilling operations with required protection board. Remove bracing as backfill operation progresses.

C. Do not furnish or install expansive soils for below grade building walls.

D. Install each layer of material in a not to exceed thickness of 6 inches, unless otherwise required.

E. Rigidly control the amount of water to be installed to provide optimum moisture content for type of fill material furnished. Do not over-saturate or compact by flooding or jetting.

F. Install wall backfill before installing railings and fences on walls.

G. Impervious backfill materials shall be installed in layers along with and by the same methods specified for structure backfill. Impervious backfill materials shall be at the approximate grade and elevation and where exposed to erosion, shall be covered with at least a 12-inch layer of fill material as reviewed by the geotechnical engineer, retained by the Owner as an Owner Consultant.

H. Install weep hole drainage at the backside of walls so the backing completely covers the weep holes, is horizontally centered and extends at least 12 inches above the bottom of the weep opening. Provide an 8-inch square section of 1/4 inch galvanized or aluminum screen, with a minimum wire diameter of 0.03 inch, and install at the backside of each weep hole before installing the backfill material.

I. Where a reviewed drainage matting system is provided instead of permeable backfill for retaining structures, install in accordance with the manufacturer recommendations.

3.7 COMPACTING

A. Compact each layer of fill material by tamping, sheepsfoot rollers or pneumatic-tired rollers, to such extent as to provide specified relative compaction. At inaccessible locations, compact to specified requirements with hand-held, operated and directed compaction equipment.

B. Unless otherwise indicated, compact each layer of fill material to a relative compaction of at least 95 percent.

C. Do not compact by flooding or jetting.

D. When fill materials, or a combination of fill materials, are encountered or provided which develop densely packed surfaces as a result of installation or compacting operations, scarify each layer of compacted fill before installing the next succeeding layer.

3.8 INSPECTION AND TESTING

A. The geotechnical engineer, retained by the Owner as an Owner Consultant, will inspect and test excavations, sample material quality as required in Part 2, and observe installation and compaction of fill materials.

B. The geotechnical engineer, retained by the Owner as an Owner Consultant, will sample imported fill materials from their designated source before delivery to the Project site.

C. Installation of backfill shall be observed by the geotechnical engineer, retained by the Owner as an Owner Consultant.

D. The geotechnical engineer, retained by the Owner as an Owner Consultant, will inspect and test excavation Work before the installation of fill and/or other materials.

E. Compaction: Test compaction in accordance with ASTM D1557, Method C.

F. The Project Inspector will inspect foundation excavations when completed and ready for forms, after forms are in place and before first placement of concrete.

3.9 PROTECTION

A. Protect the Work of this section until Substantial Completion.
3.10 CLEANUP
A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavating, backfilling, and compacting utility trenches such as water, gas, irrigation, storm drain, sewer lines, concrete-encased conduits, and manholes, vaults, valve boxes, catch basins, underground tanks, thrust blocks, yard boxes, pull boxes and other utility appurtenances.

B. Related Requirements:
   1. Division 01 – General Requirements.
   3. Section 31 1000 – Site Clearing.
   4. Section 31 2200 – Grading.
   5. Section 31 2316 – Excavation and Fill for Pavement.
   7. Section 31 0117 – Asphalt Pavement Repair.
   8. Section 32 1313 – Site Concrete Work.
   9. Section 32 8400 – Planting Irrigation.
   10. Section 33 1100 – Site Water Distribution Utilities.
   11. Section 33 3300 – Site Sanitary Sewer Utilities.
   12. Section 33 4000 – Storm Drainage Utilities.

1.2 PROJECT REQUIREMENTS.

A. Import and Export of Earth Materials:
   1. Fees: Pay as required by authorities having jurisdiction over the area.
   2. Bonds: Post as required by authorities having jurisdiction over the area.
   3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.3 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works construction, current edition except as modified herein.

B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with Section 01 4524 – Environmental Import/Export Materials Testing.

1.4 TESTING

A. OWNER will retain a Geotechnical Engineer as an OWNER Consultant who will provide observations, test, and inspections and approvals identified in the Contract Documents as being responsibility of OWNER.

B. Imported Soils: The Geotechnical Engineer will obtain initial product Sample for testing in accordance Article 3.2 of this Section.

1.5 PROJECT CONDITIONS

A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

PART 2 - PRODUCTS
2.1 MATERIALS
A. Bedding material from trench bottom to one foot above the pipe:
   1. Sand, gravel, crushed aggregate or native free-draining granular material providing a sand
      equivalent of at least 30 or a coefficient of permeability greater than 1.4 inches per hour.
   2. Sand complying with the Specifications for cement concrete aggregates.
B. Backfill Materials:
   1. Excavated trench material to be installed for backfilling shall be clean, free of large clods,
      and stones larger than 2 ½-inch in any dimension.
   2. Cement-sand slurry shall be provided with one sack of cement per cubic yard of the mixture.
   3. Imported Fill Material: Imported fill material shall be a granular material with sufficient binder
      to form a firm and stable unyielding subgrade and shall not have more than 60 percent of
      fines passing a 200 mesh sieve. Material shall provide a coefficient of expansion of not more
      than two percent from air dry to optimum moisture content and not more than six percent
      form air dry to saturation. Imported materials shall be clean and free of rubbish, debris, and
      toxic or hazardous contaminants. Adobe or clay soils are not permitted.

PART 3 - EXECUTION

3.1 GENERAL
A. Before initiating intrusive activities, contact Underground Service Alert of Southern California (USA
   or Dig Alert) to obtain a Dig Alert ticket for location information on buried public and USA member
   utilities and pipelines at least 48-hours prior to beginning work. A copy of the Dig Alert ticket shall
   be forwarded to the OWNER. For on-site utilities, retain a state-licenses third party underground
   utility locating service.
B. Barricade trenches, ditches, pits, sumps, and similar Work outside the barricaded working area
   with chain link fence as specified in Section 01 5000, Construction Facilities and Temporary
   Controls, and in accordance with Cal-OSHA standards and requirements.
C. Saw-cut concrete or bituminous paving for trench installation.
D. Trenches over 5 fee in depth shall conform to the Cal-OSHA.
E. Where indicated and required to excavate in lawn areas, protect adjoining lawn areas outside of
   the Work area. Replace or install removed sod upon completion of backfill by installing sod level
   with adjacent lawns. If installation of removed sod fails, furnish sod and install to match existing
   lawns.
F. Backfill over excavations to the required elevations with earth, gravel, sand, or concrete and
   compact as required. Provide excavations free from standing water by pumping, draining, or
   providing protection against water intrusion. Slope adjacent grades away from excavations to
   minimize entry of water.
G. Do not install piping lengthwise under concrete walks without review by the ARCHITECT.
H. Do not excavate trenches parallel to footings closer than 18 inches from the face of the footing or
   below a plane having a downward slope of two horizontal to one vertical, from a line 9 inches
   above bottom of footings.
   1. Unless otherwise indicated on Drawings, depth of excavations outside the buildings shall
      allow for a minimum coverage above top of pipe, tank, or conduit measured from the lowest
      adjoining finished grade, as follows:
      
      | Material                  | Minimum Coverage          |
      |---------------------------|---------------------------|
      | Steel Pipe                | 24 inches below finished grade |
      | Copper Water Tube         | 18 inches below finished grade |
      | Cast-Iron Pressure Pipe   | 36 inches below finished grade |
      | Plastic Pipe (other than waste) | 30 inches below finished grade |
      | Tanks or other structures | 36 inches below finished grade |
      | Soil, Sewer & Storm Drain | minimum 18 inches below finished grade, and |
      |                           | as required for proper pitch and traffic load. |
      |                           | (Install polypropylene sewer pipe with at least |
      |                           | 24 inches coverage) |
Irrigation Pipe: nonpressure pipe 12 inches, pressure pipe 24 inches

2. Trench width shall provide ample space for fitting and joining. Excavate for piping bells and fittings, bell and spigot pipe and other fittings.

I. Unless indicated otherwise, excavate trenches to the required depths for utilities, such as pipes, conduit and tanks, with minimum allowances of 6 inches at the bottom and 6 inches at the sides for bedding of unprotected piping or as required for concrete encasement of conduits as indicated on Drawings. Grade bottom of trenches to a uniform smooth surface. Remove loose soil from the excavation before installing sand bedding or concrete encasement.

J. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. If soil becomes soft, soggy, or saturated, excavate to firm undisturbed soil and fill as required. Slope adjacent grades away from excavations to minimize entry of water.

K. Provide a minimum clear dimension of 2 inches from sides of wall excavation to outer surfaces of buried pipes or conduits installed in the same trench or outside surfaces of containers and tanks.

L. Do not install backfill until required inspections and testing is completed.

M. Backfill electrical or other excavated utility trenches located outside of barricaded installation areas within 24 hours after inspection by the Project Inspector.

N. Install backfill materials in layers not exceeding 4 inches in thickness and compact to 90 percent of the maximum density.

O. If materials excavated from the Project site are not permitted for trench backfill in paved areas, backfill trenches with a cement-sand slurry mix. Install backfill to an elevation of the existing undisturbed grade plus one inch.

P. Install and compact sand bedding to provide a uniform full length bearing under piping and conduits.

Q. Where portions of existing structures, walks, paving, or other improvements are removed or cut for piping or conduit installation, replace the material with equal quality, finished to match adjoining existing improvements. Repair pavement as specified in Section 32 0117, Pavement Repair.

3.2 IMPORT/EXPORT OF MATERIALS

A. Provide fill materials as specified in Part 2, Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.

B. In addition to the requirements of this Section, import and exported materials shall comply with the requirements of Section 01 4524, Environmental Import/Export Material Testing.

C. Imported fill materials will be sampled by the Geotechnical Engineer for compliance with the requirements of Part 2 of this Section.

D. The Geotechnical Engineer will perform the tests by utilizing an independent approved testing laboratory.

E. Initial sampling will be performed by the Geotechnical Engineer before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and/or entity responsible for the source site. The Geotechnical Engineer will obtain both the initial sample and additional samples from the identified site and shall submit all samples to the approved independent testing laboratory.

F. The Geotechnical Engineer will perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1,000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1,000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.
G. The independent approved testing laboratory will perform the required tests and report results of all tests noting if the tested material passed or failed such tests and will furnish copies to the Project Inspector, ARCHITECT, OAR, DSA, CONTRACTOR, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents, CBC and the DSA. Upon completion of the Work of this Section, the independent testing laboratory and Geotechnical Engineer will submit a verified report to the DSA as required by CBC.

H. Bills of lading or equivalent documentation will be submitted to the Project Inspector on a daily basis.

I. Upon completion of import operations, provide the OAR a certification statement attesting that imported material has been obtained from the identified source site.

3.3 Inspection and Testing
A. The Geotechnical Engineer will inspect and test excavations, sample material quality as required in Part 2, observe installation and compaction of fill materials.
B. Compaction test shall be performed in accordance with ASTM D1557, method "C."

3.4 Protection
A. Protect the Work of this Section until Substantial Completion.

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

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Installation of base material.
B. Related Requirements:
   1. Division 01 - General Requirements.
   2. Section 31 1000 – Site Clearing.
   3. Section 31 2200 – Grading.
   4. Section 31 2313 – Excavation and Fill.
   5. Section 31 2316 – Excavation and Fill for Pavement.
   7. Section 32 1216 – Asphalt Paving.
   8. Section 32 1313 – Site Concrete Work.

