SECTION 05 5213

PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Galvanized pipe and tube railings.

B. Division 06 Section Rough Carpentry and Miscellaneous Rough Carpentry for wood blocking for anchoring railings where occurs.

1.03 REGULATORY REQUIREMENTS

A. Comply with applicable provisions of the following building codes, including special inspection provisions:
   1. California Building Code (CBC), Chapters 10, 11B, 17A and 22A.
      a. The top of handrail grasping surface shall be mounted between 34" to 38" above the nosing of the treads or the ramp surface.
      b. The handgrip portion of handrails for stairs and ramps shall not be less than 1¼" nor more than 1½" in cross-sectional nominal dimension or a shape providing an equivalent gripping surface. Handrail projecting from a wall shall have a space of 1 ½" (38 mm) between the wall and the handrail. The maximum projection of handrails into the required clear width of a ramp at the handrail height shall be 3 ½" on each side. CBC Sections 1133B.4.2.6 and 1133B.5.5.1.
      c. All surfaces and welded joints of the grip portion of handrails shall be ground smooth with no sharp corners. Gripping surfaces (top or sides) shall be uninterrupted by newel posts, other construction elements or obstructions. Edges shall have a minimum radius of 1/8".
      d. Any wall or other surface adjacent to handrail shall be free of sharp or abrasive elements.
      e. CBC Sections 1133B.4.2.6 and 1133B.5.5.1.
      f. Wheel guide rails or guide curbs shall provide a continuous and uninterrupted barrier along the length of a ramp. CBC Section 1133B.5.6 and Figure 11B-27.

1.04 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1.05 SUBMITTALS

A. Qualification Data: For qualified professional engineer and testing agency.

1.06 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Retain "Welding Qualifications" paragraph(s) below if shop or field welding is required. If retaining, also retain "Welding certificates" Paragraph in "Submittals" Article.

C. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
   3. AWS D1.6, "Structural Welding Code - Stainless Steel."

4. Qualify welding inspection personnel according to AWS QC1, "Standard for AWS Certification of Welding Inspectors."
    a. Welding inspectors shall be DSA-approved.

D. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

E. Testing and Inspection:
1. Testing Agency Services: Owner shall engage a qualified independent testing agency to perform material evaluation tests (except mill tests) and to perform other quality control services during construction.
    a. The testing agency will provide special inspections during all welding, in accordance with the requirements of CBC, Table 1704A.3 and Division 01 section "Quality Control-DSA.".
    b. Fabrication Inspections: Special inspection of structural steel fabrication is required unless fabricator is approved as described in CBC, Chapter 17A, section 1704A.2.2. Special inspections are always required for the special Work indicated in CBC sections 1704A.3, 1704A.4 and 1704A.6.

F. Labeling: All structural steel shall be labeled as required by CBC Table 1704A.3, CBC sections 2203A.1 and 2212A.1, and AISC 360. Such labeling shall be maintained until all necessary testing has been completed and as long as possible thereafter. Unidentified and unlabeled material shall be rejected, unless requalified by testing, and relabeled, all at Contractor's expense.

1.07 PROJECT CONDITIONS

A. If possible, design railings so that they do not have to fit other construction, and delete this article.

B. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.08 COORDINATION AND SCHEDULING

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. Stainless-Steel Pipe and Tube Railings:
    a. Stainless Fabricators, Inc.
    b. Sterling Dula Architectural Products, Inc.; Div. of Kane Manuf.
    c. Tri Tech, Inc.

2.02 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.03 STAINLESS STEEL

A. Material types, quality, and grade: Type 316L stainless steel.
   1. Tubing: ASTM A 554, Grade MT 316L.
   2. Pipe: ASTM A 312/A 312M, Grade TP 316L.
   3. Castings: ASTM A 743/A 743M, Grade CF 8M or CF 3M.
   4. Plate and Sheet: ASTM A 240/A 240M or ASTM A 666, Type 316L.
   5. Expanded Metal: ASTM F 1267, Type II (expanded and flattened), Class 3 (corrosion-resistant steel), made from stainless-steel sheet, ASTM A 240/A 240M or ASTM A 666, Type 316.
   6. Style designations in subparagraph below indicate size. 3/4 number 13 has openings approximately 3/4 by 1-1/2 inches (20 by 40 mm) and is 0.09 to 0.10 inch (2.3 to 2.5 mm) thick; 1-1/2 number 10 has openings approximately 1 by 2-1/2 inches (25 by 65 mm) and is 0.13 to 0.142 inch (3.3 to 3.6 mm) thick.
   7. Style Designation: 1-1/2 number 10 .

2.04 FASTENERS

A. General: Provide the following:
   1. G-\alvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 for zinc coating.
   2. Many fasteners, such as small diameter machine screws, are not available hot-dip galvanized.
   3. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
   4. Aluminum Railings: Type 316 stainless-steel fasteners.
   5. Stainless-Steel Railings: Type 316 stainless-steel fasteners.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:
   1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
   2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
   3. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Expansion and Chemical Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by ICC-ES.
   1. All expansion and chemical anchors shall have a current ICC-ES evaluation report.
   2. Expansion anchors and epoxy anchors shall have a minimum embedment of eight times the anchor diameter.
   3. Expansion and chemical anchors shall not be installed in the tension zone of beams and slabs without prior review by the Architect. When reviewed by the Architect, expansion anchors installed in the tension zone of structural members (e.g., beams and slabs) shall have a safety factor of eight times the design load and shall be based on the published loads allowed without special inspection.
   4. Comply with DSA IR 19-1; limit allowable capacity of expansion and chemical anchors to 80% of ICC-ES published values, unless otherwise indicated.

5. Material in first subparagraph below protects against corrosion in an indoor atmosphere.

E. Material for Exterior Locations and Where Stainless Steel is Indicated: Provide alloy Group 1 (A1) or Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.05 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
   1. For railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Zinc-Rich Primer, Exterior: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoats indicated.
   1. Provide for all galvanized structural steel and for all structural steel exposed to the exterior or weather, unless where otherwise indicated.
   2. Use primer with a VOC content of 100g/L (0.83 lb/gal) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. Provide written verification of compatibility with topcoats.
      a. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following products, or comparable substituted product :
         1) Carboline Company; Carbozinc 859 VOC.
         2) Tnemec Company, Inc.; Series 94-H20-Hydro-Zinc.
         3) ZRC Worldwide, ZRC Zero-VOC Galvanizing Compound.

D. Galvanizing Repair Paint: Use zinc-rich primer.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
   1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.06 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.Select one configuration from five subparagraphs and associated subparagraphs below or revise depending on style of railing used and code requirements. Delete all if configuration is shown on Drawings.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove flux immediately.
   4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Form changes in direction as follows:
   1. As indicated on drawings.

J. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of railing members with prefabricated end fittings.

L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
   1. Retain subparagraph below if any railings are supported from plaster or gypsum board walls.
   2. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
   3. Provide handrail support brackets with not less than two fasteners.

N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

O. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

P. Typical Configuration: 1-5/8-inch (41 mm-) outside diameter top and bottom rails, and posts, with vertical square pickets spaced less than 4 inches (100 mm) clear, unless otherwise indicated. Provide this configuration for all railings and guards unless otherwise indicated.

2.07 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.08 STEEL AND IRON FINISHES

A. Galvanized Railings:
   1. Hot-dip galvanize steel and iron railings, including hardware, where located at exterior and where indicated, after fabrication.
   2. Hot-dip galvanize indicated steel and iron railings, including hardware, after fabrication.
   3. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
   4. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
   5. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
   6. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

E. Preparation for Shop Priming: Prepare uncoated (non-galvanized) ferrous-metal surfaces to comply with requirements indicated below:
   1. Railings Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Other Railings: SSPC-SP 3, "Power Tool Cleaning."

F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
   1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
   3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.03 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.04 ANCHORING POSTS

A. Use metal sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

D. Anchor posts to metal surfaces with round or oval flanges, angle type, or floor type as required by conditions, welded to posts and to metal supporting members as follows:
   1. For steel pipe railings, weld flanges to post and weld to metal supporting surfaces to match existing post connections to railings.

3.05 ATTACHING RAILINGS

A. Anchor railing ends to posts by welding, unless returned to walls.

3.06 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
   1. Field and shop welds will be subject to testing and inspecting in accordance with CBC Chapter 17A.

B. Testing agency will report test results promptly and in writing to Contractor and Architect.

C. Remove and replace work where test results indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.07 ADJUSTING AND CLEANING

A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.08 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Project Completion.

END OF SECTION

- SECTION 12 9300 -

SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Seating.
   2. Trash and ash receptacles.
   3. Vehicular Pipe Gate

1.3 RELATED SECTIONS

A. Section 03 3000 "Cast-in-Place Concrete" for installation of anchor bolts cast in concrete footings.

B. Section 31 0000 "Earthwork and Grading" for excavation for installation of concrete footings.

1.4 SUBMITTALS

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

B. Samples for Initial Selection: For units with factory-applied color finishes.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
   1. Size: Not less than 6-inch- (152-mm-) long linear components and 4-inch- (102-mm-) square sheet components.

D. Product Schedule: For site furnishings. Use same designations indicated on Drawings.

E. LEED Submittal:
   1. Certificates for Credit MR 7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
      a. Include statement indicating costs for each certified wood product.

F. Maintenance Data: For site furnishings to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of site furnishing(s) through one source from a single manufacturer.

B. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":
   1. IPE Wood.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:
   1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
   2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
   3. Structural Pipe and Tube: ASTM B 429.
   4. Sheet and Plate: ASTM B 209 (ASTM B 209M).
   5. Castings: ASTM B 26/B 26M.

B. Steel and Iron: Free of surface blemishes and complying with the following:
   1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
   2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53, or electric-resistance-welded pipe complying with ASTM A 135.
   3. Tubing: Cold-formed steel tubing complying with ASTM A 500.
   4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500; zinc coated internally and externally.
   5. Sheet: Commercial steel sheet complying with ASTM A 1011/A 1011M.
   6. Expanded Metal: Carbon-steel sheets, deburred after expansion, and complying with ASTM F 1267.
   7. Malleable-Iron Castings: ASTM A 47/A 47M, grade as recommended by fabricator for type of use intended.
   8. Gray-Iron Castings: ASTM A 48/A 48M, Class 200.

C. Wood: Surfaced smooth on four sides with eased edges; kiln dried, free of knots, solid stock of species indicated.
   1. Wood Species:
      a. IPE: Solid stock, select and better South American hardwood, straight grain, unfinished.

D. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.
   1. Polyethylene: Fabricated from virgin plastic HDPE resin.
   2. Recycled Polyethylene: Fabricated from not less than 96 percent recycled, purified, fractional-melt plastic resin with not less than 90 percent recycled postconsumer waste by weight HDPE.

E. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality, tamperproof, vandal and theft resistant, concealed, recessed, and capped or plugged.

1. Antitheft Hold-Down Brackets: For securing site furnishings to substrate; extent as indicated on Drawings.

F. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107; recommended in writing by manufacturer, for exterior applications.

G. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.

H. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:

1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil (0.0076 mm) thick.
2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

2.2 SITE FURNISHINGS

A. Refer to furniture legend on landscape notes and schedules sheet in plans for specific manufactures and model number.

2.3 FABRICATION

A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces.

E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

F. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.4 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.6 STEEL AND GALVANIZED STEEL FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.7 IRON FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.

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

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and securely anchored and positioned at locations indicated on Drawings.