1.2 SUBMITTALS
A. Prior to import, submit written certification to OAR that crushed Miscellaneous Base (CMB) does not contain Polychlorinated biphenyls (PCB) above laboratory detection limits when tested in accordance with EPA Method 8082, and obtain written approval from LAUSD-OEHS prior to import at the subject site, refer to Article 2.02 for sampling frequency.
B. Crushed aggregate base (CAB) shall consist of native rock without naturally occurring asbestos or recycled materials. The Contractor shall submit written documentation, which identifies the source, volume, and proposed transport date of the material for review and approval by LAUSD-OEHS prior to importing the material. A statement on company letterhead from the source, stamped by either a California Professional Geologist or Engineer, which states that the subject materials are native rock, do not contain any recycled materials and that the source does not mine ultramafic materials, a source of natural occurring asbestos shall be included in the submittal to OEHS. The Contractor may request variance from testing. To be considered for a variance, the Contractor shall submit a documentation package, which includes all of the aforementioned information at least 48 hours in advance of planned import.
   1. Frequently used suppliers:
      a. Hansen Aggregates.
      c. Vulcan Materials Durbin.
C. Product Data: Submit material source, technical information and test data for base materials. Gradation and quality certifications shall be dated within 30 days of the submittal.
D. Sample: Submit Sample of proposed base course material.

1.3 QUALITY ASSURANCE
A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current location.

PART 2 - PRODUCTS

2.1 UNTREATED BASE MATERIALS
A. The following base materials shall conform to the requirements of the Standard Specifications for Public Works Construction: Section 200 - Rock Materials.
   1. Crushed Aggregate Base.
   2. Crushed Miscellaneous Base.
a. CMB meeting requirements of Article 1.02, A, may be used on-site for pavement base only.
b. CMB may be used off-site when in accordance to the Greenbook.

B. Materials generated on site shall not be used as a base course material.

### 2.2 SOURCE QUALITY CONTROL
A. Sampling and testing of imported and/or exported crushed miscellaneous base (CMB) shall be performed in accordance with the following Table 1 schedule:

<table>
<thead>
<tr>
<th>Volume (CY)</th>
<th>Sampling Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 500</td>
<td>1 per 100 Cubic Yards</td>
</tr>
<tr>
<td>501 to 1,000</td>
<td>1 per 250 Cubic Yards</td>
</tr>
<tr>
<td>1,001 to 5,000</td>
<td>1 per 250 Cubic Yards for first 1,000 Cubic Yards 1 per 500 CY thereafter</td>
</tr>
<tr>
<td>5,001 to 20,000</td>
<td>12 samples for first 5,000 Cubic Yards 1 per 1,000 Cubic Yards thereafter</td>
</tr>
<tr>
<td>over 20,000</td>
<td>1 per 2,000 Cubic Yards for first 20,000 Cubic Yards 1 per 2,500 CY thereafter</td>
</tr>
</tbody>
</table>

### 2.3 MATERIAL APPROVAL
A. Base material shall be inspected by the Project Inspector for gradation and material content prior to installation. The owner may choose to have additional tests performed by a geotechnical engineer, retained by the Owner, before installation.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION
A. Install base course material in layers not exceeding 4 inches in thickness, unless required otherwise. Grade and compact to indicated levels or grades, cut and fill, water and roll until the surface is hard and true to line, grade and required section. Provide a relative compaction of at least 95 percent, unless otherwise required.

B. Grade base course to elevations indicated on Drawings, ready to receive surfacing, in accordance with Section 31 2200 – Grading.

#### 3.2 PROTECTION
A. Protect the Work of this section until Substantial Completion.

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

**END OF SECTION**
SECTION 320117
ASPHALT PAVEMENT REPAIR

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Bituminous Surfacing Repair: Areas removed for utility trenches, heaved by tree roots, cracked areas, protruding areas where pavement meets hard surfaces, depressed areas, holes and areas around new structures, and raveled bituminous pavement.
   2. Areas heaved by tree roots, cracked areas, holes and trenches, and areas around new structures.
B. Related Sections:
   1. Division 01 - General Requirements.
   3. Section 31 2200 – Grading.
   4. Section 31 2313 – Excavation and Fill.
   5. Section 31 2316 – Excavation and Fill for Pavement.
   7. Section 31 2323 – Excavation and Fill for Utilities.
   8. Section 31 2326 – Base Course.
   10. Section 32 1216 – Asphalt Paving.
   11. Section 32 1313 – Site Concrete Work.
   12. Section 32 1236 – Seal for Bituminous Surfacing.

1.2 SUBMITTALS
A. Shop Drawings: Submit Shop Drawings indicating areas to be repaired.
B. Product Data: Submit manufacturer’s technical data for materials and products.

1.3 QUALITY ASSURANCE

PART 2 - PRODUCTS

2.1 MATERIALS
A. Base course materials: Section 31 2326 - Base Course.
B. Asphalt paving materials: Section 32 1216 - Asphalt Paving.
C. Seal materials: Section 32 1236 - Seal for Bituminous Surfacing.
D. Headers: Section 32 1216 - Asphalt Paving.

2.2 BITUMINOUS MATERIALS
A. Provide materials and products of the class, grade or type indicated, conforming to relevant provisions of Section 203 - Bituminous Materials of the latest Standard Specifications for Public Works Construction.

PART 3 - EXECUTION

3.1 PAVEMENT REMOVAL
A. Remove bituminous and concrete pavement in accordance with applicable provisions of Section 300 - Earthwork of the Standard Specifications for Public Works Construction.
B. Pavement Heaved By Roots: Remove pavement to limits of distortion and expose roots. Trim roots to provide at least 12-inch clearance to pavement.
C. Remove protruding bituminous surfaces flush with the surrounding grade using a suitable tool or equipment so that adjacent finishes are not blackened.

D. Remove raveled and depressed bituminous pavement to limits indicated or required.

E. Saw cut existing improvements, trim holes and trenches in bituminous and concrete pavement to permit mechanical hand tampers to compact the fill.

F. Remove broken concrete by saw cutting. If the required cut line is within 30 inches of a score or joint line or edge, cut and remove to the score, joint line, or edge.

3.2 EXCAVATING, BACKFILLING AND COMPACTING
A. Conform to requirements in Section 31 2313 - Excavation and Fill; Section 31 2316 - Excavation and Fill for Paving; Section 31 2319 - Excavation and Fill for Structures; or Section 31 2323 - Excavation and Fill for Utilities, as required.

B. Where subgrade or base is deemed to be unstable or otherwise unsuitable, excavate such materials to firm earth, and replace with a required material. Install and compact fill materials in accordance with the requirements of related Specification sections.

3.3 HEADERS
A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.

B. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Compact backfill on both sides of header to the density of the adjacent undisturbed grade.

C. Fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid earth a minimum of 12 inches. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes, not to exceed 4 feet on centers with top of stakes set one inch below top of header. Provide a minimum of two 12d galvanized common nails through each stake.

D. Remove existing headers where new surfacing is installed adjacent to existing surfacing.

E. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.

F. Provide additional stakes and devices as required to fasten headers.

3.4 BASE COURSE
A. Unless otherwise indicated, base course shall be crushed aggregate base, fine grade, 3 inches thick or equal to thickness of the existing base, whichever is greater.

B. Fill grade and compact as specified in Section 31 2200 - Grading.

3.5 RESURFACING
A. Holes and Trenches: Remove loose dirt and backfill with cement-sand slurry allowing for surfacing one inch thicker than existing. Resurface flush with existing adjoining pavement installing the same type of materials and section provided in existing improvements.

B. Other Areas: Other surface improvements damaged or removed shall be cut to a neat even line and excavated one inch below the bottom of the existing pavement. Resurface by following the original grades and installing the same type of materials provided in existing improvements.

C. Where bituminous surfacing abuts concrete, masonry, walks or paving, tamp joint smooth, if necessary, as described above to obtain a uniformly even joint, true to line and grade. Tamp and smooth materials before asphalt cools.

3.6 REPAIRING AND RESEALING EXISTING SURFACES
A. Preparation of Surfaces: Prior to filling cracks, clean existing bituminous surfacing of loose and foreign materials and coat with a film of asphalt emulsion.

B. Repair of Existing Surfacing:
1. Fill cracks ½ inch wide and less with RS-1 emulsion and silica sand or other required material. Cracks larger than ½ inch wide shall be filled with Type C2 Asphalt Concrete as specified. Cracks shall be filled to the level of adjacent surfacing.

2. Where low areas, holes, or depressions occur in existing surfacing, repair with emulsified asphalt. Install material, strike off the emulsified asphalt with a straightedge flush with adjoining surfacing. Finish with a steel trowel, and after dehydration, compact by rolling or tamping.

C. Testing: Flood test entire area in presence of the Project Inspector. Entire area tested shall be free of standing water or puddles.

D. Surface Seal: After surface has been repaired and tested, install seal coat over entire area indicated. Surface seal shall be as specified in Section 32 1236 - Seal For Bituminous Surfacing.

3.7 CLEANING

A. Remove all stains on the Project site and adjacent properties caused by or attributed to the Work of this section.

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

3.8 PROTECTION

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

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Paving for playground, parking areas, areas between buildings, synthetic track surfacing adjacent to planting and turf areas as indicated.

B. Related Requirements:
   1. Division 01 – General Requirements.
   2. Section 31 2200 – Grading.
   3. Section 32 0117 – Asphalt Pavement Repair.
   4. Section 31 2326 – Base Course.
   5. Section 32 1236 – Seal for Bituminous Surfacing.
   6. Section 32 1313 – Site Concrete Work.

1.2 SUBMITTALS
A. Shop Drawings: Submit site plan indicating extent of paving and accessories.
B. Product Data: Manufacturer’s technical data for materials and products.

1.3 QUALITY ASSURANCE
A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction.

1.4 PROJECT CONDITIONS
A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.
B. A copy of the soils report is available for examination in the office of the Architect during regular office hours of the Architect.

PART 2 - PRODUCTS

2.1 BITUMINOUS MATERIALS
A. Provide materials of the class, grade, or type indicated on the Drawings, conforming to relevant provisions of Section 203 - Bituminous Materials of the Standard Specifications for Public Works Construction.

2.2 HEADERS
A. Concrete: Per specification Section 32 1313 - Site Concrete Work.

PART 3 - EXECUTION

3.1 HEADERS
A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.
B. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Compact backfill on both sides of header to the density of adjacent undisturbed earth.
C. Remove existing headers where new surfacing is installed adjacent to existing surfacing.
D. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.
E. Provide additional stakes and anchorage as required to fasten headers in place.

3.2 CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT
A. Thickness of Surfacing: Unless otherwise indicated on Drawings or specified, install bituminous surfacing to a compacted thickness of 2 inches.
B. Provide surfacing material over base course as specified in Section 31 2326 - Base Course.
C. Surfaces of walls, concrete, masonry, or existing bituminous surfacing indicated to be in direct contact with installed bituminous surfacing shall be cleaned, dried and uniformly coated with an asphaltic emulsion film.
D. Thicken edges of bituminous surfacing that do not abut walls, concrete, or masonry, and edges joining existing bituminous surfaces. Remove headers at existing bituminous surfacing where new bituminous surfacing is to be installed. Thicken edges an additional 2 inches and taper to the indicated or specified thickness 6 inches back from such edges.
E. At stairways, adjust thickness of paving such that the first tread is equal in height to all other treads.
F. Provide adequate protection for concrete, planting areas, and other finish Work adjacent to areas indicated to receive bituminous surfacing.
G. Placing:
   1. Do not install bituminous surfacing when atmospheric temperature is below 40 degrees F; or when fog or other unsuitable weather conditions are present. Temperature of mixture at time of installation shall not be lower than 260 degrees F in warm weather or higher than 320 degrees F in cold weather.
   2. Where 2-inch or 3-inch thick surfacing is indicated or specified, install surfacing in one course. Where surfacing is indicated or specified 4 inches or more in thickness, except for thickened edges, install bituminous surfacing in courses of approximately equal thickness, each course not exceeding 2 ½ inches in thickness.
H. Stakes or Screeds: Provide grade or screed stakes spaced not more than 15 feet apart in flow lines with grades of less than one percent. Continuous screeds may be provided instead of stakes.
I. Spreading: Install bituminous surfacing in a manner to cause least possible handling of mixture. In open areas and wherever practicable, install by mechanical means with a self-propelled mechanical spreader. In confined or restricted areas, install mixture with hot shovels and rakes, and smooth with lutes.
J. Joints: Provide vertical joints between successive runs. Install joints true to line, grade, and cross section. Lapped joints are not permitted.
K. Rolling:
   1. Finish roll with a self-propelled tandem roller weighing at least 8 tons. Break down roll with a self-propelled roller weighing between 1 ½ tons and 8 tons.
   2. Roll in a manner that preserves flow lines and the established finished grades. Break down roll in areas adjacent to flow lines parallel to flow lines. Break down roll after bituminous surfacing is installed without shoving or cracking of mixture under roller. Continue finish rolling until surfacing is unyielding, true to grade, and meets requirements for specified smoothness. Areas inaccessible to finish roller may be finish rolled with breakdown roller or tamped with hot tamping irons and smoothed with hot smoothing irons or hand roller.
   3. Where bituminous surfacing abuts concrete, masonry, walks or paving, tamp joint smooth, if necessary, as described above to obtain a uniformly even joint, true to line and grade. Tamp and smooth to properly compact.
   4. Compacted bituminous surfacing shall be provided with a bulk specific gravity of at least 2.31 when tested in accordance with ASTM D1188.

3.3 TOLERANCE
A. Smoothness: Surface of bituminous surfacing after rolling, shall be even, smooth and uniform in texture with no voids or rock pockets, free of roller marks or other irregularities, and not varying by more than 0.03 foot, except at local depressions or raised areas as indicated, when a 10-foot straightedge is placed on surface.

B. Grade: Finished grade shall not vary more than 0.02 foot above or below required grade. Variations within prescribed tolerance shall be compensating so that average grade and cross-section are provided.

C. Premium paving tolerances and requirements for synthetic track:
   1. General: Test in-place asphalt concrete courses for compliance with requirements or thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Owner’s representative.
   2. Thickness: Tolerances for thickness shall be ¼ inch, plus or minus.
   3. Planarity: The asphalt substrate shall not vary from the planned cross slope by more than plus or minus 0.1 percent. The finished asphalt shall not vary, plus or minus, under a 10 feet straight edge greater than 1/8 inch. Flood test the surface with the use of a water truck. If, after 30 minutes on a 70 degree F day, “bird baths” are evident at a depth more than 1/8 inch repair using the best method of correction.
   4. Corrective Measures: Determine if the planarity, cross slopes, and general specifications have been met. If all of the conditions have been met notify the Owner in writing of the acceptance of the asphalt paving.

3.4 TESTING
   A. After first coat of surface seal has been installed and after a 24 hour period, the flood test shall be completed of the bituminous surfacing in presence of the Project Inspector. Repair areas of standing water or puddles and flood test locally; install surface seal and retest as necessary.

3.5 SURFACE SEALING
   A. After bituminous surfacing has passed flood test, clear and allow to dry and provide one more coat of surface seal as specified in Section 32 1236 - Seal for Bituminous Surfacing.
   B. Where indicated, provide multiple coats of surface seal to existing bituminous surfacing.
   C. Where new bituminous surfacing joins existing bituminous surfacing, overlap surface seal a minimum of 12 inches onto existing bituminous surfacing.

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

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

END OF SECTION
SECTION 321236
SEAL FOR BITUMINOUS SURFACING

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Surface sealer over bituminous surfacing.
B. Related Requirements:
   1. Division 01 - General Requirements.
   2. Section 32 0117 – Asphalt Pavement Repair.
   3. Section 32 1216 – Asphalt Paving.

1.2 SUBMITTALS
A. Product Data: Submit manufacturer’s product information and application procedures for bituminous surfacing.

1.3 QUALITY ASSURANCE
B. Agitate bulk materials during transport.

1.4 MAINTENANCE
A. Extra Materials: Provide 10 gallons in unopened containers.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Provide one of the following surface seals:

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Guard-Top</td>
<td>CALMAT / Industrial Asphalt</td>
</tr>
<tr>
<td>2. Over Kote</td>
<td>Diversified Asphalt Product</td>
</tr>
<tr>
<td>3. Park Top</td>
<td>Western Colloid Products</td>
</tr>
<tr>
<td>4. Sure Seal</td>
<td>Asphalt Coating Engineering</td>
</tr>
<tr>
<td>5. Super Drive Top.</td>
<td>SAF– T Seal. Inc.</td>
</tr>
</tbody>
</table>

PART 3 - EXECUTION

3.1 SURFACE PREPARATION
A. Thoroughly wash surfaces with water to remove dirt, debris, excessive oil and grease, or other foreign matter.

3.2 APPLICATION
A. Install seal coat in strict accordance with manufacturer's written directions and recommendations.
B. Install two coats of surface seal to new bituminous surfacing. First coat shall be installed before flood testing. Clean surface and allow to dry before installing second coat. Second coat shall be installed after bituminous surfacing has passed flood test.

C. Where new bituminous surfacing is installed adjacent to existing bituminous surfacing, overlap surface seal a minimum of 12 inches onto existing bituminous surfacing.

D. Where existing bituminous surfacing is indicated to be patched and sealed, install two coats of surface seal after patching. Refer to Section 32 1216 - Asphalt Paving.

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

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

3.4 TESTING
A. Owner reserves the right to obtain samples, perform tests to ensure compliance with the specifications, and to review weight slips and invoices of materials delivered to the Project site.

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

END OF SECTION
SECTION 321313
SITE CONCRETE WORK

PART 1 – GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Portland cement concrete pavement, cement walks, curbs, gutters, trash pick-up area, ramps, mowing strips, fence post footings, sliding gate concrete tracks, catch basins, pipe bedding and encasements, thrust blocks, transition structures, flagpoles and light standard bases and footings, athletic equipment footings and equipment pads.

B. Related Requirements:
   1. Division 01 - General Requirements.
   2. Section 03 2000 - Concrete Reinforcement.
   3. Division 26 - Electrical.
   4. Section 31 2200 - Grading.
   5. Section 31 2313 - Excavation and Fill.
   6. Section 31 2316 - Excavation and Fill for Pavement.
   7. Section 32 0117 - Asphalt Pavement Repair.
   8. Section 31 2326 - Base Course.
   9. Section 32 1216 - Asphalt Paving
   10. Section 33 1100 - Site Water Distribution Utilities.
   11. Section 33 3000 - Site Sanitary Sewer Utilities.
   12. Section 33 4000 - Storm Drainage Utilities.

1.2 SUBMITTALS
A. Shop Drawings: Submit plans, elevations and details of concrete site work.
B. Product Data: Submit mix designs and manufacturer’s technical data for materials and products. Submit 3’ x 3’ concrete mock-up of each specified color and finish with all project adjacency combinations.
C. Material Sample: Submit one concrete bumper to the Project Inspector for destructive testing.

1.3 QUALITY ASSURANCE
A. Comply with Standard Specifications For Public Works Construction.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Concrete, Mortar and Related Materials: Comply with applicable provisions of Standard Specifications for Public Works Construction, Section 201 - Concrete, Mortar and Related Materials:
   1. Concrete: 28-day compressive strength 2,500 psi, unless specified otherwise.
   2. Reinforcing Mesh: ASTM A185, 4 by 4/W1.4 by W1.4 welded wire mesh.
B. Form Materials:
   1. Side forms: Douglas fir, Construction Grade or Better or metal forms.
   2. Stakes: Douglas fir, Construction Grade or Better or metal stakes.
C. Concrete Parking Bumpers:
   1. Precast concrete, smooth and free of pits and rock pockets, providing a minimum 28-day compressive strength of 3,500 psi. Size at least 7 ½-inch wide, 5 ½-inch high and 6-foot long. Reinforce with two #5 reinforcing bars. Provide 2 3/4-inch diameter pre-drilled holes for anchor installation.
   2. Bumper Anchors: Provide ½ inch diameter by 18-inch long galvanized steel pipe.

D. Integral Concrete Color:
   1. Provide integral color as noted on drawings. Store, mix and apply per manufactures recommendations.

E. Top-Surface Retarder:
   1. Provide and install 'Grace Top-Cast', or equal, water-based, top surface retarder as noted on drawings. Store, mix and apply per manufactures recommendations. Protect adjacent pours per data sheet recommendations. Remove retarder with high pressure water.

PART 3 - EXECUTION

3.1 CONSTRUCTION OF FORMS FOR CAST-IN-PLACE STRUCTURES
   1. Portland cement concrete paving shall be stable, firm, and slip resistant and shall comply with CBC Sections 11B-302 and 11B-403.
B. Miscellaneous Exposed Concrete: Install concrete curbs, walks, gutters, cross gutters, access ramps, driveways, catch basins, yard boxes, vaults and similar structures, in compliance with the Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction.
C. Exposed Concrete Bases: Install bases, such as for post, flagpole, light standards and similar bases, in compliance with the Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction.
D. Post, flagpole, light standard footings below grade, underground conduit bedding, encasements, thrust blocks and similar structures may be placed directly in excavations conforming to the required sizes.
E. Reinforcement installation and concrete placement, surface finishes, curing and removal of forms shall be performed in compliance with applicable provisions of Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction. Provide heavy broom finish at slopes exceeding six percent and medium broom finish at slopes up to six percent.

3.2 INSTALLATION OF PARKING BUMPERS
A. Install bumpers as indicated on the Drawings. On bituminous paving, install anchors through pavement and into the ground a minimum of 12 inches. On concrete pavement, install bumpers in a continuous bed of adhesive.

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

3.4 PROTECTION
A. Protect the Work of this section until Substantial Completion.
PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Concrete paving, bands, curbs, mow strips, steps and walls.
      2. Reinforcement.
      3. Surface finish.
      4. Special curing.
   B. Related sections:
      1. Section 312000 - Earth Moving, for backfilling and compacted fill for paving.
      2. Section 321373 - Joint Sealants, for paving contraction joint sealing.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated.
   B. LEED Submittals:
      1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
   C. Samples: Provide a 4 x 4 foot job site sample of each paving finish specified, for review and approval by Owner’s Representative prior to installation. Sample shall represent final appearance of paving, including any stain, sealer or other surface applications. Provide additional samples until finish is considered acceptable by the Owner’s Representative, at no additional cost to the Owner. The approved sample shall serve as a standard of appearance for the final work to be produced and shall remain on site until all site concrete has been reviewed and approved by the Owner’s Representative.
   D. Other Action Submittals:
      1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.3 QUALITY ASSURANCE
   A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   B. ACI Publications: Comply with ACI 301 unless otherwise indicated.