D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle

and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch (19 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

F. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

3.3 CLEANING

A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

- END OF SECTION -

SECTION 31 10 00

SITE PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section describes general requirements, products, and methods of execution relating to site preparation, unless otherwise noted. This section applies to:
   1. Surface and subsurface demolition.
   2. Backfilling of excavations and depressions.
   3. Coordination, demolition and/or relocation of existing utilities.
   4. Prior to start of demolition of facilities, shut-off, disconnect, cut, and cap where required, underground utility services to facilities.
   5. Removal of A.C. pavement driveway and concrete pavement, concrete pads, and A.C. curbing.
   6. Removal of cyclone wire, wood fences and barricades.
   7. Removal of storm drainage piping, catch basins, and manholes.
   8. Removal of vegetation and trees as specified herein.

B. Contractor shall provide labor, material and equipment required for demolishing, cutting, removing and disposing of existing construction as designated and shown on the Plans for the following as required, unless otherwise noted.

1.3 SUBMITTALS

A. Comply with requirements of Section 01 3219 – Submittal Procedures.

B. Submit all permits and certificates required for the project, for record purposes.

C. Demolition schedule and proposed methods and operations.

D. Permits and notices authorizing demolition.

E. Letter or certificates of severance of utilities services from the affected agencies or utilities.

F. Proposed haul route(s) from the demolition worksite to an authorized disposal site.

G. Permit for transport and disposal of debris.

H. Make arrangements of disposing of waste and excess materials at a legally licensed landfill/disposal facility outside worksite and pay cost thereof.

I. Photograph existing conditions of existing structure surfaces, equipments, and adjacent improvements that might be misconstrued as damage related to removal operations. File photographs with Project Manager prior to start of work.

J. Submit Proposed dust control measures.

K. Submit Proposed noise control measures.

L. Work Schedule: Submit a proposed schedule of work items to be performed, and a description of how the work is to be accomplished, for the Project Manager's review.

M. Report of inspections conducted with the Project Manager before and after performing work.

1.4 QUALITY ASSURANCE

A. Comply with the following Standards: American National Standards Institute, Inc. "American National Standard Safety Requirements for Demolition" (ANSI A10.6 and A10.8).

B. Regulatory Agencies:
   1. Comply with rules and regulations of State of California, California Code of Regulations, Title 8, Industrial Relations, Chapter 4, Subchapter 4, "Construction Safety Order."
   2. Comply with applicable local and state agencies having jurisdiction.
   3. Comply with governing EPA notification regulations.

C. Secure all required Permits or Certificates for demolition or discontinuance of utilities, prior to beginning the work.

1.5 PROJECT CONDITIONS

A. Disposition of Existing Improvements:
   1. All materials indicated to be removed shall become the property of the Contractor; dispose of these outside the project site.
      a. Do not dispose of removed materials to the general public by sale, gift or in any other manner at the Site.
      b. These provisions shall not be construed as limiting or prohibiting sale or disposal of such materials at the Site to duly licensed Contractors or material suppliers, provided materials are removed from the construction site by the Contractor.

   2. All removal of debris from the site, including removal of inventory to site of storage, is part of this Contract and shall be done by Contractor's employees and no others.

B. Salvage and Reuse:
   1. Where units or items of existing work are designated to be removed and reused in the new work or are to become salvage, remove such units or items carefully.
      a. Use tools and methods that will not damage such units or items.
      b. Protect underlying or adjoining work from damage.
      c. Salvaged items shall be cleaned by the Contractor.

C. Protection:
   1. Erect and maintain temporary bracing, shoring, lights, barricades, except construction barricades for subsequent new construction, warning signs, and guards necessary to protect public, the District's employees, finishes, improvements to remain and adjoining property from damage, all in accordance with applicable regulations.
   2. Wet down areas affected by this work as required preventing dust and dirt from rising.

D. Scheduling:
   1. Coordinate with the District in scheduling noisy or dirty work.
   2. Schedule work at the District's convenience to cause minimal interference with the District's normal operations.
   3. Jackhammering shall be coordinated with the District and College to minimize disturbance of

classes.

E. Traffic Circulations: Ensure minimum interference with roads, streets, driveways, sidewalks, and adjacent facilities.
   1. Do not close or obstruct public thoroughfares without first obtaining the required permit or permission of the responsible jurisdiction.
   2. Where closing of a vehicular or pedestrian traffic circulation route is necessary, provide adequate directional signs to minimize the potential for confusion.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas affected by work of this Section and verify following:
   1. Disconnection of utilities as required.
   2. That utilities serving occupied portions of buildings on and off the site will not be disturbed or that temporary utility services have been provided.
   3. Removal by the District of the District's personal property, movable furniture and equipment items not designated for relocation.

B. Where existing conditions conflict with representations of the Construction Documents, notify the Project Manager and obtain clarifications. Do not perform work affecting the conflicting conditions until clarification of the conflict is received.

3.2 PREPARATION

A. Verify that the area to be demolished or removed has been vacated, or adequate space made available to perform the work.

B. Arrange for, and verify termination of utility services to include removing meters and capping of lines.

C. Lay out cutting work at Job Site and coordinate with related work for which cutting is required.

3.3 DEMOLITION

A. If confirmed or suspected hazardous materials are encountered during operations, stop operations immediately and notify the Project Manager.

B. Perform work in accordance with ANSI A10.6-1969 unless otherwise noted.

C. Provide noise and dust abatement as required to prevent contamination of adjacent areas.
   1. Remove all materials not designated as salvage, in their entirety.
   2. Remove building foundations in their entirety, unless otherwise indicated on the plans.

D. Fill voids in the land left by the removal of existing structures as follows:
   1. Grade finished remaining surface to the contours shown, or if not shown, to match the existing natural contours.

E. Lower, or remove, heavy structural framing members by hoist or crane.

F. Concrete and Masonry:

1. Demolish concrete and masonry in sections, less than 3 feet in any direction.
2. Method of cutting shall be limited to saw cutting and torch.

3.4 CUTTING

A. Make new openings neat.

B. Do not cut or alter structural members and any utilities including appurtenances unless indicated to do so in the Construction Documents, or written approval is received from the Project Manager.

C. Take care not to damage reinforcing or structural steel scheduled to remain in place.

D. Concrete: Cut new openings in concrete by coring and saw cutting. Saw run-bys will not be permitted.

3.5 PREPARATION FOR NEW FINISH WORK

A. Where demolished surfaces are scheduled to receive new finishes, Contractor shall restore such substrate to a condition ready to receive the scheduled new finishes, including grinding or leveling.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning of demolished materials off District's property in a legal manner.

3.7 FIELD QUALITY CONTROL

A. The Project Manager will accompany the Contractor before and after performance of work to observe physical condition of existing structures or improvements involved.

END OF SECTION

SECTION 31 1300

TREE PROTECTION & TRIMMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the protection and trimming, or removal of existing trees and shrubs that are within limits of the work, interfere with, or are affected by, execution of the Work, whether temporary or permanent construction.

1.3 RELATED SECTIONS

A. Section 31 0000 "Earthwork and Grading" for building and utility trench excavation, backfilling, compacting and grading requirements, and soil materials.

B. Section 31 1000 "Site Preparation" for removal limits of trees, shrubs, and other plantings affected by new construction.

C. Section 32 9119 “Landscaping Grading” for work near, or within the “Tree Protection Zone” under the direct supervision of a certified Arborist.

D. Section 32 9300 "Landscaping" for tree and shrub planting, tree support systems, and soil materials.

1.4 DEFINITIONS

A. Tree Protection Zone: Area surrounding individual trees or groups of trees to remain during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Tree Pruning and Removal Schedule: Written schedule from an arborist detailing scope and extent of removing trees, or pruning of trees to remain, that interfere with or may be affected by construction. Arborist must meet the qualifications listed in the Quality Assurance article of this section.

B. Qualification Data: For both tree service firm and arborist.

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

D. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

1.6 QUALITY ASSURANCE

A. Arborist Qualifications: An arborist certified by International Society of Arboriculture (ISA), and licensed in the jurisdiction where Project is located. License shall be California C27 and D49 licenses.

B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will assign a qualified, experienced, ISA certified arborist to Project site during execution of tree protection and trimming.

C. Tree Pruning Standard: Comply with ANSI A300 (Part 1), "Tree, Shrub, and Other Woody Plant Maintenance--Standard Practices (Pruning)", as well as Class I, per ISA standards.

D. Any pruning, cutting trimming or trimming of any trees shall be performed by an International Society of Arboriculture (ISA) Certified Arborist, or certified tree worker in accordance with the National Arborist Association and/or ISA pruning standards.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."
   1. Prior to the beginning of clearing, grubbing, trenching, tree pruning or removal, or excavation on site, the Contractor, grading contractor, project arborist, landscape contractor, tree removal firm, Landscape Architect, and the Architect shall meet in a pre-construction conference to discuss grading near existing trees, tree protection and trimming procedures, and responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 3/4-inch (19 mm) in diameter; and free of subsoil and weeds, roots, toxic and other non-soil materials. Refer to Section 32 9300 “Landscaping” for more information.

B. Obtain topsoil only from well-drained sites where topsoil is 4 inches (100 mm) deep or more; do not obtain from bogs or marshes.

C. Filter Fabric: Manufacturer's standard, nonwoven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers similar to Mirafi N-Series “140N”, or equal.

D. Chain-Link Fence: Metallic-coated steel chain-link fence fabric of 0.120-inch- (3-mm-) diameter wire; a minimum of 72 inches (1800 mm) high; with 1.9-inch- (48-mm-) diameter line posts; 2-3/8-inch- (60-mm-) diameter terminal and corner posts; 1-5/8-inch- (41-mm-) diameter top rail; and 0.177-inch- (4.5-mm-) diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.

E. Organic Mulch: Wood and bark, free of deleterious materials as specified in Section 32 9300 “Landscaping”.

PART 3 - EXECUTION

3.1 GENERAL

A. The contractor shall protect all existing trees and shrubs scheduled to remain against injury or damage, including cutting, breaking or skinning of roots, trunks or branches. No blasting of rock shall occur in any area adjacent to existing trees without prior written consent of the Architect.

B. No trees or shrubs are to be removed, trimmed, or cut without prior approval of the Landscape Architect.

C. Prior to the beginning of the clearing and grading phase of the project, a continuous temporary, six foot high chain link fence shall be erected around the dripline of trees scheduled to remain, unless otherwise specified by the Landscape Architect. The temporary fence shall be erected prior to commencing any other work on the project. No construction activity shall be allowed within the limits of this fencing unless directed by the Landscape architect. The temporary fence shall remain in place during the entire construction period and shall not be removed until directed by the Landscape Architect.

D. Grading beneath trees to be saved shall be given special attention. Every effort shall be made to avoid creating conditions adverse to the tree's health. The natural ground within the drip lines of trees to be preserved shall remain as undisturbed as possible. Grading within the protected root zone of trees to be preserved will not be permitted unless specifically approved by the Architect prior to beginning of proposed grading.

E. If during construction or grading (grading, excavation, etc.) tree roots of 2-inches in diameter or greater are encountered, work shall stop immediately and the Arborist, approved in advance by the Architect, shall be contracted for a root inspection. Root cutting of any roots over 2-inches in diameter must have prior approval from the Landscape Architect. All cuts are to be made with appropriate equipment, as to not affect the plant material.
   1. Major roots 1-inch or greater in diameter encountered within the "Tree Protection Zone" in the course of hand excavation or hand trenching shall not be cut and shall be kept moist and covered with earth as soon as possible.
   2. Roots one half inch (1/2") to one inch (1") in diameter which are severed shall be trimmed cleanly and covered with earth as soon as possible.

F. All trenching beneath the "Tree Protection Zone" of trees scheduled to remain shall be done with hand tools only. No mechanical trenching or excavation is allowed within the drip line of existing trees at any time, or where roots are encountered outside the "Tree Protection Zone".

G. Branches interfering with construction but not designated for removal may be removed only as directed by the Architect.

H. Procure a permit where required prior to pruning or removing any trees, as required by applicable local codes or ordinances.

I. Parking of vehicles, equipment or storage of materials under the drip line of existing trees shall not occur at any time.

J. The areas outside the perimeter Loop Road are infested with poison oak and ground yellow jacket nests. It is the Contractor's responsibility to provide workers with adequate warnings and protection for this situation. Contractor shall hold harmless the College and all other parties for any poison oak and yellow jacket related issues.

3.2 TREE REMOVAL AND PRUNING SCHEDULE

A. Trees to be removed in the future parking areas within the "Loop Road" are identified on the Civil Demolition Plans.

3.3 PREPARATION

A. Temporary Fencing: Install temporary fencing around "Tree Protection Zones" (as defined in Part 2 of this Section) to protect remaining trees and vegetation from construction damage. The temporary fencing shall be erected prior to commencing any other work on the project. No construction activity shall be allowed within the limits of this fencing unless directed by the Architect. The temporary fencing shall remain in place during the entire construction period and shall not be removed until directed by the Architect.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
C. Mulch areas inside tree protection zones and within drip line of trees to remain and other areas indicated.
   1. Apply 6-inch (150-mm) average thickness of organic mulch. Do not place mulch within 6 inches (150 mm) of tree trunks.

D. Do not store construction materials, debris, or excavated material inside tree protection zones. Do not permit vehicles or foot traffic within tree protection zones; prevent soil compaction over root systems.

E. Maintain tree protection zones free of weeds and trash.

F. Do not add or remove soil within the "Tree Protection Zone".

G. Do not allow fires within tree protection zones.

3.4 TREE REMOVAL

A. Remove trees designated for removal prior to the construction of new improvements in the vicinity.

B. Refer to Tree Removal and Pruning Schedule in this Section for specific tree removal and pruning information.

C. Perform tree removal work in a safe and proper manner, adhering to CAL-OSHA and ANSI Standards.

D. All trees to be demolished shall be removed in such a way as to not damage branches, trunks, or root systems of adjacent trees, including small existing Oak trees and Oak bushes.

E. When demolishing trees indicated to be removed within the perimeter of the existing Loop Road, remove tree, stump to a depth of two (2) feet below finish grade, and all roots located in the top twelve (12) inches of soil. Remove wood chips created from grinding process down to remaining stump then refill void and re-compact to 80% relative compaction. Use import soil as indicated in specifications for this purpose. Import soil and compaction in future paved areas shall comply with civil paving plans and specifications.

F. When demolishing trees located outside the perimeter of the existing Loop Road, removal shall be done in one of the following ways:
   1. For trees located in accessible areas, remove tree and grind stump to four (4) inches below finish grade. Backfill the void and re-compact to 80% relative compaction. Use import soil as indicated in specifications for this purpose. Do not remove existing roots.
   2. For trees located in inaccessible areas, cut stump flush with finish grade, and cover with 3 inches of bark mulch. Do not grind the stump and do not remove existing roots.

3.5 CLEANING

A. Wash all existing and new trees weekly to remove dust and debris during construction.

3.6 EXCAVATION

A. Install shoring or other protective support systems to minimize sloping or benching of excavations.

B. Do not excavate within "Tree Protection Zones", without prior written consent of the Landscape Architect.
   1. Excavation within the "Tree Protection Zone" for existing trees shall be done under the direct supervision of the Arborist.

C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.

1. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches (75 mm) back from new construction.
2. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

D. Where utility trenches are required within tree protection zones, tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.
1. Mechanical trenching of any kind is prohibited.
2. Root Pruning: Prune Roots only with the approval of the Landscape Architect. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with sharp pruning instruments; do not break or chop.

3.7 REGRADING

A. No regrading of any kind, either cut of fill will be permitted within the "Tree Protection Zone" without prior written consent of the Landscape Architect. Regrading shall be done under the direct supervision of the certified Arborist.
1. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade beyond tree protection zones. Maintain existing grades within tree protection zones.
2. Minor Fill: Where existing grade is 6 inches (150 mm) or less below elevation of finish grade within the "Tree Protection Zone", fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.8 TREE PRUNING

A. Prune trees to remain that are affected by temporary and permanent construction as directed by Arborist.

B. Refer to Tree Removal and Pruning Schedule in this Section for specific tree removal and pruning information.

C. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.

D. Pruning Standards: Prune trees according to ANSI A300 (Part 1) as follows:
1. Type of Pruning as follows:
   a. Cleaning: Selective pruning to remove one or more of the following parts: dead, diseased, and/or broken branches (5.6.1).
   b. Thinning: Selective pruning to reduce density of live branches (5.6.2).
   c. Raising: Selective pruning to provide vertical clearance (5.6.3).
   d. Reduction: Selective pruning to decrease height and/or spread (5.6.4).

2. Branches interfering with construction but not designated for removal may be removed only as directed by the Architect.
3. Cutting of 2" diameter limbs or greater or major dead wooding shall require approval of the Architect.
4. Lion's Tailing is not permitted.
5. Remove interfering leaders or crossing branches.
6. Never remove more than 20 to 30 percent of the tree mass.

E. Additional Pruning Standards: Trees shall be pruned so that they are laced out and balanced per Class I, ISA standards.

F. Cut branches with sharp pruning instruments; do not break or chop.

G. All trees shall be pruned, and cleared in such a way as to not damage branches, trunks, or root systems of adjacent trees, including small existing Oak trees and Oak bushes.

H. Chip removed tree branches and dispose of off-site.

3.9 TREE REPAIR AND REPLACEMENT

A. Promptly repair trees or shrubs scheduled to remain, damaged by construction operations within 24 hours to prevent progressive deterioration. Treat damaged trunks, limbs, and roots according to arborist's written instructions at no additional expense to the Owner.
   1. Damaged trees and shrubs shall be repaired promptly. Repair or replacement of trees and shrubs shall be as determined by the Landscape Architect.

B. Remove and replace trees indicated to remain that die or are damaged during construction operations that arborist determines are incapable of restoring to normal growth pattern.
   1. Provide new trees of same size and species as those being replaced; plant and maintain as specified in Section 32 9300 “Landscaping”.
      a. Take caliper measurements 6 inches (150 mm) above the ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

   2. Provide new trees of 6-inch (150-mm) caliper size and of a species selected by Architect when damaged trees more than 6 inches (150 mm) in caliper size, measured 12 inches (300 mm) above grade, are required to be replaced. Plant and maintain new trees as specified in Section 32 9300 “Landscaping”.

C. Damages: Trees which cannot not be replaced of equal caliper size and species shall compensate the Owner at a rate of $ 750.00 per inch difference in caliper size between the original tree and the replacement tree.
   1. Contractor shall be held liable for damage caused to trees and shrubs shall be assessed fees based on the International Society of Arboriculture (ISA) “Guide for Plant Appraisal”, as determined by the project Arborist; fees will be assessed for: 1). any injury to the trunk, limbs, or root system, and 2). for the value of any tree requiring removal subsequent to injury or treatment that varies from these Specifications.

3.10 DISPOSAL OF WASTE MATERIALS

A. Burning is not permitted.

B. Disposal: Remove excess excavated material and displaced trees from Owner's property.

END OF SECTION

SECTION 32 0190

LANDSCAPE MAINTENANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Furnish all labor, material, equipment and services required to maintain landscape in a healthy growing condition and in a neat and attractive appearance throughout the maintenance period.

1.3 RELATED WORK

A. Section 32 8400 “Planting Irrigation” for installation of underground piping and control systems.

B. Section 32 9300 “Landscaping” for planting, soil treatment, soil testing, soil amendments and planting accessories.

1.4 QUALITY ASSURANCE

A. The Maintenance Contractor shall be experienced in horticulture and landscape maintenance, practices and techniques, and shall provide sufficient number of workers with adequate equipment to perform the work during the maintenance period.

1.5 MAINTENANCE PERIOD

A. Continuously maintain the entire project area during the progress of the work and during the ninety (90) calendar-day, maintenance period until final acceptance of the project by the Landscape Architect,
   1. Maintenance Period begins following “Final Completion” of the Project.

B. Maintenance period shall not start until final completion, when all elements of construction, planting and irrigation for the entire project are in accordance with Plans and Specifications. A prime requirement is that all lawn and landscape areas shall be planted and that all lawn areas shall show an even, healthy stand of grass seedlings which shall have been mown twice. If such criteria is met to the satisfaction of the Landscape Architect, a written notification shall be issued to establish the effective beginning date of maintenance period.

C. Any day of improper maintenance, as determined by the Landscape Architect, shall not be credited as an acceptable maintenance period day. The maintenance period shall be extended on a daily basis if the work is not in accordance to the Plans and Specifications. Project shall not be segmented into maintenance areas or phases, unless authorization of the Landscape Architect is obtained.

D. Maintenance shall continue beyond the ninety (90) day maintenance period, as required, until final acceptance is given by the Landscape Architect.

E. Contractor shall provide protection to the project site during the maintenance period.

1.6 GUARANTEE AND REPLACEMENT

A. Guarantee: All plant material and other materials installed under the Contract shall be guaranteed for one year after the beginning of the duration of the landscape maintenance period against any and all poor,

inadequate or inferior materials and/or workmanship or improper maintenance, as determined by the Landscape Architect, and shall be replaced by the Contractor at his expense.

B. Replacement: Any materials found to be dead, missing, or not in a satisfactory or healthy condition during the maintenance period shall be replaced immediately. The Landscape Architect shall be sole judge as to the condition of material. Material to be replaced within the guarantee period shall be replaced by the Contractor within five (5) days of written notification by the Landscape Architect. All replacement materials and installations shall comply to the Plans and Specifications. Any plant missing due to suspected theft shall be replaced by the Contractor. If the Contractor suspects that theft may be a problem, the Contractor shall provide written documentation to the Landscape Architect that security on this site needs to be intensified.

C. The Contractor may relieve himself of theft responsibility if after the security notice, with no result, a written notice to the Landscape Architect shall be given that plant material will not be replaced for theft or vandalism due to lack of site security being maintained. This procedure may take place only during the Landscape Maintenance Period.

1.7 OBSERVATION SCHEDULE

A. Normal progress observations shall be requested by the Contractor from the Landscape Architect as per observations listed in specifications Division 02 Section "Landscape Work".

1.8 FINAL ACCEPTANCE OF THE PROJECT

A. Upon completion of all project work, including maintenance period, the Landscape Architect will, upon proper request, make an observation to determine final project acceptability.

B. Where observed work does not comply with the Plans and Specifications, replace rejected work and continue specified maintenance period until reinspected by the Landscape Architect and determined to be acceptable. All replacement materials and installations shall be in accordance with the Plans and Specifications. Remove rejected work and materials immediately from project. Prior to the date of final observation, Contractor shall provide the Landscape Architect with all Record Drawings in accordance with the Plans and Specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials used shall either conform to Specifications in other sections or shall otherwise be acceptable to the Landscape Architect. The Landscape Architect shall be given a monthly record of all herbicides, insecticides and disease control chemicals used.

B. Turf maintenance fertilizer: shall be "Best Turf Supreme 16-6-8":
   1. 16% nitrogen
   2. 6% phosphoric acid
   3. 8% potash

C. Slow Release maintenance fertilizer: shall be "Best Superturf 25-5-5 with Polyon" and shall consist of the following percents by weight:
   1. 25% nitrogen
   2. 5% phosphoric acid
   3. 5% potash

PART 3 - EXECUTION

3.1 MAINTENANCE

A. General: Proper maintenance, including watering, weeding, mowing, edging, fertilization, repairing and protection shall be required until entire project is finally accepted, but in any event for a period of not less than the specified maintenance period after planting.