1.4 TESTS
   A. Testing and analysis will be performed under provisions of Section 014000 - Quality Requirements.
   B. Make available proposed mix design of each class of concrete to appointed firm for review prior to commencement of work.
   C. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.
   D. Tests of cement and aggregates will be performed to ensure conformance with specified requirements.
   E. Three concrete test cylinders will be taken for every 75 or less cubic yards of each class of concrete placed each day.
   F. One additional test cylinder will be taken and be cured on site under same conditions as concrete it represents.
   G. One slump test will be taken for each set of test cylinders taken.
PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS
A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:
B. Normal-Weight Aggregates: ASTM C 33, Class 4S, uniformly graded. Provide aggregates from a single source.
C. Water: Clean, potable and complying with ASTM C 94/C 94M.
E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain no more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
F. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalies.
   1. Color: As indicated.

2.2 FORM MATERIALS
A. Conform to ACI 301.
B. Wood or Steel form material, profiled to suit conditions.

2.3 STEEL REINFORCEMENT
A. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, uncoated finish, fabricated from as-drawn steel wire into flat sheets.
C. Reinforcing Bars: ASTM A 615/A 615M; deformed, uncoated finish.
D. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
E. Tie Wire: Annealed steel, minimum 16 gage size.
F. Dowel Bars: ASTM A 615/A 615M, plain-steel bars. Cut bars true to length with ends square and free of burrs, uncoated finish.
G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's Manual of Standard Practice from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified.

2.4 FIBER REINFORCEMENT
A. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 inch long.

2.5 ACCESSORIES
A. Pre-emergent Herbicide: Surflan.
B. Curing Compound: FS TT-C-800, Type 1, 30 percent solids; ASTM C309, Ashford Formula.
C. Integral Color (Non-immersion Conditions): Davis Colors, or approved equal.
D. Chemical Surface Retarder: 'Top-cast' by Grace Construction Products.
E. Liquid Surface Sealer: 'HLQ-125' by SINAK Corporation.
F. Patch Bond: Weld-Crete.

2.6 RELATED MATERIALS

2.7 PAVEMENT MARKINGS
A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.
   1. Color: As indicated.
B. Pavement-Marking Paint: MPI #97 Latex Traffic Marking Paint.
   1. Color: As indicated.

2.8 WHEEL STOPS
A. Wheel Stops: Precast, air-entrained concrete.

Estancia High School Theater Project
Newport-Mesa Unified School District 321314-2
Pfeiffer Partners Project # 6164

Concrete Paving
June 17, 2021
DSA Backcheck
2. Dowels: Galvanized steel, 3/4 inch in diameter, 10-inch minimum length.
3. Adhesive: As recommended by wheel stop manufacturer for application to concrete pavement.

2.9 CONCRETE MIXTURES
A. Mix concrete in accordance with ASTM C94.
B. Prepare design mixtures, proportioned according to ACI 301, with the following properties:
   2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
   3. Slump Limit: 4 inches, plus or minus 1 inch.
   4. Air Content: 6 percent plus or minus 1.5 percent.
C. Chemical Admixtures:
   1. Use accelerating admixtures in cold weather only when approved by Owner’s Representative. Use of admixtures will not relax cold weather placement requirements.
   2. Use set-retarding admixtures during hot weather only when approved by Owner’s Representative.
D. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 pound/cu. yd.
E. Color Pigment: Add color pigment to concrete mixture according to manufacturer’s written instructions.
F. Add air entraining agent to concrete mix for concrete work as necessary.

2.10 CONCRETE MIXING
A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION
A. Verify compacted subgrade and/or base is ready to support paving and imposed loads.
B. Verify gradients and elevations of base are correct.
C. Beginning of installation means acceptance of existing conditions.
D. Moisten base to minimize absorption of water from fresh concrete.
E. Notify Owner's Representative minimum 24 hours prior to commencement of concreting operations.
F. Proof-roll prepared sub-base surface below concrete paving to identify soft pockets and areas of excess yielding.
G. Remove loose material from compacted sub-base surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION
A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement. Obtain layout approval prior to pour.
B. Assemble formwork to permit easy stripping and dismantling without damaging concrete. Use of permanent concrete screed is permissible. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.
C. Place joint fillers vertical in position, in straight lines. Secure to formwork during concrete placement.

3.3 REINFORCEMENT
B. Interrupt reinforcement at expansion joints.
C. Place reinforcement to achieve slab and curb alignment as detailed.
D. Provide dowelled joints at interruptions of concrete with one end of dowel set in capped sleeve to allow longitudinal movement.
3.4 JOINTS
A. General: Form construction, isolation, and expansion joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct control joints at maximum 5 foot intervals of paving and at right angles to centerline unless otherwise indicated. Align curb, gutter and sidewalk joints when possible.
B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
D. Expansion Joints: Place expansion joints at 20 foot intervals unless otherwise shown to correct elevation and profile. Place expansion joints between paving components and building or other appurtenances.
E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/8-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.5 CONCRETE PLACEMENT
A. Comply with ACI 301 requirements for measuring, mixing, transporting, placing, and consolidating concrete.
B. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.
C. Deposit and spread concrete in a continuous operation between predetermined construction joints. Do not push or drag concrete into place or use vibrators to move concrete into place. Do not break or interrupt successive pours such that cold joints occur.
D. Place concrete to pattern indicated.
E. Coordinate pours of integral color concrete to ensure consistency of color throughout. Color inconsistency will not be accepted.
F. For steps, walls or other cast-in-place elements, settle concrete by vibration to eliminate honeycombs. Concrete with visible honeycombs will be rejected.
G. Screed paving surface with a straightedge and strike off.
H. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
I. Tolerances in horizontal alignment of hardscape elements such as paving edges, joints, walls and steps shall not exceed 1/4 inch in 10 feet, or 1/2 inch in 50 feet.

3.6 FINISHING
A. See plan for finishes and finish locations.
B. Curbs, mow strips and gutters: Light broom, unless otherwise specified.
C. Finishes:
   1. General: Do not add water to concrete surfaces during finishing operations. Compact and tamp concrete (unless Retardant Finish is specified), to bring 3/8 inch of mortar to surface, float with wood screeds and floats only, and apply following finishes after surface floating. Do not use steel or any plastic screeds, floats or “Fresno” for initial floating and screeding operations. For Retardant Finish, the concrete shall be placed and consolidated so as to completely fill all spaces in the forms; however, tamping will not be permitted because the aggregate must remain near the surface for later exposure.
   2. All concrete finishes shall be as listed on the Drawings. Finishes are as follows:
      a. Fine-to-Medium-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
      b. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
      c. Rough Trowel Swirl Finish: Provide rough trowel finish to slab surfaces. After placing slabs, consolidate surface by floating to a uniform, smooth, granular texture.
d. Scratch Finish: Provide scratch finish to slab surfaces that are to receive mortar setting beds for precast tile pavers as noted on Drawings.

e. Steel Trowel Finish: After surface water disappears and floated surface is sufficiently hardened, steel trowel and re-trowel to smooth, dense, hard finish. After concrete has set sufficiently, re-trowel to a smooth, uniform finish free of trowel marks or other blemishes. Avoid excessive troweling that produces burned areas.

f. Sandblast Finish (Dry Sand Method):
   1) Contractor shall schedule this work to be executed with as little conflict with other trades as possible. Contractor shall be responsible for the protection or masking of adjacent surfaces, if necessary.
   2) Test areas for sample of blasting will be established where surfaces will not be left exposed. Owner’s Representative shall be present at time of sample blasting and approve the desired finish.
   3) Care shall be taken to protect all adjacent surfaces from damage which are not receiving sandblasting.
   4) Sandblasting shall be accomplished using qualified workmen familiar with the proper technique.
   5) Sandblasting work shall be by the dry sand method, utilizing appropriate equipment and adequate air pressure. Abrasives shall be washed silica sand free from salt, clay or other foreign materials. Nozzle position during the operation shall be as determined in the making of the approved samples.
   6) All concrete areas requiring patching shall be patched, with all rough spots and unevenness in the concrete surface ground smooth before the sandblasting operation is begun.

g. Etched or Retardant Finish (with Surface Retarder):
   1) All work shall conform to applicable OSHA and EPA standards.
   2) Contractor shall schedule this work to be executed with as little conflict with other trades as possible. If necessary, Contractor shall be responsible for the protection of adjacent masonry and concrete surfaces with a film-forming protective coating, 'Face-off' by Grace Construction Products, or approved equal, allowing time for coating to dry prior to pouring concrete.
   3) Preparatory Work: The concrete should be placed and consolidated so as to completely fill all spaces in the forms. Tamping will not be permitted for Top-cast finish #25 or higher because the aggregate must remain near the surface for later exposure.
   4) Application of Retarder: Surface retarder shall be applied by qualified workmen familiar with the proper technique. After concrete has been floated or trowel finished and initial bleed water has risen to the surface, apply film-forming top surface retarder, 'Top-cast' by Grace Construction Products or approved equal, at specified gradient, using a low-pressure sprayer with a 0.5 gpm tip at a rate of 200-350 square feet per gallon until surface has a complete hiding coat. Once surface retarder has cured adequately, dependent on weather and site conditions, remove by pressure washing. Remove rinse water and cement matrix from site in accordance with local codes.

3.7 CONCRETE PROTECTION, CURING AND SEALING
A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
B. Comply with ACI 306.1 for cold-weather protection.
C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 pound/square feet x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture-retaining-cover curing, curing compound or a combination of these.

F. Concrete Surface Sealer: All concrete paving shall be sealed with a clear, penetrating concrete sealer. If efflorescence or alkali-staining is evident after the concrete has cured, lightly wash the surface with a mild muriatic acid solution (usually a 10:1 dilution) that has been thoroughly rinsed with water and cleaned with diluted Lithochrome Floor Cleaner by L.M. Scofield, or approved equal. Rinse again and dry thoroughly. After concrete mix has cured for at least one month, the concrete surface shall be thoroughly washed with fresh, clean water. After surface is thoroughly dried, apply ‘HLQ-125’ as manufactured by SINAK Corporation, per manufacturer’s specifications.

3.8 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:
   1. Elevation: 3/4 inch.
   3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/2 inch.
   4. Joint Spacing: 3 inches.
   5. Contraction Joint Depth: Plus 1/4 inch, no minus.

3.9 PAVEMENT MARKING

A. Allow concrete paving to cure for a minimum of 28 days and be dry before starting pavement marking.

B. Sweep and clean surface to eliminate loose material and dust.

C. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 millimeters.

3.10 WHEEL STOPS

A. Install wheel stops in bed of adhesive applied as recommended by manufacturer.

B. Securely attach wheel stops to paving with not less than two steel dowels located at one-quarter to one-third points. Install dowels in drilled holes in the paving and bond dowels to wheel stop. Recess head of dowel beneath top of wheel stop.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Owner's Representative.

B. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

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

END OF SECTION
SECTION 321400
UNIT PAVERS – MORTAR SET

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete pavers set in aggregate and mortar setting beds.
   2. Steel edge restraints.

1.2 ACTION SUBMITTALS

A. Product Data: For materials other than water and aggregates.

B. LEED Submittals:
   1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

C. Samples for unit pavers and edge restraints.

1.3 PROJECT CONDITIONS

A. Cold-Weather Protection: Do not use frozen materials or build on frozen subgrade or setting beds.

B. Weather Limitations for Mortar and Grout:
   2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Do not apply mortar to substrates with temperatures of 100 degrees F and higher.
1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for unit pavers, indicating compliance with requirements.

1. For grid paving units, include durability test data based on testing according to proven field performance requirements of ASTM C 1319 performed on units subjected to three years' exposure to same general type of environment, temperature range, and traffic volume as Project.