B. Watering: Thoroughly water to insure vigorous and healthy growth until work is accepted. Water in a manner to prevent erosion due to application of excessive quantities of water. When hand watering use a water wand to break the water force.

C. Weeding:
   1. Keep plant basins and areas between plants free of weeds. Control weeds with preemergent herbicides. If weeds develop, use legally approved herbicides. Avoid frequent soil cultivation that destroys shallow roots. Weeding also shall be included in all paved areas including public or private sidewalks.
   2. Apply a final application of pre-emergent herbicide at the end of the maintenance period, just prior to final acceptance.

D. Tree basins in turf areas: Remove turf from around each tree to create a 3'- 0" diameter basin.

E. Pruning
   1. Trees: Prune trees to select and develop permanent scaffold branches; to eliminate narrow V-shaped branch forks that lack strength; to reduce toppling and wind damage by thinning out crowns; to maintain a natural appearance and to balance crown with roots. All trees shall be maintained and pruned in accordance with the accepted practices of the International Society of Aboriculture (ISA). Prune only as directed by the Landscape Architect.
   2. Shrubs: Same objectives as for trees. Shrubs shall not be clipped into balled or boxed forms unless such is required by the landscape plans. All pruning cuts shall be made to lateral branches, buds or flush with the trunk. Stubbing and heading shall not be permitted.
   3. Only skilled workers shall perform pruning work in accordance with standard horticultural pruning practices. Remove from the project all pruned branches and material. Remove and replace any plant material excessively pruned or malformed resulting from improper pruning practices at no additional costs to the owner.

F. Staking: Stakes shall remain in place through the guarantee period and shall be inspected and adjusted to prevent rubbing that causes bark wounds. Remove nursery stake from all trees that are staked with lodgepole stakes per specifications unless directed otherwise by Architect.

G. Insect, Animal, Rodent and Disease Control: Maintain proper control with legally approved materials as required as part of the Contract.

H. Protection: The Contractor shall maintain protection of the planted areas. Damaged areas shall be repaired or replaced at the Contractor's expense.

I. Trash: Remove trash weekly in all planted areas, pedestrian walkways and parking areas.

J. Replacement: As per Guarantee and Replacement Specifications of this Section.

K. Fertilization: Fertilize all planting areas, just prior to end of maintenance period with the slow release maintenance fertilizer at manufacturer's recommended rate.

3.2 LAWN AND TURF MAINTENANCE

A. Mowing and Edging
   1. Mowing of turf will commence when the grass has reached a height of two and one-half (2-1/2) inches. The height of cut will be two (2) inches. Mowing will be at least every 4-6 days for the second through fifth cuttings, and at least once per week after that. Turf must be well established and free of bare spots and weeds to the satisfaction of the Landscape Architect prior to final acceptance.

2. Excess grass clippings shall be picked up and removed from the site and premises. Let turf areas dry out enough so that mower wheels do not skid, tear or mark the lawn. Edges shall be trimmed at 90 degrees to pavement, at least twice monthly or as needed for neat appearance. Clippings shall be removed from paved and planting areas, etc. and disposed of from the site.

B. Watering: Lawns shall be watered at such frequency as weather conditions require to replenish soil moisture below root zone and to establish healthy strands of grass.
   1. Contractor is responsible for water audits and payment of any local penalties by local water districts at no additional cost to the Owner.

C. Disease control: Control turf diseases throughout the maintenance period with legally approved fungicides and herbicides.

D. Weed Control:
   1. Control broad leaf weeds with selective, legally approved herbicides throughout maintenance period.
   2. A final application of selective herbicide shall be applied at the end of the landscape maintenance period, acceptance, just prior to final acceptance.

E. Fertilization:
   1. During maintenance period an application of turf maintenance fertilizer, as specified, shall be made at thirty (30) day intervals from the date of maintenance period start at a rate of five (5) pounds per 1,000 square feet, or as per manufacturer's recommendations.
   2. Final application (just prior to final acceptance) shall be made with the slow-release maintenance fertilizer at the manufacturer's recommended application rate.
   3. Replacement: At conclusion of maintenance period a final observation of lawn and turf areas shall be made. Remove diseased areas and unhealthy strands of grass from the site; do not bury into the soil. Replant areas with material and in a manner as specified on the Plans and Specifications at no additional cost to the Owner.

3.3 IRRIGATION SYSTEM

A. System Observation: The Contractor shall check all systems for proper operation. Lateral lines shall be flushed out after removing the last sprinkler head or two at each end of the lateral. All heads are to be adjusted as necessary for unimpeded head to head coverage.

B. Valves: Contractor shall set, and verify that all pressure regulating valves to the operating pressure specified on the drawings.

C. Controllers: Set and program automatic controllers for seasonal water requirements. Give the Owner's Representative instructions on how to turn off system in case of emergency.

D. This irrigation system is designed and specified to be operable from a central irrigation computer controller located off site. Contractor shall demonstrate to Landscape Architect, Owner's Representative and future maintenance contractor that the central irrigation system is fully installed and operational from this off site control system as described and specified. Contractor shall make all adjustments as necessary to insure this operation prior to final acceptance.

E. Contractor shall set up and coordinate training for the Maintenance Contractor (Provider) on the central irrigation controller, with the manufactures representative. Maintenance period shall not end, and the project will not be accepted until this training has been completed.

F. Repairs: Repair all damages to irrigation system at the Contractor's expense. Repairs shall be made within twenty-four (24) hours.

3.4 CLEANING

A. During maintenance work, keep pavements clean and work area in an orderly condition. Haul away and remove all debris from landscape areas, and do not leave any prunings, clippings, and or other material from landscape planting and/or maintenance period.

B. Powerwash all paving and flatwork as necessary to remove all staining and tire marks and provide a clean surface caused by maintenance vehicles, prior to final acceptance.

END OF SECTION

SECTION 32 13 13

CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes exterior cement concrete paving for the following:
   1. Pedestrian concrete walkways, including integral color and special finishes.
   2. Concrete aprons, curbs and gutters.
   3. Precast wheel stops.

1.3 RELATED SECTIONS

A. Section 03 10 00 “Formwork” for general formwork requirements.

B. Section 03 3000 "Cast-in-Place Concrete" for general building applications of concrete.

C. Section 32 1373 "Concrete Paving Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction.

1.4 DEFINITIONS & STANDARDS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

B. ASTM C494 - Standard specifications for chemical admixtures for concrete

C. ASTM C979 - Standard specifications for pigments for integrally colored concrete

D. ASTM C3 09 - Liquid membrane forming compounds for curing concrete

E. ACI 302 JR - Guide for concrete floor and slab construction

F. ACT 305 R - Hot weather concreting

G. ACT 306 R - Cold weather concreting

H. ACT 3 18 - Building code requirements for reinforced concrete

I. NRMCA - CJP5 - Plastic shrinkage cracking

1.5 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.
   1. Submit manufacturer’s tech-data sheets and certificates of compliance to applicable ASTM requirements.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when

characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
1. Design Mixes shall be stamped by a licensed engineer in the State of California.

C. Samples:
1. Manufacturer's color chip for colored concrete colors.

D. Qualification Data: For testing agency.

E. Material Test Reports: From a qualified testing agency provided by the Owner indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

F. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Applied finish materials.
6. Joint fillers.

G. Mock-up: Contractor shall provide an on-site 5 foot by 5 foot mock-up of each concrete finish and color with respective score/sawcut and expansion joints for approval by the Architect.
1. Upon request, the Architect may require modifications to be made to the mock-ups. The revised mock-ups shall be provided at no additional cost to owner. Once mockups have approved by the Architect, contractor shall retain approved mock-ups during construction as standard for judging completed work.
a. Paving Module: Construct a mock-up of one special paving module, including banding, 12'-0" x 12'-0".
b. Construct a mock-up of curved radial paving, approximately 180 sq.ft.
2. Walls: Construct at least 6 linear feet of straight or curved special finished concrete site wall, including detailed reveal and skateboard deterrents as detailed on Drawings.
3. Location: Construct mock-ups on site where directed. Approved mock-ups shall not become part of the final installation. Mock-ups will be used to establish acceptable quality, color and texture; remove and repeat until results satisfactory to the Architect are achieved. Maintain exact record of variables associated with each mock-up to facilitate the matching of approved mock-ups in actual construction
4. Contractor to remove mockups at contractor's cost when directed by owner's representative.

H. Field quality-control test reports.

I. Pour Sequence and Joint Layout Plan. This plan will show how paving contractor intends to sequence paving and where he intends to provide required contraction, construction, and isolation joints.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Installer Qualifications: Provide a minimum of five (5) similar architectural concrete paving projects totaling at least 100,000 SF within 100 miles of project site. Reference list to contain following

information:

1. Contact people with current (confirmed) telephone numbers:
   a. Property Owner.
   b. Architect of Record.
   c. Landscape Architect of Record.
   d. Project's Chief Operating Manager.

2. Two digital photos (.jpg format at min. 1mb resolution) of each project installed:
   a. Photo #1 – general overview of the architectural concrete paving and architectural concrete walls
   b. Photo #2 – close-up of architectural concrete paving and architectural concrete walls taken 2-3' from surface with joints clearly shown.

3. Supervision - placement and finishing of concrete work to be supervised by a person having a minimum of three (3) years of experience in placement and finishing of architectural concrete paving similar to this project.

C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

D. Concrete Testing Service: Owner shall engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

E. Pre-installation Conference: Conduct conference at Project site to comply with all civil specifications.
1. Before submitting design mixtures, review concrete pavement mixture designs and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete producer.
   d. Concrete subcontractor.

2. Identify mockup cast-in-place locations, and verify types and quantity of mockups during the pre-installation meeting.
   a. Mock-ups to be reviewed by Architect 7 to 14 days after the concrete pour.
   b. Notify Architect a minimum of 72 hours prior to the contractor's request for review of field mock-ups.

1.7 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

1.8 WARRANTY

A. Warranty: In addition to manufacturer's guarantees for products required to install architectural concrete paving, concrete work to be warranted for one (1) year from date of Final acceptance by Owner against defects in materials, workmanship, and damage caused by Concrete Subcontractor's employees.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to

provide full-depth, continuous, straight, smooth exposed surfaces.
1. Use flexible or curved forms for curves with a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

C. Epoxy-Coated Welded Wire Fabric: ASTM A 884/A 884M, Class A, plain steel.

D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

E. Plain Steel Wire: ASTM A 82, as drawn.

F. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs, similar to “Speed Dowel” assembly manufactured by Greenstreak, Inc. St. Louis, MI (800) 325-9504.

G. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

H. 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, and as follows:
1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.3 CONCRETE MATERIALS

A. Concrete material shall comply with ASTM C94, Ready-Mixed Concrete, and the State of California Standard Specifications, Section 90, except as herein specified.

B. Fine and Coarse Aggregates: ASTM C33, 3/4-inch maximum size; clean, crushed permanent limestone aggregate free of materials which may cause staining; use Olympia natural sand for fine aggregate.

C. Water: Clean, free from injurious amounts of oil, alkali, organic matter, or other deleterious material, and not detrimental to concrete per ASTM C 94/C 94M.

D. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:
1. Portland Cement: ASTM C 150, Type II, or IV, gray [white].
a. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120. E. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of

cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.4 CURING MATERIALS

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

B. Water: Potable.

C. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
   1. Products:
      a. Burke by Edeco; BurkeFilm.
      b. ChemMasters; Spray-Film.
      c. Dayton Superior Corporation; Sure Film.
      d. Euclid Chemical Company (The); Eucobar.
      e. Kaufman Products, Inc.; Vapor Aid.
      f. Lambert Corporation; Lambco Skin.
      g. L&M Construction Chemicals, Inc.; E-Con.
      h. Meadows, W. R., Inc.; Sealtight Evapre.
      i. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
      j. Sika Corporation, Inc.; SikaFilm.