2. For solid interlocking paving units, include test data for freezing and thawing according to ASTM C 67.

C. Paver Installation ICPI certified Subcontractor.

1. A copy of Subcontractor’s current certificate from the Interlocking Concrete Pavement Institute Concrete Permeable Paver Installer Certification program.

2. Job references from projects of a similar size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.

3. Written Method Statement and Quality Control Plan that describes material staging and flow, paving direction and installation procedures, including representative reporting forms that ensure conformance to the project specifications.

4. Subcontractor must supply ICPI permeable certificate at time of bidding and must have completed at least two permeable paver projects of similar magnitude in past three years.

PART 2 - PRODUCTS

2.1 CONCRETE PAVERS

A. Regional Materials: Provide concrete pavers that have been manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Concrete Pavers: Solid interlocking paving units complying with ASTM C 936 and resistant to freezing and thawing when tested according to ASTM C 67, made from normal-weight aggregates. Use concrete paver units of type, quality, size, color and finish indicated on the drawings.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Acker-Stone Industries.
   b. Angelus Block Company, Inc.
   c. Belgard Commercial.
   d. Olsen Pavingstone, Inc.
2. Color: As indicated on drawings.
3. Finish: As indicated on drawings.

2.2 EDGE RESTRAINTS

A. Steel Edge Restraints: Manufacturer's standard painted steel edging 3/16 inch thick by 4 inches high with loops pressed from or welded to face to receive stakes at 36 inches o.c., and steel stakes 15 inches long for each loop.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Collier Metal Specialties, Inc.
   c. J. D. Russell Company (The).
   d. Sure-loc Edging Corporation.

2. Color: As indicated on drawings.

2.3 AGGREGATE SETTING-BED MATERIALS

A. Graded Aggregate for Base: Sound, crushed stone or gravel complying with ASTM D 2940, base material.

B. Sand for Leveling Course: Sound, sharp, washed natural sand or crushed stone complying with gradation requirements in ASTM C 33 for fine aggregate.

C. Sand for Joints: Fine, sharp, washed, masonry sand with 100 percent passing No. 16 sieve and no more than 10 percent passing No. 200 sieve.

D. Paver Bond©: SB-10 quick curing, high strength, structural grade adhesive complying with ASTM 2339-70.

   1. Acceptable Manufacturer: SUREBOND; (800) 424-9300.

E. Drainage Geotextile: Nonwoven needle-punched geotextile fabric, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

   1. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
   2. Permittivity: 0.5 per second, minimum; ASTM D 4491.

F. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.
2.4 MORTAR SETTING-BED MATERIALS

A. Regional Materials: Provide aggregate, cement, and lime for mortar that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Portland Cement: ASTM C 150, Type I or Type II.

C. Hydrated Lime: ASTM C 207, Type S.

D. Sand: ASTM C 144.

E. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed Portland cement and aggregate mortar bed, and not containing a retarder.

F. Water: Potable.

2.5 GROUT MATERIALS

A. Regional Materials: Provide aggregate and cement for grout that has been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Polymer-Modified Tile Grout: ANSI A118.7, sanded.

C. Grout Colors: As specified on drawings.

D. Water: Potable.

2.6 MORTAR AND GROUT MIXES

A. General: Comply with referenced standards and with manufacturers' written instructions. Discard mortars and grout if they have reached their initial set before being used.

B. Mortar-Bed Bond Coat: Mix neat cement and water to a creamy consistency.


D. Latex-Modified, Portland Cement Setting-Bed Mortar: Comply with written instructions of latex-additive manufacturer and as necessary to produce stiff mixture with a moist surface when bed is ready to receive pavers.


F. Packaged Grout Mix: Proportion and mix grout ingredients according to grout manufacturer's written instructions.
2.7 SEALER AND JOINT SAND STABILIZER

A. Sealer and joint sand stabilizer: Enhanced Stabilizing Seal, as produced by B.P. PRO, commercial grade, water-based, single component, epoxy-modified, penetrating sealer and joint sand stabilizer, complying with applicable air quality regulations.

2. Appearance: Water-white solution that dries crystal clear, enhancing paver color without darkening.
3. Waterproof quality: 0 gallons per hour on treated masonry wall, tested according to ASTM E 154 – Water Permeance of Masonry.
5. Skid resistance: 0.6 to 0.7 when tested according to ASTM E 303 – Test Method for Measuring Surface Frictional Properties Using the British Pendulum.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

B. Cut unit pavers with motor-driven masonry saw equipment to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible.

1. For concrete pavers, a block splitter may be used.

C. Joint Pattern: Indicated on drawings.

D. Pavers over Waterproofing: Exercise care in placing pavers and setting materials over waterproofing so protection materials are not displaced and waterproofing is not punctured or otherwise damaged.

1. Provide joint filler at waterproofing that is turned up on vertical surfaces unless otherwise indicated; where unfilled joints are indicated, provide temporary filler or protection until paver installation is complete.

E. Tolerances: Do not exceed 1/16-inch unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches (3 mm in 600 mm) and 1/4 inch in 10 feet from level, or indicated slope, for finished surface of paving.

F. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide compressible foam filler as backing for sealant-filled joints unless otherwise indicated. Install joint filler before setting pavers. Sealant materials and installation are specified in Section 079200 "Joint Sealants."

G. Expansion and Control Joints: Provide cork joint filler at locations and of widths indicated. Install joint filler before setting pavers. Make top of joint filler flush with top of pavers.
H. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

I. For installation of paver units smaller than 3 inches square, use construction adhesive as follows:

Apply a 1/4” to 3/8” bead of SB-10 Paver Bond to form an “S” shape on the bottom surface of the paver or stone. Run a bead around the edge a minimum of 1/2 inch from the edge. Set the stone in place and tamp the stone down gently with a rubber mallet to compress the adhesive.

3.2 AGGREGATE SETTING-BED APPLICATIONS

A. Compact soil subgrade uniformly to at least 95 percent of ASTM D 698 laboratory density.

B. Place aggregate base, compact by tamping with plate vibrator, and screed to depth indicated.

C. Place drainage geotextile over compacted base course, overlapping ends and edges at least 12 inches.

D. Place leveling course and screed to a thickness of 1 to 1-1/2 inches, taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.

E. Treat leveling course with herbicide to inhibit growth of grass and weeds.

F. Set pavers with a minimum joint width of 1/16 inch and a maximum of 1/8 inch, being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size unit pavers.

G. Vibrate pavers into leveling course. Perform at least 3 pass across paving with vibrator. Vibrate under the following conditions:

1. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
2. Before ending each day’s work, fully compact installed concrete pavers. Cover the open layers with nonstaining plastic sheets to protect it from rain.

H. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.

I. Do not allow traffic on installed pavers until sand has been vibrated into joints.

J. Repeat joint-filling process 30 days later.

3.3 MORTAR SETTING-BED APPLICATIONS

A. Saturate concrete subbase with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.
B. Apply mortar-bed bond coat over surface of concrete subbase about 15 minutes before placing mortar bed. Limit area of bond coat to avoid its drying out before placing setting bed. Do not exceed 1/16-inch thickness for bond coat.

C. Apply mortar bed over bond coat; spread and screed mortar bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.

D. Mix and place only that amount of mortar bed that can be covered with pavers before initial set. Before placing pavers, cut back, bevel edge, and remove and discard setting-bed material that has reached initial set.

E. Wet brick pavers before laying if the initial rate of absorption exceeds 30 g/30 square inch per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

F. Place pavers before initial set of cement occurs. Immediately before placing pavers on mortar bed, apply uniform 1/16-inch-thick bond coat to mortar bed or to back of each paver with a flat trowel.

G. Tamp or beat pavers with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each paver in a single operation before initial set of mortar; do not return to areas already set or disturb pavers for purposes of realigning finished surfaces or adjusting joints.

H. Spaced Joint Widths: Provide 1/2-inch nominal joint width with variations not exceeding plus or minus 1/16 inch.

I. Grouted Joints: Grout paver joints complying with ANSI A108.10.

J. Grout joints as soon as possible after initial set of setting bed.

1. Force grout into joints, taking care not to smear grout on adjoining surfaces.
2. Tool exposed joints slightly concave when thumbprint hard.

K. Cure grout by maintaining in a damp condition for seven days unless otherwise recommended by grout or liquid-latex manufacturer.

L. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

1. Remove temporary protective coating as recommended by coating manufacturer and as acceptable to paver and grout manufacturers.

END OF SECTION 321400
SECTION 329113
SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes planting soils specified by composition of the mixes.
B. Related Requirements:
   1. Section 311000 Site Clearing.

1.2 DEFINITIONS
A. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.
B. Imported Soil: Soil that is transported to Project site for use.
C. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
E. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
F. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
G. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.3 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. LEED Submittals:
   1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
C. Samples: For each bulk-supplied material in sealed containers labeled with content, source, and date obtained; providing an accurate representation of composition, color, and texture.

1.5 INFORMATIONAL SUBMITTALS
A. Field quality-control reports.

1.6 QUALITY ASSURANCE
A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Regional Materials: Imported soil, manufactured planting soil, and soil amendments and fertilizers shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
2.2 PLANTING SOILS SPECIFIED BY COMPOSITION

A. Planting Soil Type: Existing, on-site surface soil, with the duff layer, if any, retained; modified to produce viable planting soil. Blend existing, on-site surface soil with the following soil amendments and fertilizers in the following quantities to produce planting soil.

B. Planting-Soil Type: Imported, naturally formed soil from off-site sources and consisting of sandy loam soil according to USDA textures; and modified to produce viable planting soil.
   1. Sources: Take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches deep, not from agricultural land, bogs, or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Bermuda grass, poison oak, nutsedge, Canada thistle, bindweed, bentgrass, ground ivy, perennial sorrel, and bromegrass.
   2. Additional Properties of Imported Soil before Amending: Soil reaction of pH 6 to 7 and minimum of 4 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.
   3. Unacceptable Properties: Clean soil of the following:
      a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
      b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 8 percent by dry weight of the imported soil.
      c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 2 inches in any dimension.
   4. Amended Soil Composition: Blend imported, unamended soil with the soil amendments and fertilizers in the quantities as recommended in the soils report to produce planting soil.

C. Planting-Soil Type: Manufactured soil consisting of manufacturer’s basic topsoil blended in a manufacturing facility with sand, stabilized organic soil amendments, and other materials to produce viable planting soil.
   1. Additional Properties of Manufacturer’s Basic Soil before Amending: Soil reaction of pH 6 to 7 and minimum of 4 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.
   2. Unacceptable Properties: Manufactured soil shall not contain the following:
      a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
      b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 5 percent by dry weight of the manufactured soil.
      c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 2 inches in any dimension.
   3. Blend manufacturer’s basic soil with soil amendments and fertilizers in the quantities as recommended by the soils report to produce planting soil.

2.3 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
   1. Class: T, with a minimum of 99 percent passing through a No. 8 sieve and a minimum of 75 percent passing through a No. 60 sieve.
   2. Class: O, with a minimum of 95 percent passing through a No. 8 sieve and a minimum of 55 percent passing through a No. 60 sieve.
   3. Form: Provide lime in form of ground mollusk shells.
B. Sulfur: Granular, biodegradable, and containing a minimum of 99 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.
C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
D. Perlite: Horticultural perlite, soil amendment grade.
E. Agricultural Gypsum: Minimum 98 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.
F. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C 33/C 33M.

2.4 ORGANIC SOIL AMENDMENTS
A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:
   1. Feedstock: Limited to leaves.
   2. Reaction: pH of 6.0 to 7.5.
   3. Salinity: Ensure that saturation extract conductivity does not exceed 3.5 millimhos per centimeter at 25 degrees c. as determined by saturation extract method.
   4. Moisture Content: 35 to 55 percent by weight.
   5. Organic-Matter Content: 30 to 40 percent of dry weight.
   6. Particle Size: 95 to 100 percent passing through a 6.33 mm standard sieve; 80 to 100 percent passing through a 2.33 mm sieve.
   7. Iron Content: Minimum 0.08 percent dilute acid soluble Fe on dry weight basis.
   8. Ash: 0 to 6 percent dry weight.
B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 1/2-inch sieve, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of dS/m.
C. Wood Derivatives: Shredded and composted, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
D. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.5 FERTILIZER
A. Planting Fertilizer: Pelleted or granular form consisting of the following percents by weight and mixed by commercial fertilizer supplier: 6-nitrogen, 20-phosphoric acid, 20-potash.
B. Planting Tablets: Provide slow-release type with potential acidity of not more than 5 percent by weight containing the following percents by weight of nutrients listed: 20-nitrogen, 10-phosphoric acid, 5-potash, 2.6 combined calcium, 1.60 combined sulphur, 0.35-iron elemental from ferrous sulfate. Provide in 21 gram tablets manufactured by Agriform or other approved.

PART 3 - EXECUTION

3.1 GENERAL
A. Place planting soil and fertilizers according to requirements of the Agronomic Soils Report recommendations.
B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

3.2 BLENDING PLANTING SOIL IN PLACE
A. General: Mix amendments with in-place, unamended soil to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
B. Preparation: Till unamended, existing soil in planting areas to a minimum depth of 12 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
C. Mixing: Apply soil amendments and fertilizer, if required, evenly on surface, and thoroughly blend them into full depth of unamended, in-place soil to produce planting soil.
1. Mix sulfur with dry soil before mixing fertilizer.
2. Mix fertilizer with planting soil no more than seven days before planting.

D. Compaction: Compact blended planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.3 PROTECTION AND CLEANING

A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."

B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Vehicle traffic.
   4. Foot traffic.
   5. Erection of sheds or structures.
   6. Impoundment of water.
   7. Excavation or other digging unless otherwise indicated.

C. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
   1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Soil Preparation.
   2. Planting.
   3. Staking.
   4. Hydroseeding.
   5. Clean up.
B. Related Sections:
   1. Section 328400 – Planting Irrigation

1.2 DEFINITIONS
A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
B. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
C. Finish Grade: Elevation of finished surface of planting soil.
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. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
F. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
G. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
H. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
I. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
J. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
K. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.3 ACTION SUBMITTALS
A. Product Data: Prior to installation submit for review and approval specifications and product information on items being used on project. Submit bound with list of items as cover sheet. Conform to Section 01300. For each type of product indicated, including soils.
   2. Pesticide and Herbicides: Include product label and manufacturer's application instructions specific to the Project.
   3. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to the Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average
plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

B. Samples of mineral and/or organic mulch.

1.4 INFORMATIONAL SUBMITTALS
A. Product certificates.
B. Material test reports.
C. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year.

1.5 OBSERVATION SCHEDULE
A. Notify Architect in advance for the following inspections, according to the time specified:
1. Pre-Job conference – 7 days
2. Final grade review – 48 hours
3. Plant material review – 48 hours
4. Plant layout review – 48 hours
5. Soil preparation and planting operations review – 48 hours
6. Pre-maintenance – 7 days
7. Final inspection – 7 days
B. No site visits shall commence without all items noted in previous observation reports either completed or remedied unless such compliance has been waived by the Architect.

1.6 QUALITY ASSURANCE
A. Soil Analysis: For each un-amended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory.
   1. The soil-testing laboratory shall oversee soil sampling.
   2. Report suitability of tested soil for plant growth.
      a. State recommendations for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
      b. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.
B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
C. Source Quality:
   1. At least 60 days prior to planting submit documentation that all plant materials are available. Materials are subject to inspection after confirmation of ordering.
   2. Materials are subject to inspection at place of growth and upon delivery for conformity to specifications. Inspection, approval and rejection can also take place at other times during progress of work.
   3. Request, in writing, inspection of plant materials at place of growth. Identify place of growth and quantity of plants to be inspected.
   4. As described in the planting notes for tree tagging, the Architect may opt to either visit the tree nursery or review photographs submitted by the Contractor. In either case, visit the nursery and select trees conforming to specifications prior to review by the Architect.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, 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 plants during shipping and delivery. Do not drop plants during delivery and handling.
B. Handle planting stock by root ball.
C. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
D. Deliver fertilizer to site in original unopened containers bearing manufacturer’s guaranteed chemical analysis, name, trade mark, and conformance to State law.
E. Provide copies of receipts for all amendments specified in these specifications or in the agronomic Soils Report.

F. Deliver plants with legible identification labels. Label trees, evergreens, bundles of containers of like shrubs and groundcover plants. State correct plant name and size indicated on plant list. Use durable waterproof labels with water-resistant ink which will remain legible for at least 60 days.

G. Protect plant material during delivery to prevent damage to root ball or desiccation of leaves.

H. Notify Architect 7 days in advance of delivery of plant materials and submit itemization of plants in each delivery.

I. Store plants in shade and protect from weather.

J. Maintain and protect plant material in a healthy, vigorous condition.

K. Exercise care in handling, loading, unloading and storing of plant materials. Replace damaged materials.

1.8 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Warranty Periods from date of end of 90-day maintenance period:
   a. Trees: 12 months.
   b. Shrubs, Vines, Ornamental Grasses, Ground Covers, Biennials, and Perennials: 90 days.
   c. Annuals: 90 days.

1.9 MAINTENANCE SERVICE

A. Initial Maintenance Service: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

1. Maintenance Period for Trees and Shrubs: 90 days from date of Substantial Completion.

2. Maintenance Period for Ground Cover and Other Plants: 90 days from date of Substantial Completion.

B. Continuously maintain all site areas involved in this contract during the progress of work and during the maintenance period until final acceptance of the work by City. Improper maintenance or possible poor condition of the project at the termination of the scheduled maintenance period may cause postponement of the final completion date of the Contract. Continue maintenance until acceptable to the Owner.

C. Provide sufficient numbers of workers and adequate equipment to perform work during maintenance period.

D. Maintenance period does not start until all elements of construction, planting, and irrigation for the complete project are in accordance with the contract documents for this project.

E. Request an inspection to begin maintenance period after all planting and related work has been completed in accordance with other contract documents. Maintenance period commences as described in written notification by the Owner.

F. Prior to commencement of maintenance period, ensure that all ground cover and lawn areas have been planted and that all lawn areas show an even, healthy stand of grass seedlings or sod, grass having been mown twice.

G. Any day or days that there is failure to properly maintain plantings, replace suitable plants, perform weed control or maintain hardscape areas will not be credited as part of the 90 days maintenance. The project will not be segmented into maintenance phases.

H. Keep paved areas free of silt, dirt, leaves and other planting area debris. Maintain these areas at least broom clean through the duration of the maintenance period, cleaning no less often than once per week.

I. Guarantee: Guarantee plant material against any and all poor, inadequate or inferior materials and workmanship for one year. Replace plants found to be dead or in poor condition due to faulty materials or workmanship, at no extra cost to owner.

J. Replacement: Replace materials found to be dead, missing or in poor condition during the maintenance period immediately. The Architect is the sole judge of the acceptability of condition. Make replacements of materials within 15 days after condition develops or written
notification from Architect has been sent. Architect has the right to make emergency repairs without releasing Contractor’s guarantee and warranty to Architect.

K. Prior to date of final inspection, acquire approved reproducible prints and finally record from the job record set, all changes made during construction and deliver them to Architect.

L. Deliver guarantees to Architect.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Legend shown on Drawings and complying with ANSI Z60.1. Provide plant materials in accordance with the State Department of Agriculture’s regulation for nursery inspections, rules and ratings. Provide plants with a normal habit of growth, sound, healthy, vigorous and free from insect infestations, plant diseases, sunscalds, and other disfigurements. Ensure tree trunks are sturdy and have well-hardened systems and vigorous and fibrous root systems which are not root or pot-bound. In the event of disagreement as to condition of root system, the root conditions of the furnished plants in containers will be determined by removal of earth from the roots of not less than two plants, or more than 2 percent of the total number of plants of each species or variety. Where container grown plants are from several sources, roots of not less than two plants of each species or variety from each source will be inspected. In the event that the sample plants inspected are found to be defective, the entire lot or lots of plants represented by the defective samples may be rejected. Plants rendered unsuitable for planting due to this inspection will be considered samples and will be provided at no cost to the Owner.

B. Size of plants will comply with ANSIZ60.1 and correspond with that normally expected for species and variety of commercially available nursery stock or as specified on drawings. The minimum acceptable size of plants measured before pruning with the branches in normal position, must conform to the measurements specified in the plant list. If approved by the Owner, larger sized plants may be used. If larger plants are approved for use, the ball of earth or spread of roots for each plant will be increased proportionately.

C. Plants not meeting requirements of these specifications are considered to be defective whether in place or not. They must be immediately removed and replaced with new acceptable and approved plants of the required size, species and variety.

D. Pruning: Do not prune, trim, top or alter the shape of trees or plants except as approved.

E. Provide plant material true to botanical and common name and variety as specified in Annotated Checklist of Woody Ornamental Plants in California, Oregon and Washington, published by University of California School of Agriculture (latest edition).

F. Nursery Grown and Collected Stock: Grow under climatic conditions similar to those in locality of project; container-grown stock in vigorous, healthy condition, not root-bound or with root system hardened off. Use only liner stock plant material which is well established in removable containers or formed homogenous soil sections.

G. Select trees which are aesthetically desirable and are good examples of the species. Trees with gashes, misshapen trunks or branches, topped leaders, structural defects, badly crossed branches, or other visual defects will not be accepted. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread to assure symmetry in planting.

H. Seed: Label seed and provide in sealed containers with signed copies from vendor certifying that each container is fully labeled in compliance with State Agricultural Code and is in compliance with minimum requirements of these specifications. Wet, moldy or damaged seed will not be permitted. Provide seed mix per plan.

2.2 INORGANIC SOIL AMENDMENTS

A. The following soil amendments are to be used for bid purposes only. Specific amendments and fertilizer will be selected and specified after rough grading operations are complete and Contractor has had soil samples tested.
B. Soil Sulfur: Agricultural grad sulfur containing minimum of 99 percent sulfur expressed as elemental.
C. Iron Sulfate: 20 percent iron expressed as metallic iron, derived from ferric and ferrous sulfate, 10 percent sulfur expressed as elemental.
D. Agricultural Gypsum: Minimum 98 percent calcium sulfate, Calcium Carbonate: 95 percent lime as derived from oyster shells.

2.3 ORGANIC SOIL AMENDMENTS
A. The following soil amendments are to be used for bid purposes only. Specific amendments and fertilizer will be selected and specified after rough grading operations are complete and Contractor has had soil samples tested.
B. Nitrogen Stabilized: 0.56 to 0.84 percent N based on dry weight for wood residual or rice hulls.
C. Particle Size: 95 to 100 percent passing 6.35 mm standard sieve; 80 to 100 percent passing 2.33 mm standard sieve.
D. Salinity: Ensure that saturation extract conductivity does not exceed 3.5 millimohs per centimeter at 25 degrees C. as determined by saturation extract method.
E. Iron Content: Minimum 0.08 percent dilute acid soluble Fe on dry weight basis.
F. Ash: 0 to 6 percent dry weight.