D. Curing and Sealing Materials-Colored Concrete:
   1. Manufactures:
      a. Materials Basis-of-Design Product: The design is based on L.M. Scofield Company, Los Angeles, CA, tel: (800) 800-9900, www.scofield.com.
      b. Subject to compliance with requirements, provide the named product or a comparable product by one of the following manufactures:
         1) Davis Colors.
         2) Solomon Colors.

   2. Curing and sealing-exterior and/or interior: Colorcure concrete cureseal manufactured by L.M. Scofield Company. Color-matched, water-based curing and sealing compound that complies with ASTM C-309. Application per tech-data A634.03
   3. Concrete surface repellent-vertical and/or flatwork: Repello surface treatment,
   4. invisible chemical treatment barrier system.

2.5 HARDENERS & SEALERS

A. Curing and finishing-exterior: Sinak HLQ-125 as manufactured by Sinak Corporation. Clear, non-yellowing water-based curing compound that complies with ASTM C-309.

2.6 AGGREGATE BASE

A. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, 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.

B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch (9.5-mm) sieve, 10 to 30

percent passing a No. 100 (0.15-mm) sieve, and at least 5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.7 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
   1. Integral Color Admixture: Basis of Design: All concrete designated as integrally colored concrete in plans or specifications shall contain the proper proportion of Solomon ColorFlo Liquid Color Pigments for color conditioned concrete as manufactured by the Solomon Colors. It shall be certified that the colored admixtures comply with the requirements of paragraph 407 of ACI 318-83 (Building code requirements for reinforced concrete) as water-reducing admixtures, and that their water-reducing components have tested for compliance with ASTM C494. The color-conditioned admixture shall be a single-component pigmented, water-reducing concrete admixture, factory formulated, and packaged in pails, not multiple additives and pigments to dosed separately into the mix. The pigment portion of the colored admixture shall comply with ASTM C979.
   2. Other Acceptable Manufacturers:
      a. Davis Colors.
      b. LM Scofield Company.

   3. Color: Match color as indicated on drawings.

2.8 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 3 minutes.
   1. Color: As indicated on drawings.

B. Glass Beads: AASHTO M 247, Type 1.

2.9 WHEEL STOPS

A. Wheel Stops: Precast, air-entrained concrete, 2500-psi (17.2-MPa) minimum compressive strength, 5-1/2 inches high by 7-1/2 inches wide by 48 inches long. Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate.
   1. Dowels: Galvanized steel, 1/2-inch diameter, 18-inch minimum length.

2.10 CONCRETE MIX, DESIGN, AND TESTING

A. Comply with requirements of applicable Division 3 sections for concrete mix design, sampling and testing, and quality control and as herein specified.

B. Design mix to produce normal-weight concrete consisting of portland cement, aggregate, water-reducing or high-range water-reducing admixture (superplasticizer), air-entraining admixture, and water to produce the following properties:
   1. Compressive Strength:
      a. Typical: 3000 psi, minimum at 28 days, unless otherwise indicated.
      b. Curbs & Gutters: 3500 psi, minimum at 28 days.

2. Slump Limit: 8 inches minimum for concrete containing high-range water-reducing admixture (superplasticizer, limited to flatwork only, not for use on walls); 4 inches for other concrete.
3. Water/Cement Ratio: 0.5

C. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.
1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery
2. time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

D. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

2.11 INTEGRAL COLORED PROPORTIONING AND MIXES

A. Mixing of integrally colored concrete- The concrete color admixture shall be added at the concrete batch plant. Minimum batch size shall be three (3) yards. The same brand of cement, source of sand, and water/cement ratio must be maintained for each load of the same color. The batching procedures shall be as follows: Before adding color-conditioning admixture, the mixing drum must be thoroughly cleaned and wetted with approximately 40 gallons of the mix water and/or a portion of the aggregates. The contents of each pail of admixture needed to properly color the concrete should be added to the mixer. Proceed with normal batching of balance of ingredients After loading is complete, mix at mixing speed for a minimum of 130 revolutions before discharging. No water should be added after a portion of the load has been discharged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
2. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction.

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement 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.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

C. Slope step treads at 1/4-inch per foot to drain

3.4 AGGREGATE BASE

A. Granular Course: Cover subgrade with granular fill, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch (0 mm) or minus 3/4 inch (19 mm).
   1. Place and compact a 1/2-inch- (13-mm-) thick layer of fine-graded granular material over granular fill.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.6 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
   1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
   1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
   2. Provide tie bars at sides of pavement strips where indicated.
   3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
   4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
   5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation (Expansion)Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 20 feet, unless otherwise indicated on plans and drawings.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. 6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction (Control) Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows to match jointing of existing adjacent concrete pavement:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/8-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
   3. Do not continue steel across joint.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 3/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.7 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Screed pavement surfaces with a straightedge and strike off.

J. 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.

K. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

L. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
   2. Do not use frozen materials or materials containing ice or snow.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

M. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
   1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
   3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.8 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

C. Broom Finish Type:
   1. Surfaces Sloped Less than 6%: Provide a medium salt (medium broom) finish by drawing a soft bristle broom across concrete surface, perpendicular to line of traffic, to provide a uniform fine line texture.
   2. Surfaces Sloped Greater than 6%: Provide a slip resistant (heavy broom finish) by striating surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

D. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.
   1. 3/8-inch wide radius at surface, tapered, with top edges rounded to 1/8-inch radius.

3.9 SPECIAL FINISHES

A. Integral Colored Finish:
   1. Flatwork: Strike off concrete to specified level using wooden strike off bar, immediately following strike off, further level and consolidate concrete with wooden bull float or wood darby. Begin floating operation before free moisture rises to the surface. After the concrete has reached

a point where bleed water disappears, finishing may proceed. For uniformity of appearance, consistent finishing practices must be used when applying specified finish. Water must not be sprinkled or otherwise added to the surface while finishing. All final hand finishing must be done in the same direction. Furnish appropriate curing and/or sealing compound as per manufacturer's recommendations (see section 2.0 1E) reference tech-data A304. 10

2. Vertical Concrete: Formwork for vertical colored concrete shall be a resin, high density overlay, an epoxy or urethane coated plywood. Release agents must be nonstaining approved by the color admixture manufacturer. Joints shall be sealed with a urethane or silicone sealant. Form ties shall leave no metal closer than 1 1/2 inches from the surface. The location of form ties shall be selected to minimize the impact on the overall appearance of the structure. All walls shall be cast in such a manner as to eliminate cold joints or lift lines in the finished product. All forms shall be stripped at the same age and a light sandblasting performed to remove minor form marks and surface residue. Patching and repair shall be performed using a compatible concrete patch in a matching color. Finished surfaces shall receive an application of a clear water repellent after the walls have been allowed to cure a minimum of 28 days.

B. Abrasive-Blast (Sandblast) Finish: Perform abrasive blasting after compressive strength of concrete exceeds 2000 psi (13.8 MPa). Coordinate with formwork removal to ensure that surfaces to be abrasive blasted are treated at same age for uniform results.
   1. Surface Continuity: Perform abrasive-blast finishing in as continuous an operation as possible, maintaining continuity of finish on each surface or area of Work. Maintain required patterns or variances in depths of blast to match design reference sample or mockup.
   2. Abrasive Blasting: Abrasive blast corners and edges of patterns carefully, using backup boards, to maintain uniform corner or edge line. Determine type of nozzle, nozzle pressure, and blasting techniques required to match design reference sample or mockup.
   3. Depth of Cut: Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surfaces to match design reference sample or mockup, as follows:
      a. Light Sandblast: Approximately 1/32 to 3/32-inches deep.
      b. Medium Sandblast: Approximately 1/16 to 1/8-inches deep.
      c. Heavy Sandblast: Approximately 3/32 to 5/32-inches deep.
   4. Allow concrete to cure minimum 28 days prior to commencing sandblasting operations.
   5. Protect adjacent materials and finishes from dust, dirt and other surface or physical damage during finishing operations,; provide protection as required and remove at completion of Work.
   6. Repair or replace other work damaged by sandblasting operations to the Owner's satisfaction.
   7. Comply with applicable codes and requirements of applicable authorities for sandblasting operations.
   8. Perform sandblast finishing in as continuous an operation as possible, utilizing same work crew to maintain continuity of finish.

C. Portland Cement-based surface treatment:
   1. ARDEX Finish – to match existing site walls on CSM campus.
      a. Mix Design
         1) One 40 lb. bag of Ardex CD- Fine concrete dressing – Portland cement based modified with high performance polymers.
         2) One 10 lb. bag of Ardex Tilt Wall (TWP) Portland cement-based finishing compound
         3) 3 teaspoons of Davis color Black #8084 (dry material), or equal.
         4) Mix well the two Ardex materials and color together DRY.
         5) Take from this dry mixture the quantity of material desired and water as needed to achieve the correct working consistency.
      b. After Ardex is applied, and thoroughly dried, lightly sandblast as described above.
      c. Final wall color and finish shall match existing walls on the CSM Main Campus as constructed under CSM CIP2 Site Package.

3.10 CONCRETE PROTECTION AND CURING

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 lb/sq. ft. 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 curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
   1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.11 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:
   1. Elevation: 1/4 inch.
   2. Thickness: Plus 3/8 inch, minus 1/4 inch.
   3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
   4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
   5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
   6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
   7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
   8. Joint Spacing: 3 inches, unless otherwise indicated.
   9. Contraction Joint Depth: Plus 1/4 inch, no minus.
   10. Joint Width: Plus 1/8 inch, no minus.

3.12 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Owner and Engineer of Record.

B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

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

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
   1. Spread glass beads uniformly into wet pavement markings at a rate of 6 lb/gal.

3.13 WHEEL STOPS

A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded in holes drilled or cast into wheel stops at one-quarter to one-third points. Firmly bond each dowel to wheel stop and to pavement. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.14 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
   1. Testing Frequency: Obtain at least 1 composite sample for each 20 cu. yd. or fraction thereof of each concrete mix placed each day.
   2. a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
   4. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
   5. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
   6. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
   7. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
      a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Owner, Architect and Engineer of Record, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer of Record but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer of Record.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Design Team Review – contractor to contract Design Team requesting review of the following stages of paving construction:
   1. Pre-Installation Meeting
   2. Formwork string layout
   3. Formwork layout
   4. Formwork placement prior to concrete pour
   5. First Concrete pour
   6. Layout of paving joints to be sawcut
   7. First day of paving joint sawcutting
   8. First day of paving sealing.

3.15 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, cracked, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Engineer of Record, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

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

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

3.16 CLEANUP

A. Remove all concrete over pours, and waste from the site.

B. Provide a final power wash of all concrete surfaces.

END OF SECTION

SECTION 32 1373

CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Exterior joints in the following horizontal traffic surfaces:
   1. Isolation (Expansion) and contraction joints within cement concrete pavement.
   2. Other joints as indicated.

1.3 RELATED SECTIONS

A. Section 32 1313 – Concrete Paving, for constructing joints in concrete pavement.

1.4 SUBMITTALS

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

B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch- (13-mm-), and 1/4-inch (6.4-mm) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

D. Qualification Data: For Installer.

E. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

F. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.

G. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for sealants.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

D. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

E. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.

F. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

G. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

H. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

I. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing of current sealant products within a 36-month period preceding the commencement of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

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

B. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (4.4 deg C).

C. When joint substrates are wet or covered with frost.

D. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

E. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by

sealant manufacturer, based on testing and field experience.