2.4 FERTILIZERS
A. The following soil amendments are to be used for bid purposes only. Specific amendments and fertilizer will be selected and specified after rough grading operations are complete and Contractor has had soil samples tested.
B. Planting Fertilizer: Granular or pelleted fertilizer consisting of the following percents by weight and mixed by commercial fertilizer supplier:
   1. Composition: 6 percent nitrogen, 20 percent phosphorous, and 20 percent potash, by weight.
C. Planting Tablets: Provide slow-release type with potential acidity of not more than 5 percent by weight containing the following percent by weight of nutrients listed:
   1. Size: 21 gram tablets manufactured by Agriform, or approved equal.
   2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphoric acid, and 5 percent potash, 2.6-combined calcium, 1.6 combined sulfur, 0.35-iron elemental from ferrous sulfate, by weight plus micronutrients.
D. Hydroseeding Fertilizer: Provide ammonium phosphate which consists of the following percent by weight and mixed by a commercial fertilizer supplier: 16-nitrogen, 20-phosphoric acid, 0-potash.
E. Sulfate of potash: 0-0-50.
F. Single super-phosphate: Commercial product containing 18 to 20 percent available Phosphoric Pentoxide, or other approved.
G. Urea formaldehyde: 38-0-0.

2.5 PLANTING SOILS
A. Planting Soil (Import or Amended Top Soil) Ensures silt plus clay content of top soil does not exceed 20 percent by weight, with a minimum 95 percent passing the 2.0 mm sieve. Do not allow the sodium absorption ratio SAR to exceed 6. The electrical conductivity (ECE) of the saturation extract cannot exceed 3.0 millimohs per centimeter at 25 degrees C. Ensure boron content is less than 1 part per million as measured on the saturation extract. To ensure compliance with these requirements submit samples of soil for analysis prior to and following backfilling.

2.6 PLANTER MIX
A. Planter Mix for all on-structure planters and plant container: provide custom topsoil (“Disney”) Mix by EarthWorks Soil Amendments, Inc., (951) 782-0260, to include the following pre-blended items:
   85 percent sandy loam topsoil
   15 percent peat moss
   0.5 pounds / cy Triple Super Phosphate (0-45-0)
   0.25 pounds/ cy Potassium Sulfate (0-0-50)
   1.0 pound/cy Agricultural Gypsum
   0.2 pounds/cy P.A.M. (soil aggregating polymer)
B. Roof Deck Soil Mix
1. On-structure Planter Soil (Mix “A”) – (bottom of planter to 8-inches below finish grade) – per cubic yard of mix:
   a. 80% Over-structure Planter Sand (optional – 100% sand if weight is not a consideration).
   b. 20% pumice (optional no pumice).
   c. 2 lbs. Nitroform (38-0-0, 27% WIN).
   d. 2 lbs. 12-12-12 General Planting Fertilizer.
   e. 1 lb. iron sulfate.
   f. 2 lbs. dolomite lime.
   g. 2 lbs. calcium carbonate limestone.
   h. Thoroughly blend mix before placing soil in 12" lightly compacted lifts.

2. On-structure Planter Soil (Mix “B”) – (8-inch layer – place on top of On-structure Planter Soil (Mix “A”) up to finish grade) – per cubic yard of mix:
   a. 70% Over-structure Planter Sand.
   b. 30% Organic Amendment.
   c. 2 lbs. Nitroform (38-0-0, 27% WIN).
   d. 1 lb. iron sulfate.
   e. 2 lbs. dolomite lime.
   f. 2 lbs. calcium carbonate limestone.
   g. Thoroughly blend soil mix before placing soil in one lightly compacted lift.

3. Over-structure Planter Sand:
   a. Washed nursery sand which meets following U.S. Standard Sieve criteria:
      
      | Sieve No. (U.S. Standard) | Weight Percent Passing |
      |--------------------------|------------------------|
      | 10                       | 100                    |
      | 18                       | 100                    |
      | 35                       | 92                     |
      | 60                       | 16                     |
      | 100                      | 2.1                    |
      | 140                      | 1.3                    |
      | 270                      | 0.1                    |

2.7 MULCHES
   A. Organic Mulch: Provide medium grind bark, consisting of organic, fibrous, woody bark mixture of varied particle size such that 90 to 100 percent passes 1 inch sieve, 80 to 100 percent passes 1/2 inch sieve, and 20 to 60 percent passes 1/4 inch sieve, or approved equal. Mulch shall be free of contaminants and weed seed and shall have a pleasant musty or moldy soil-like odor. Putrid, ammonia and sour-smelling materials will be deemed unacceptable. Recycled construction materials will not be permitted.

2.8 HYDROSEEDING FIBER MULCH
   A. Provide Hydro-mulch as manufactured by Conwed, or other approved equal, composed of wood cellulose fiber and containing no germination or growth inhibiting factors. Ensure a consistent texture which disperses evenly and remains suspended in agitated water. Provide with a temporary green dye and the following percentage property analysis: moisture content 9 plus or minus 0.8; 3 o.d. basis, organic matter 99.2 plus or minus 0.8; ash content 0.8 plus or minus 0.2; pH 4.8 plus or minus 0.5; water holding capacity (grams of H20 per 100 grams of fiber) 1150 minimum.

HYDROSEEDING ADDITIVE (BINDER)

2.9 GUYING AND STAKING MATERIALS
   A. Wood Tree Stakes: lodge pole pine, full treated with Coppernaphtanate Wood Preservative in strict accordance with FS TT-W-572 Type I, Composition B, 2-inch minimal normal size diameter by 10 feet long, minimum, with no split stakes.
   B. Ties: Provide cinch ties, size corresponding to tree box size as manufactured by VIT Company or other approved.

2.10 LANDSCAPE EDGINGS
   A. Wood Edging:
      1. Provide 2-inch by 4-inch pressure treated Douglas Fir or Redwood construction grade headerboards. Make splices with 1-inch by 4-inch pieces no less than 12 inches long.
Place 1-inch by 3-inch by 16-inch stakes at intervals of not more than 5 feet. Cut stakes level and set below top of headerboards.

2. On sharp turns and curves, four 1/2 inch by 4-inch laminated boards, or two 1-inch by 4-inch laminated boards may be permitted.


4. Provide header as shown on drawings, laid true to line and grade, protect in-place adjacent improvements, shrubbery and other properties. Place stakes on ground cover side of header.

B. Steel Edging: Standard commercial-steel edging, rolled edge, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.

C. Aluminum Edging: Standard-profile extruded-aluminum edging, ASTMB221, Alloy 6063-T6, fabricated in standard lengths with interlocking sections with loops stamped from face of sections to receive stakes.

D. Plastic Edging: Standard black polyethylene or vinyl edging, horizontally grooved, extruded in standard lengths, with 9-inch steel stakes.

E. Concrete Mowstrip: 6 inch wide by 6 inch thick concrete mowstrip with 1/2 inch tooled edging and #3 continuous rebar.

A.11 MISCELLANEOUS PRODUCTS

A. Sand: Provide washed silica sand.

B. Water: Provide clean, potable water.

C. Root Barrier: Provide UB24-2 by Deep Root Corporation, (800) 458-7668. Install at all trees within 5 feet of concrete paving, curbs or mow strips or as shown on plans. Install barrier with vertical ribs facing toward the tree and with the top edge 1/2 inch above finish grade. Provide linear root barrier adjacent to paving or curbing; root barrier shall not circle the rootball.


2.12 QUALITY CONTROL

A. Provide standard, approved and first-grade quality materials, in prime condition when installed and accepted. Deliver commercially processed and packaged materials in manufacturer’s unopened containers bearing the manufacturer’s guaranteed analysis. Supply a sample of all supplied materials accompanied by analytical data from an approved laboratory source illustrating compliance, or bearing the manufacturer’s guaranteed analysis.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Obtain certification that final grades to 1/10 foot have been established prior to commencing landscaping operations. Provide for inclusion of all amendments, settling, etc. Be responsible for shaping all planting areas as indicated on drawings or as required.

B. Inspect trees, shrubs and liner stock plant material for injury, insect infestation and trees and shrubs for improper pruning.

C. Do not begin planting of trees until deficiencies are corrected or plants replaced.

3.2 PLANTING AREA ESTABLISHMENT

A. Soil Preparation: After proper finish grades have been verified or established, cross-rip all planting areas to a depth of 12 inches, condition and fertilize soil in accordance with recommendations of soil testing laboratory and as approved by Owner. The following is for bid purposes only. Uniformly spread and cultivate amendments thoroughly by means of mechanical tiller into top 6 inches of soil. Application rates per 1,000 square feet:

1. Nitrogen stabilized organic amendment: 4 cubic yards
2. 16-16-16 Commercial Fertilizer: 15 lbs.
3. Agricultural Gypsum: 100 lbs.
B. At time of planting, ensure that top 2 inches of all areas to be planted or seeded are free of stones, stumps and other deleterious matter 1 inch in diameter or larger, and free from wire, plaster, concrete, wood and similar materials which would cause hindrance to planting or maintenance.

C. Finish Grading: Make minor modifications to grade as may be necessary to establish required final grade. Ensure that finish grade provides proper drainage of the site and surface drainage is away from building. Final grades are to be 1-inch below adjacent paved areas, sidewalks, valve boxes, headers, clean-outs, drains, manholes, etc., or as shown on drawings or required by City. Eliminate erosion scars prior to commencing maintenance period.

D. Pre-Plant Weed Control:
1. After irrigation system is operational, use a non-selective systemic contact herbicide as recommended and applied by an approved licensed landscape pest control advisor and applicator. Leave sprayed plants intact for at least 15 days.
2. Clear and remove these existing weeds by mowing or grubbing off all plant parts at least 2 inches below surface of soil over entire areas to be planted.
3. After irrigation system is operational, apply water for 10 days as needed to achieve weed germination. Apply contact herbicides and wait as needed before planting. Repeat as required.
4. Maintain weed free site until acceptance by Owner.

3.3 PLANTING INSTALLATION
A. General:
1. The irrigation system shall be operational and approved prior to planting.
2. Perform actual planting only during those periods when weather and soil conditions are suitable and in accordance with locally accepted practice, as approved.
3. Distribute in planting areas only as many plants as can be planted and watered that same day.
4. Ensure that containers which are opened and plants removed are handled with care such that ball of earth surrounding roots is not broken and that plants are planted and watered immediately. Do not open containers prior to placing plants in planting areas.

B. Layout: Mark locations for plants and outlines of areas to be planted before any plant pits are dug. Gain City approval. If underground construction or utility lines are encountered in the excavation of planting areas, other locations for planting may be selected by Owner. Accomplish layout with flagged grade stakes indicating plant names and specified container size on each stake. Confirm location and depth of underground utilities and obstructions.

3.4 EXCAVATION FOR TREES AND SHRUBS
A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Trim perimeter of bottom leaving center area of bottom raised slightly to support rootball and assist in drainage away from center. Do not further disturb base. Ensure that rootball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
1. Excavate approximately two times as wide as rootball diameter.
2. Do not excavate deeper than depth of the rootball, measured from the root flare to the bottom of the rootball.

B. Subsoil and topsoil removed from excavations may be used as planting soil backfill.
C. Strip and stack approved excavation for planting which is encountered within areas for trenches, tree holes, plant pits and planting beds.
D. Remove from site excess soil generated from planting holes and not used for backfilling.
E. Protect areas from excessive compaction when trucking plants or other materials to planting areas.

3.5 TREE, SHRUB, AND VINE PLANTING
A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1.
B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
C. Set stock plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
1. Use planting soil for backfill.
2. Container Grown: Cut cans on two sides with acceptable can cutter only. Carefully remove rootball from container without damaging rootball or plant. Superficially loosen edge roots on three sides after removing from can.

3. Boxed Trees: Remove bottom of plant boxes before planting. Remove sides without damage to rootball after positioning plant and partially backfilling.

4. Face plants with fullest growth into prevailing wind.

5. Backfill plants with: 6 parts by volume on-site soil, 4 parts by volume organic amendment, 1 pound 6-20-20 fertilizer mix per cubic yard of mix, 2 pounds iron sulfate per cubic yard of mix. Note: This is for bid purposed only. Specific backfill recommendations are made as a result of the soils testing described on the planting plan.

6. Backfill around rootball in layers, tamping to settle soil and eliminate voids and air pockets. Hold plant rigidly and plumb until soil has been firmed around ball or roots. Raise all plants which settle deeper than the surrounding grade. When planting pit is approximately one-half filled, add water to the top of the planting pit and thoroughly saturate rootball and adjacent soil.

7. Set planting tablets with each plant on top of rootball while plants are still in their containers so the required number of tablets can be verified. After water has completely drained, place planting tablets as follows or in amounts recommended in soil reports from soil-testing laboratory.
   - 1 tablet per 1-gallon container
   - 2 tablets per 5-gallon container
   - 3 tablets per 15-gallon container
   - 4 tablets per 24-inch box
   - 6 tablets per 36-inch box
   - 8 tablets per 48-inch box
   Place tablets beside the rootball about 1-inch from root tips; do not place tablets in bottom of the hole.

8. Continue backfilling process. Construct an earthen basin around each plant after backfilling. Provide basin of depth sufficient to hold at least 2 inches of water. Construct basins with amended backfill. Remove basin in all turf areas after initial watering. Water again after placing and tamping final layer of soil.

9. Limit pruning to minimum necessary. Remove injured twigs and branches. Pruning may not be done prior to delivery of plants. Paint cuts over 3/4 inch in diameter with tree paint.

10. Stake or guy trees immediately after planting. Install stakes plumb. Locate stakes so that a straight line drawn between the stakes is perpendicular to the prevailing wind direction.

11. Do not bring iron sulfate into contact with concrete surfaces due to potential staining. Contractor is responsible for cleaning and replacing stained surfaces.

D. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the rootball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the rootball.

3.6 TREE, SHRUB, AND VINE PRUNING

A. Remove only dead, dying, or broken twigs or branches. Do not prune for shape. Pruning may not be done prior to delivery of plants.

B. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

3.7 GROUNDCOVER AND OTHER SMALL CONTAINER PLANTING

A. Set out and space ground cover and plants from flats or containers smaller than 1-gallon as indicated on planting plan in even rows with triangular spacing.

B. Ensure that groundcover remains in the flats until transplanting. Flats’ soil must contain sufficient moisture so it will not fall apart when lifting plants.

C. Use planting soil for backfill. Plant each rooted plant with its proportionate amount of flat soil.

D. Dig holes large enough to allow spreading of roots.
E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
G. Protect plants for damage and trampling.

3.8 HYDROSEEDING:
A. Install large trees and shrubs (5 gallon and larger) if they occur in hydroseeded areas.
B. Install trees and shrubs (1 gallon) and groundcovers from flats if they occur in hydroseeded areas.
C. Provide seed mixes as shown on plan.
D. Apply hydroseed by an approved hydro-mulch company.
E. Apply in a form of slurry consisting of cellulose fiber, see, chemical additives, commercial fertilizer and water. When hydraulically sprayed on soil, ensure that hydro-mulch forms a blotter like groundcover impregnated uniformly with seed and fertilizer and allows the absorption of moisture and rainfall to percolate to the underlying soil.
F. Prepare the slurry at the site by first adding water to the tank when the engine is at half throttle. When water level has reached height of agitator shaft, provide full circulation, then add seed, followed by fertilizer, then mulch. Only add the mulch to the mixture after the seed and the tank is at least 1/3 filled with water. By the time the tank is 2/3 to 3/4 full, all mulch shall be in. Commence spraying immediately when tank is full.
G. Spray uniform visible coat by using the green color as a guide. Apply the slurry in a sweeping motion, in an arched stream so as to fall like rain allowing the wood fibers to build on each other until a good coat is achieved and the material is spread at the required rates.
H. Remove slurry not used within two hours from the site.
I. Fill out the daily worksheets by the nozzle main with the following information: Seed type and amount, mulch type and amount, number of loads and amount of water, seeding additive type and amount, area covered and equipment used, capacity and license number.
J. Do not allow any slurry to be sprayed into any reservoir basin or drainage ditches and channels which may impede the flow of rain or irrigation water. Clean up any spilled slurry.
K. After application of hydro-mulch, wash excess material from previously planted materials and architectural features. Avoid washing or eroding mulch materials.
L. Ensure that application equipment has a built-in agitation system and operating capacity sufficient to agitate, suspend and mix a slurry containing not less than 40 pounds of fiber mulch plus a combined total of 7 pounds fertilizer solids for each 100 gallons of water.
M. Slurry distribution lines shall be large enough to prevent stoppage and shall be equipped with a set of hydraulic spray nozzles which will provide a continuous non-fluctuating discharge. Capacity requirements is 1,500 gallons, mounted on a traveling unit, either self-propelled or drawing by a separate unit which will place slurry tank and nozzles within sufficient proximity of areas to be seeded.
N. Hydraulic equipment used for pesticide applications shall consist of a clean 150 gallon capacity fiberglass tank, complete with mechanical agitation. Pump volume shall be 10 gallons per minute, while operating at a pressure of 100 pounds per square inch. Distribution lines shall be large enough to carry the volume of water necessary for even chemical distribution. Spray nozzle must cover a 15-foot swath, with a minimum output of 5 gallons per minute at 80 pounds per square inch.

3.9 PLANTING AREA MULCHING
A. Mulch backfilled surfaces of planting areas with 3 inch layer of mulch except slopes that are 2:1 or steeper, hydroseeded areas, turf areas and bioretention basin bottoms.

3.10 CLEAN-UP
A. After all planting operations are complete; remove all trash, excess soil, empty plant containers, and rubbish from the property. Repair scars, ruts and other marks in the ground and leave ground in a neat and orderly condition.
B. Leave the site in a broom-clean condition and wash down all paved areas within the project site. Leave walks in a clean and safe condition.

3.11 LANDSCAPE MAINTENANCE
A. Weed and cultivate all areas at intervals of not more than 10 days.
B. Perform watering, mowing, rolling, edging, trimming, fertilization, spraying, pest control, and cleaning as may be required.
C. Street gutters and curbs are to be included.
D. Maintain adequate protection for people and property, and be financially responsible for damages and injuries. Notify the Architect immediately should damage occur as a result of maintenance operations and provide repair or remuneration.
E. Between the 15th and 20th calendar day of the maintenance period, reseed or resod all spots or areas within the lawn where normal turf growth is not evident.

3.12 TREE AND SHRUB CARE
A. Watering: Maintain a large enough water basin around plants so that enough water can be applied to establish moisture through the major root zone. When hand watering, use a water wand to break force of water.
B. Pruning:
   1. Prior to any pruning, obtain written approval from the Architect to proceed.
   2. Trees:
      a. Propose tree pruning to the Architect should there be health or structural reasons for doing so, including the need to eliminate diseased or damaged growth, eliminate structurally unsound growth, reduce potential for wind toppling or wind damage, or maintain growth within limited space.
      b. Tree pruning that is required during the Maintenance Period for tree health or structural reasons, or as directed by the City, shall be performed in accordance with ANSI A-300 ISA standards.
      c. Major pruning of deciduous trees shall be during their dormant season.
   3. Shrubs:
      a. The objectives of shrub pruning are the same as for trees. Do not clip shrubs into balled or boxed forms unless such is required by the design.
      b. Make pruning cuts to lateral branches or buds or flush with trunk. Stubbing will not be permitted.
C. Staking and guying: Ensure that stakes and guys remain in place through acceptance and monitor to prevent girdling of trunks or branches and to prevent rubbing that causes bark wounds. All nursery stakes shall be removed.
D. Weed control: Keep all areas free of weeds. Use recommended legally approved herbicides. Avoid frequent soil cultivation that destroys shallow roots. Use mulches per specifications to help prevent weed seed germination.
E. Insect and disease control: Maintain a reasonable control with approve materials.
F. Fertilize as specified by the agronomic soils testing recommendations and as follows for bid purposes:
   1. Commencement of maintenance period – 6 pounds per 1,000 square feet with top dress fertilizer.
   2. At the end of first 30 days of maintenance period – 6 pounds per 1,000 square feet with top dress fertilizer.
   3. At end of maintenance period and at 30 day intervals should maintenance period be extended for any reason – 6 pounds per 1,000 square feet with fertilizer mix.
   4. Avoid applying fertilizer to the rootball and base of main stem; rather, spread evenly under plant to dripline. Rates will vary from about a cup of nitrate fertilizer (depending upon nitrogen percentage) around a newly installed small plant to about 1/2 pound of actual nitrogen per inch of truck diameter measured four feet from the ground for mature trees.
G. Replacement of plants: Replace dead, dying and missing plants with plants of a size, condition and variety acceptable to the Architect.

3.13 GROUND COVER CARE
A. Weed control: Control weeds, preferably with pre-emergent herbicides, but also by hand or with selective systemic herbicides. Hoe weeds as little as possible since this may result in plant damage.
B. Watering: Water enough that moisture penetrates throughout root zone and only as frequently as is necessary to maintain healthy growth.
C. Trash: Remove as it accumulates, but no less often than weekly.
D. Edging and trimming: Edge groundcover to keep in bounds.
E. Replace dead and missing plants.

3.14 LAWN AND TURF CARE
A. Turf must be well-established prior to final acceptance.
B. Watering: Water lawns at such frequency as weather conditions required to replenish soil moisture below root zone.
C. Weed control: If needed, control broad leaf weeds with selective herbicides.
D. Mowing:
   1. Perform mowing at such times of the day or week as may be requested by the Owner so as not to impede the Owner's operations. Mowing times may be at times other than normal working hours or days. Perform work at Owner's convenience.
   2. Clean up grass clippings during and after mowing, and remove legally from site. Use of blowing type equipment in lieu of sweeping or vacuuming is not acceptable.
E. Renovating:
   1. If required, remove thatch by verticutting preferable in the Fall of the year, but otherwise in the Spring. At this time, fertilize with nitrate and over-seed if needed. Over-seeding must precede pre-emergent herbicides by at least 4 to 6 weeks. Normally, this means that lawns which have been invaded by crabgrass would be renovated and over-seeded in the Fall and treated for crabgrass control in the following late Winter.
   2. Clean up grass clippings during and after mowing, and remove legally from site. Use of blowing type equipment in lieu of sweeping or vacuuming is not acceptable.

3.15 IRRIGATION SYSTEM
A. Inspection: Check all systems for proper operation. Lateral lines must be flushed out after removing the last sprinkler head or two at each end of the lateral. Adjust heads as necessary for unimpeded coverage and no overspray.
B. Controllers: Set and program automatic controllers for seasonal water requirements. Give Owner a key to controllers and instruction on how to turn off system in case of emergency as specified in other sections of these specifications.
C. Repair all damages to irrigation system. Make all repairs within one watering period.

END OF SECTION