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

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Multicomponent Pourable Urethane Sealant (Sealant #1):
   1. Available Products:
      a. Bostik Findley; Chem-Calk 550.
      b. Meadows, W. R., Inc.; Pourthane.
      c. Pacific Polymers, Inc.; Elasto-Thane 227 Type I (Self Leveling).
      d. Pecora Corporation; Urexpan NR-200.
      e. Polymeric Systems Inc.; PSI-270SL.
      f. Schnee-Morehead, Inc.; Permathane SM 7201.
      g. Sika Corporation, Inc.; Sikaflex - 2c SL.
      h. Sonneborn, Division of ChemRex Inc.; SL 2.
      i. Tremco; THC-900/901.
      j. Tremco; Vulkem 245.

   2. Type and Grade: M (multicomponent) and P (pourable).
   3. Class: 25.
   4. Use Related to Exposure: T (traffic).
   5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

D. Multicomponent Nonsag Urethane (Sealant #2):
   1. Available Products:
      a. Pacific Polymers, Inc.; Elasto-Thane 227 High Shore Type II (Gun Grade).
      b. Pecora Corporation; Dynatred.
      c. Polymeric Systems Inc.; PSI-270.

   2. Type and Grade: M (multicomponent) and NS (nonsag).
   3. Class: 25.
   4. Use Related to Exposure: T (traffic).
   5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
      a. Use O Joint Substrates: Galvanized steel.

2.4 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width

required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.5 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.2 PREPARATION

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

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

3.3 INSTALLATION OF JOINT SEALANTS

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

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

C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of backer materials.
   2. Do not stretch, twist, puncture, or tear backer materials.
   3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses provided for each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.

F. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

3.6 SCHEDULE

A. Horizontal Joints, less than 5 percent slope; Sealant #1.

B. Horizontal Joints, grades steeper than 5 percent; Sealant #2.

C. Vertical Joints; Sealant #2.

END OF SECTION

SECTION 32 1723

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Provide requirements for materials, fabrications, and installation of traffic control and pavement markings.

1.3 SUBMITTALS

A. Comply with provisions of Section 01 3219 – Submittal Procedures.

B. Shop Drawings: Show complete layout and location of pavement markings prior to demolition or obliteration of the existing markings.

C. Submit samples as follows:
1. Traffic paint.
2. Pavement markers and adhesives.
3. Reflectorized markers and posts.

1.4 DELIVERY, STORAGE AND HANDLING

A. Comply with Division 1 requirements, specifications, and the Project Manager.

B. Deliver and store packaged products in original containers with seals unbroken and labels intact until time of installation.

C. Provide proper facilities for handling and storage of products to prevent damage. Where necessary, stack products off ground on level platform, fully protected from weather.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Parking/Traffic Markings and Symbols
1. Parking Stalls, Traffic Markings and Symbols:
a. Traffic Marking and Symbol Paint: Water-Born, Fast-Dry, Traffic Paint distributed by Fuller-O'Brien Corp. D.J. Simpson (#108-273, White); (#108-280, Blue); or approved equivalent.

2. Limit Line:
a. Thermoplastic Stripes and Markings:
1) Thermoplastic stripes and makings shall be hot applied conforming to CSS Section 84 and shall be Cataphote-Catatherm brand, Pavemark thermoplastic brand, or approved equal.

2) Thermoplastic stripes and markings shall have a minimum skid friction value of BPN 35.

B. International Symbol of Accessibility Logo Background Paint: Blue Color. Glidden Co. "Glid-Guard Lifemaster Finish No. 5200 /series, Color 1/M 79", or approved equivalent.

C. Pavement Markers and Adhesives:
1. Fire hydrant pavement markers shall be two-way retroflective "Blue" markers and shall conform to the applicable requirements of CSS Section 85.
2. Adhesive for pavement markers shall be standard set epoxy adhesive conforming to the requirements of CSS Section 95-2.05.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine receiving surfaces and verify that surfaces are clean and proper for installation.

B. Do not start work until unsatisfactory conditions have been corrected.

3.2 APPLICATION

A. Preparation:
1. Clean and prepare surfaces to receive traffic paint in accordance with CSS Section 84-3.05 and these special provisions. Where required, remove existing striping and markings by wet blasting or equivalent method. Do not use dry sandblasting or other dust producing methods.

B. Traffic Paint:
1. Traffic paint shall be machine applied in accordance with CSS Section 84-3.04.

C. Striping Layout:
1. Traffic stripe shall be single and double, solid and broken, and of the color to match existing conditions.
2. Traffic striping shall be placed in patterns to match existing conditions, contractor shall document.

D. Thermoplastic Stripes and Markings:
1. Thermoplastic stripes and markings shall be applied hot in conformance with manufacturer's recommended instructions and the applicable requirements of CSS Section 84-2.06.

E. Pavement Markers:
1. Blue pavement markers shall be installed to delineate the location of fire hydrants along the loop road. No markers shall be installed until the surface has been approved by the Project Manager and until at least 10 days after the slurry seal on asphalt concrete has been placed. Place markers in accordance with CSS Section 85-1.06.

F. Apply marking paint in accordance with approved manufacturer's recommendations.

G. Density of paint coverage shall hide color and texture of substate.

H. Parking Stripes: Paint four inches wide unless otherwise noted. Provide blue outline of loading aisles of accessible parking stalls.

I. Symbol Marking: Paint to match existing conditions.

3.3 CLEANING AND PROTECTION

A. Upon completion of work, remove surplus materials and rubbish and clean off spilled or splattered paint resulting from this work.

B. Permit no surface traffic until pavement and symbol marking has dried thoroughly.

END OF SECTION

SECTION 32 50 00

RESTORATION OF SURFACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes but is not limited to:
   1. General surface restoration.
   2. Concrete surface restoration.
   3. Pavement Marking
   4. Landscape/Planting restoration.

B. Related Sections:
   1. Section 32 1313 – Concrete Paving.
   2. Section 32 1723 – Pavement Markings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Refer to Section 32 1313 – Pedestrian Concrete Paving.

B. Refer to Section 32 1723 – Pavement Markings.

PART 3 - EXECUTION

3.1 GENERAL

A. Surface restoration shall be in kind or better.

3.2 CONCRETE SURFACE RESTORATION

A. The base for permanent concrete surface restoration shall be Class II Aggregate base, equal in depth to the existing section, but not less than 6 inches in depth.

B. The weaving surface for permanent concrete surface restoration shall be concrete equal in thickness to the existing concrete section, but not less than 4 inches in depth. The concrete shall be 6-sack concrete, in accordance with Section 32 1313 –Concrete Paving.

3.3 PAVEMENT MARKING RESTORATION

A. Replace pavement marking disturbed by construction operations/activity to the satisfaction of the Project Manager in kind in accordance with Section 32 1723 – Pavement Markings.

3.4 LANDSCAPE RESTORATION

A. Replace landscaping, planting, trees, shrubs, ground cover, irrigations systems disturbed by

construction operations/activity to the satisfaction of the Project Manager in kind or better.

B. Disturbed lawn areas shall be replaced with Sod in kind or better to the satisfaction of the Project Manager.

END OF SECTION

SECTION 32 8400

PLANTING IRRIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Work Included: Order and furnish all labor, materials, supplies, tools and transportation and perform all operations in connection with and reasonably incidental to complete installation of the automatic sprinkler irrigation systems as shown on the drawings. Items hereinafter are included as an aid to take off, and are not necessarily a complete list of work items.
   1. Trenching, stockpiling, excavation, backfill materials and refilling trenches.
   2. Furnishing materials and installation for complete system including piping, backflow prevention assembly, valves, fittings, sprinkler heads, automatic controls and final adjustment of heads to insure complete and uniform coverage.
   3. Line voltage connections to the irrigation controllers and low voltage control wiring from controllers to remote control valves.
   4. Replacement of unsatisfactory materials.
   5. Clean-up, inspection and approval.
   6. All work of every description mentioned in the specification and/or addenda thereto, and all other labor, and materials reasonably incidental to the satisfactory completion of the work, including clean-up of the site as directed by the Architect.
   7. Tests.
   8. Record drawings.

B. Work Not Included:
   1. Irrigation water stub-out.
   2. 120 volt A.C. electrical stub-out to controller location.
   3. Irrigation sleeves.

1.3 GENERAL REQUIREMENTS

A. OSHA Compliance: All articles and services covered by this specification shall meet or exceed the safety standards established under the Federal Occupational Safety and Health Act of 1970, together with all amendments in effect as of the date of this specification.

B. Codes and Standards: Comply with all applicable codes and standards.
   1. All work and materials shall be in full accordance with the latest rules and regulations of the National Electric Code; the Uniform Plumbing Code, published by Western Plumbing Officials Association; and other State or local laws or regulations. Nothing in these drawings or specifications is to be construed to permit work not conforming to these codes.
   2. When the specifications call for materials or construction of a better quality or larger size than required by the above mentioned rules and regulations, the provision of the specifications shall take precedence over the requirements of the said rules and regulations.
   3. The Contractor shall furnish, without any extra charge, any additional material and labor when required by the compliance with these rules and regulations, though the work be not mentioned in these particular specifications or shown on the drawings.
   4. The Contractor shall erect and maintain barricades, guards, warning signs and lights as necessary or required by OSHA regulations for the protection of the public or workmen.

5. Any existing buildings, equipment, piping, pipe covering sewers, sidewalks, landscaping, etc., damaged by the Contractor during the course of this work shall be replaced or repaired by the Contractor in a manner satisfactory to Architect and at Contractor's expense, and before final payment is made. The Contractor shall be responsible for damage caused by leaks in the piping systems being installed or having been installed by him. He shall repair, at his own expense, all damage so caused, in a manner satisfactory to Architect.
6. The Contractor shall pay for all permits, licenses and fees required.

1.4 SUPERVISION AND WORKMANSHIP

A. The Contractor, personally or through an authorized and competent representative, shall supervise the work constantly, and shall as far as possible keep the same foreman and workmen on the job from commencement to completion. The workmanship of the entire job must in every way be first class, and only experienced and competent workmen will be allowed on the job.

1.5 LAYOUT OF WORK

A. The Contractor shall stake out the irrigation system as shown on the drawings. These areas shall be checked by the Contractor and Architect before construction is started. Any changes, deletions or additions shall be determined at this check.

1.6 INSTRUCTION

A. After the system has been installed and approved, the Contractor shall instruct the Owner's Representative in complete operation and maintenance of the irrigation system.

1.7 SUBMITTALS

A. Substitutions: Submit 6 copies of catalogue information on materials which are to be submitted for substitution. No substitution will be permitted without prior written approval by the Architect. Complete material list shall be submitted prior to performing any work.
B. Record Drawings:
   1. The Contractor shall maintain in good order in the field office one complete set of black line prints of all sprinkler drawings which form a part of the contract, showing all water lines, sprinklers, valves, controllers and stub-outs. In the event any work is not installed as indicated on the drawings, such work shall be corrected and dimensioned accurately from the building walls.
   2. All underground stub-outs for future connections and valves shall be located and dimensioned accurately from building walls on all record drawings.
   3. Upon completion of the work, obtain reproducible prints from Architect and neatly correct the prints to show the as-built conditions.

PART 2 - MATERIALS

2.1 PIPE AND FITTINGS

A. Main lines (constant pressure); 3" and larger shall be polyvinylchloride (PVC) 1120-200 PSI with ring-tite connections; 2 1/2" and smaller shall be PVC 1120-Schedule 40 plastic pipe.
   1. Join lengths of pipe by means of integrally formed bell end on pipe using rubber ring seal. Use Schedule 40 PVC solvent weld couplingson Schedule 40 pipe.
   2. Ring-tite main line: At changes in direction or branch mains, use appropriate Ductile Iron rubber ring seal fittings.
   3. Solvent weld main lines: At changes in direction or branch mains, use appropriate Schedule 40 PVC solvent weld fittings as approved by the Uniform Plumbing Code.

B. Lateral lines (non-pressure): 3/4" and larger shall be 1120-200 PSI PVC plastic pipe. All lateral lines shall be connected with Schedule 40, Type I, Grade I, PVC solvent weld fittings.

C. Connections between main lines and RCV's shall be of Schedule 80 PVC (threaded both ends) nipples and fittings.

D. Risers shall be as follows:

E. Schedule 80 PVC threaded nipples and Schedule 80 PVC ells as shown in the construction details. Offset risers shall be Cobra connector Model CC-600 (1/2"x6").

2.2 QUICK COUPLING VALVES

A. Quick coupling valves shall be as listed on the drawings.

2.3 CONTROLLERS

A. Controllers shall be as listed on the drawings.

2.4 REMOTE CONTROL VALVES

A. Remote control valves shall be globe/angle pattern with plastic (Irritrol, Toro) brass/plastic flow stem and manual bleed petcock. Sizes of remote control valves shall be as listed on the drawings.

2.5 GATE VALVES

A. 2 ½" and smaller shall be bronze construction with cross handle and screwed connections. 3" and larger shall be cast iron with operating nut (2" square) and "O" ring connections for PVC plastic pipe. Install in 10" diameter plastic valve box as detailed.

2.6 CONTROL WIRE

A. Control wire shall be copper with U.L. approval for direct burial in ground, size #14-Common ground wire shall have white insulating jacket; control wire shall have insulating jacket of color other than white. Splices shall be made with 3M-DBY seal packs. Provide a separate ground wire for each controller.

2.7 BOXES FOR REMOTE CONTROL VALVES

A. NDS Pro Series Plus Model 1419 plastic valve box with plastic lid. Lid shall be marked: "Irrigation Control Valve."

2.8 SPRINKLER HEADS

A. All sprinkler heads shall be as listed on the drawings.

2.9 BACKFLOW PREVENTION DEVICE

A. Backflow prevention device shall be the reduced pressure type with gate valves, check valves, test cocks, reduced pressure chamber and air vent. Install 12" above finish grade.

2.10 EMITTERS

A. Emitters shall be as listed on the drawings.

2.11 STRAINER

A. Emitter strainer shall have a plastic housing, MIPT x MIPT connections with removable screen and integral flush valve with hose threads. Amiad model.39-0 with 155 mesh stainless steel screen.

2.12 MISCELLANEOUS INSTALLATION MATERIALS

A. Solvent cement and primer for solvent weld joints shall be of make and type approved by manufacturer(s) of pipe and fittings. Cement shall be maintained at proper consistency throughout use.

B. Lubricant for assembling rubber ring seal joints shall be of make and type approved by manufacturer of pipe.

C. Pipe joint compound shall be non-hardening, non-toxic materials designed specifically for use on threaded connections in water carrying pipe. Performance shall be same as RectorSeal #5.

2.13 MISCELLANEOUS EQUIPMENT

A. Provide all equipment called for by the drawings.

B. Provide to the Owner, at completion of the maintenance period, three (3) each of all operating and servicing keys and wrenches required for complete maintenance and operation of all heads and valve. Include all wrenches necessary for complete disassembly of all heads and valves.

PART 3 - EXECUTION

3.1 PREPARATION

A. Schedule and coordinate placement of materials and equipment in a manner to effect the earliest completion of work in conformance with construction and progress schedule.

3.2 HANDLING AND STORAGE

A. Protect work and materials from damage during construction and storage as directed by Architect.

B. Handle plastic pipe carefully; especially protect it from prolonged exposure to sunlight.

3.3 LAYOUT

A. Lay out work as accurately as possible in accordance with diagrammatic drawings.

B. Where site conditions do not permit location of piping, valves and heads where shown, notify Architect immediately and determine relocation in joint conference.

C. Run pipelines and automatic control wiring in common trenches wherever practical.

3.4 EXCAVATION AND TRENCHING

A. Excavation shall be in all cases ample in size to permit the pipes to be laid at the elevations intended and to permit ample space for joining.

B. Make trenches for pipelines deep enough to provide minimum cover from finish grade as follows:
   1. 18” minimum cover over main lines to control valves and quick coupling valves.
   2. 18” minimum cover over control wires from controller to valves.
   3. 12” minimum cover over RCV controlled lateral lines to sprinkler heads.

C. Restore surfaces, existing underground installations, etc., damaged or cut as a result of excavations, to original conditions in a manner approved by Architect.

D. Where other utilities interfere with irrigation trenching and pipe work, adjust the trench depth as instructed by Architect.

3.5 ASSEMBLING PIPELINES

A. All pipe shall be assembled free from dirt and pipe scale. Field cut ends shall be reamed only to full pipe diameter with rough edges and burrs removed.

B. Rubber Ring Seal Joint:
   1. Use factory made male end or prepare field-cut male end to exact specifications of factory made end.
   2. Carefully clean bell or coupling and insert rubber ring without lubricant. Position ring carefully according to manufacturer's instructions.
   3. Lubricate male end according to manufacturer's instruction and insert male end to specified depth. Use hands only when inserting PVC pipe.
   4. Thrust blocks shall be provided where necessary to resist system pressure on ring-tite pipe and fittings. Blocks shall be concrete and the size shall be based on an average soil safe bearing load of 700# per square foot.
   5. Form thrust blocks in such a manner that concrete comes in contact only with the fittings. Thrust blocks shall be between solid soil and the fittings.

C. Solvent Weld Joint:
   1. Prepare joint by first making sure the pipe end is square, then deburring the pipe end and cleaning pipe and fitting of dirt, dust and moisture.
   2. Dry-insert pipe into fitting to check for missizing. Pipe should enter fitting 1/3 to 2/3 depth of socket.
   3. Coat the inside socket surface of the fitting and the male end of the pipe with P-70 primer (manufactured by Weld- On). Then without delay, apply Weld-On 711 cement liberally to the male end of the pipe and also apply 711 cement lightly to the inside of the socket. At this time, apply a second coat of cement to the pipe end.
   4. Insert pipe immediately into fitting and turn 1/4 turn to distribute cement and remove air bubbles. The pipe must seat to the bottom of the socket and fitting. Check alignment of the fitting. Pipe and fitting shall be aligned properly without strain to either.
   5. Hold joint still for approximately thirty (30) seconds and then wipe the excess cement from the pipe and fitting.
   6. Cure joint a minimum of thirty (30) minutes before handling and at least six (6) hours before allowing water in the pipe.

D. Threaded Joint:
   1. Field threading of plastic pipe or fittings is not permitted. Factory-formed threads only will be permitted.
   2. Factory made nipples shall be used wherever possible. Field cut threads in metallic pipe will be permitted only where absolutely necessary. When field threading, cut threads accurately on axis with sharp dies.
   3. All threaded joints shall be made up with joint compound. Apply compound to male threads only.
   4. Where assembling metallic pipe to metallic fitting or valve, not more than three (3) full threads shall show when joint is made up.
   5. Where assembling to threaded plastic fitting, take up joint no more than one full turn beyond hand tight.
   6. Where assembling soft metal (brass or copper) or plastic pipe, use strap type friction wrench only; do not use metal-jawed wrench.

E. Cap or plug openings as pipeline is assembled to prevent entrance of dirt or obstructions. Remove caps or plugs only when necessary to continue assembly.

F. Where pipes or control wires pass through sleeves, provide removable non-decaying plug at ends of sleeve to prevent entrance of earth.

3.6 REMOTE CONTROL VALVES

A. Install where shown on drawings and group together where practical. Limit one remote control valve per box. No exceptions!

B. Locate valve boxes 12" from and perpendicular to walk edges, buildings and walls. Provide 12" between valve boxes where valves are grouped together.

C. Thoroughly flush main line before installing valves.

D. Install in shrub or groundcover areas where possible.

E. Label control line wire at each valve with a 2 1/4" x 2 3/4" polyurethane I.D. tag, indicating identification number of valve (controller and station number). Attach label to control wire.

3.7 AUTOMATIC CONTROL WIRE

A. Run lines along mains wherever practical. Tie wires in bundles with pipe wrapping tape at 10' intervals and allow slack for contraction between strappings.

B. Loop a minimum of three (3) feet of extra wire in each valve box; both control wire and ground wire.

C. Connections shall be made by crimping bare wires with brass connectors and sealing with watertight resin sealer packs.

D. Splicing will be permitted only on runs exceeding 2500'. Locate all splices at valve locations within valve boxes.

E. Where control lines pass under paving, they shall pass through Schedule 40 electrical PVC conduit. Do not tape wire in bundles inside conduit.

3.8 AUTOMATIC CONTROLLER

A. Provide and install automatic irrigation controller in approximate locations shown on drawings. The exact location will be determined on the site by the Architect. Provide conduit and wire and connect to 120 volt switch accessible to controller for ease of maintenance.

B. Connect control lines to controller in sequential arrangement according to assigned identification number on valve. Each control line wire shall be labeled at controller with a permanent non-fading label indicating station number of valve controlled. Attach label to control wire.

3.9 SPRINKLER HEADS AND QUICK COUPLING VALVES

A. Thoroughly flush lines before installing heads or QCV's.

B. Locate heads and QCV's as shown in the drawings and details.

C. Adjust sprinkler heads for proper distribution and trim.

D. Install lawn heads 1" above grade in seeded lawn area at time of installation. Lower to finished grade after turf is well established and as directed by Architect.

3.10 BACKFILLING

A. Backfill only after piping has been tested, inspected and approved.

B. Backfill material shall be the earth excavated from the trenches, free from rocks, concrete chunks, and other foreign or coarse materials. Carefully select backfill that is to be placed next to plastic pipe to avoid any sharp objects which may damage the pipe.

C. All pipe under asphalt paving shall be backfilled with 4" of clean sand on all sides of pipe.

D. Place backfill materials in 6" layers and compact by jetting or tamping to a minimum compaction of 90 percent of original soil density.

E. Dress off areas to finish grades and remove excess soil, rocks or debris remaining after backfill is completed.

F. If settlement occurs along trenches, and adjustments in pipes, valves and sprinkler heads, soil, sod or paving are necessary to bring the system, soil, sod or paving to the proper level or the permanent grade, the Contractor, as part of the work under this contract, shall make all adjustments without extra cost to the Owner.

3.11 TESTING

A. Perform test as specified below. Remake any faulty joints with all new materials. Use of cement or caulking to seal leaks is absolutely prohibited.

B. The Contractor shall:
   1. Notify Architect at least three (3) days in advance of testing.
   2. Perform testing at his own expense.
   3. Center load piping with small amount of backfill to prevent arching or slipping under pressure. No fitting shall be covered.
   4. Apply the following tests after welded plastic pipe joints have cured at least 24 hours.
      a. Test live (constant pressure) and QCV lines hydrostatically at 125 PSI minimum. Lines will be approved if test pressure is maintained for six (6) hours. The lines shall be restored to the original test pressure and the amount of water required to do so shall be measured. Approved tables of allowable loss will be consulted, and the line will be approved or not approved as such results may indicate. The Contractor shall make tests and repairs as necessary until test conditions are met.
      b. Test RCV controlled lateral lines with water at line pressure and visually inspect for leaks. Retest after correcting defects.

3.12 GUARANTEE

A. It shall be the responsibility of the Contractor to fill and repair all depressions and replace all necessary lawn and planting due to the settlement of irrigation trenches for one year following completion and acceptance of the job.

B. The Contractor shall also guarantee all materials, equipment and workmanship furnished by him to be free of all defects of workmanship and materials, and shall agree to replace at his expense, at any time within one year after installation is accepted, any and all defective parts that may be found.

3.13 CLEAN-UP

A. When work of this section has been completed and at such other times as may be directed, remove all trash, debris, surplus materials and equipment from site.

END OF SECTION

SECTION 32 9119

LANDSCAPE GRADING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes the following:
   1. Weeding.
   2. Finish grading for lawns
   3. Finish grading for planting areas.

1.3 RELATED SECTIONS

A. Section 31 1000 "Site Preparation" for removal limits of trees, shrubs, and other plantings affected by new construction.

B. Section 31 0000 "Earthwork and Grading" for building and utility trench excavation, backfilling, compacting and grading requirements, and soil materials.

C. Section 31 1300 “Tree Protection & Trimming” for pruning and protection of existing site trees.

D. Section 32 1540 “Decomposed Granite Surfacing”.

E. Section 32 9300 "Landscaping" for tree and shrub planting, tree support systems, and soil materials.

1.4 DEFINITIONS

A. Finish Grading: finish grading shall consist of adjusting and finishing soil surfaces with site or imported topsoil, raking grades to a smooth, even, uniform plane. Remove and legally dispose of all extraneous matter off site. Facilitate natural run-off of water and establish grades and drainage indicated as part of the contract work.

B. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 3/4-inches (19 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

C. Finish Grading: Finish grading shall consist of finishing surfaces by raking smoothly and evenly to facilitate natural run-off water, and by removing and disposing of extraneous matter.

D. Sub-grade: The surfaces upon which additional specified materials are to be placed, prepared, or constructed.

E. Rough Grade: The establishment of grades to required tolerances.

F. Finish Grade: Spot elevations (grades) are indicated based on the best available data. Contract Civil Drawings are referenced to provide additional site grading information. It is intended that constant slopes are maintained between spot elevations.

G. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.5 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 EXISTING UTILITIES

A. Stake and mark the location of existing utilities before commencing work.

B. Retain and protect in operating condition all active utilities traversing the site designated to remain.

1.7 QUALITY ASSURANCE

A. Finish grade shall conform to contours, grades, lines, and shapes, as indicated on Contract Drawings, with uniform slopes between finish grades or between finish grades and existing grades.

B. Establish finish landscape grades in a continuous, uniform line, resulting in a uniform surface with no ridges or water pockets.

C. Finish landscape grade tolerance shall be 0.04-feet plus-or-minus from finish elevations indicated on site drawings.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Topsoil: A natural, fertile, friable soil, free from stones, excessive gravel, roots, clods larger than 1" in diameter, noxious seeds, weeds, subsoil, undesirable insects, plant disease or any other natural objects detrimental to normal plant growth.
   1. Silt plus clay content of the import soil shall not exceed 20% by weight with a minimum 95% passing 2.0-millimeter sieve.
   2. Total pore space content on a volume/volume basis shall be at least 15 percent at field capacity.
   3. Permeability rate shall be not less than one inch per hour or more than 20 inches per hour.
   4. The sodium absorption ratio (SAR) shall not exceed 6 and the electrical conductivity (ECe) shall not exceed 2.0 millimhos per centimeter at 25 degrees centigrade.
   5. Soluble boron shall be no greater than 1.0 part per million (mg/l).
   6. Soil pH range shall be 6.0 – 7.9.
   7. Maximum concentration of soluble chloride shall be 150 parts per million.
   8. Maximum concentration of heavy metals shall not exceed the following when the pH is between 6 and 7:
      a. Arsenic: 1 ppm
      b. Cadmium: 1 ppm
      c. Chromium: 5 ppm
      d. Cobalt: 1 ppm
      e. Lead: 15 ppm
      f. Mercury: 0.5 ppm

g. Nickel: 2.5 ppm
h. Selenium: 1.5 ppm
i. Silver: 0.25 ppm
j. Vanadium: 1.5 ppm

9. Petroleum hydrocarbons shall not exceed 100 mg/kg dry soil.
10. Aromatic volatile organic hydrocarbons shall not exceed 2 mg/kg dry soil.

B. Obtain imported topsoil from approved local sources.

C. Soil obtained from the Lot 10A stockpile shall not be placed or otherwise used in any way in landscape areas.

D. Spoils from demolition or ground up concrete buildings shall not be placed or otherwise used in any way in landscape areas.

E. All topsoil to be used for planting, regardless of whether import or on-site in origin, shall be tested as described in Part 3 of Section 32 9300 “Landscaping”.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of conditions: Prior to commencing the finish grading, review the installed work of other trades and verify that their work is complete.
1. Rough Grading: Grading in planting areas (except raised planter areas) shall be established to within plus or minus 0.10 foot prior to beginning of finish grading.

B. Import topsoil only when necessary to supplement site soil to achieve grades shown on Drawings, or if site soil is unsuitable for planting.

3.2 PREPARATION

A. Weeding: Before finish grading, weeds and grasses shall be dug out by the root or sprayed with an herbicide and disposed of off-site. This procedure is outlined in Section 32 9300 “Landscaping”.

B. Remove debris, roots, branches, weeds, stones, in excess of 3/4-inch (9 mm) in size and clumps of earth that do not break up. Before and during finish grading, remove weeds and grasses, including roots, and dispose off-site.

C. Remove soil contaminated with petroleum products and legally dispose off-site.

3.3 INSTALLATION

A. General: When rough grading and weeding have been completed, and the soil has dried sufficiently to be readily worked, lawn and planting areas shall be graded to the elevations indicated on the Drawings.
1. Grades indicated on Drawing are grades that will result after thorough settlement and compaction of the soil.
2. Grades not otherwise indicated shall be uniform finish grades and, if required, shall be made at the direction of the Architect.
3. Finish grades shall be smooth, even, and a uniform plane with no abrupt change of surfaces.
4. Soil areas adjacent to buildings shall slope away from the building to allow a natural run-off of water, and surface drainage shall be directed as indicated on the drawings by remodeling surfaces to facilitate the run off water at 2% minimum grade.
5. Low spots and pockets shall be graded to drain properly.

B. Drainage: Finish grade with proper slope to drains.
   1. Flow lines, designated or not, shall be graded and maintained to allow free flow of surface water.
   2. If any drainage problems arise during construction period due to Contractor's work (such as, but not limited to, low spots, slides, gullies and general erosion), the Contractor shall be responsible for repairing these areas to a condition equal to their original condition, and in so doing shall prevent further drainage problems from occurring.

C. Prior to placing backfill, remove rock, aggregate base, concrete, and deleterious materials to a depth of 18 inches below soil grade in planter areas. Cross-rip subsoil of friable soil to a depth of 12-inches.
   1. Place a minimum of 15-inchesof topsoil backfill in planters.
   2. Refer to Section 32 9300 “Landscaping” for soil materials.

D. Toe of slope: To prevent soil creep or erosion across pavement, where pavement (walk, curb, etc.) is at the toe of a slope, finish grade is to level out or swale slightly at least 12-inches before reaching pavement.

E. Moisture Content: The soil shall not be worked when the moisture content is so great that excessive compaction occurs, nor when it is so dry that dust may form in the air or that clods do not break readily. Water may be applied, if necessary, to provide moisture content for tilling and planting operations. It is the Contractor’s responsibility to control dust that is spread as a result of grading operations.

F. Grades: The finish grade in areas to be planted with turf shall be 1-inch below grade of adjacent pavement, walks, curbs, or headers. Finish grade in shrub areas shall be 1 1/2-inches below adjacent surfaces. Exceptions may be made when drainage conditions require flush grades, as directed by the Architect.

G. Compaction: Soils in planted areas shall be loose and friable, yet firm enough that no settling occurs from normal foot traffic or irrigation.

3.4 FIELD OBSERVATION

A. It is the Contractor's responsibility to contact the Architect 48 hours or two working days in advance of each agreed observation or conference.

B. Schedule for On-Site Reviews: at completion of finish grading and prior to any planting operations.
   1. See “Site Observation” in Part 3 of Section 32 9300 “Landscaping” to coordinate inspections and review of work.

END OF SECTION

SECTION 32 9300

LANDSCAPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Extent of landscape development work is shown on drawings and in schedules. The work includes, but is not limited to:
   1. Soil Prep and Fertilization.
   2. Planting Operation.
   3. Planting Materials.
   4. Topsoil and Planting Mix.
   5. Agronomic Testing.
   6. Drainage Materials.
   7. Jute Mesh and Erosion Control.
   8. Mulching.
   9. Pruning.
   10. Tree stabilization.
   11. Edgings.

1.3 RELATED SECTIONS

A. Section 05 5000 “Metal Fabrications” for miscellaneous sitework metal fabrications.
B. Section 31 0000 "Earthwork and Grading" for stockpiling of stripped topsoil.
C. Section 31 1300 “Tree Protection & Trimming” for pruning and protection of existing site trees.
D. Section 32 0190 “Landscape Maintenance” for maintenance work beyond Substantial Completion.
E. Section 32 8400 “Planting Irrigation” installation of underground piping and control systems.
F. Section 32 9119 “Landscape Grading” placement and treatment of topsoil over rough grade.

1.4 REFERENCES

A. American Association of Nurserymen, Inc. (AAN)
   1. American Standard for Nursery Stock, latest edition (ANSI).

1.5 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum laced as recommended by ANSI Z60.1.

C. Balled and Potted Stock: Exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of exterior plant required.

D. Bare-Root Stock: Exterior plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of exterior plant required.

E. Clump: Where three or more young trees were planted in a group and have grown together as a single tree having three or more main stems or trunks.

F. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of exterior plant required.

G. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted exterior plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of exterior plant.

H. Finish Grade: Elevation of finished surface of planting soil.

I. Sub-grade Elevations: Excavation, filling and grading required to establish elevations is shown on drawings. Coordinate all work with grading contractor in order to arrive at rough grades that will allow tolerance for topsoil in planting areas, soil amendments and ornamental mulch as required in other sections of this specification. Contractor to assume tolerance of rough grades established at ± 0.09 feet (less than 1 tenths of a foot)

J. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

K. Multi-Stem: Where three or more main stems arise from the ground from a single root crown or at a point right above the root crown.

L. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

M. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

N. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

O. Pruning: As designated on contract drawings. Items not specifically indicated or specified, but normally required to conform with such work, are considered part of the work.

1.6 SUBMITTALS

A. WITHIN 30 DAYS OF START OF THE PROJECT:
   1. Submit a certificate indicating all plant material has been secured for the project and is available.
   2. Submit documentation that all plant material has been ordered in accordance with Article 1.7 of this section.

B. CERTIFICATION: Submit the following:
   1. Certificates of inspection as required by governmental authorities when transporting materials into the state.
   2. Agronomic Soils Laboratory Test Report.
   3. In accordance with Section 01 3219, submit complete manufacturer descriptive literature and specifications for proprietary materials and any additional items required by the Architect.

a. Soil Amendments (as identified in Agronomic Soils Report – Part 2).
b. Fertilizer (as identified in Agronomic Soils Report).
c. Stakes.
d. Tree Ties and Vine Ties.
e. Seed Mixtures
f. Hydroseeding: Furnish certificate, in writing, stating that the hydroseeding has been installed as specified.
g. Accessory Material.
h. Other soil additives per Agronomic Soils Report.
i. Prior to start of construction and submittals, furnish to the Architect the list of items to be reviewed.

4. Submit other data substantiating that materials comply with specified requirements. Such certificates may be tags, labels, and/or manufacturers literature. All submittals shall be reviewed and accepted by the Architect before contractor begins work.
5. Substitution Request
   a. If any plant specified is not obtainable, submit a written substitution request to the Architect during the bidding period.
   b. Substitutions of plant material will not be permitted unless accepted in advance in accordance with the provisions of Section 01 3219.
6. With submittal of Bid Documents, submit complete list of plant materials to be provided, including unit prices for plants and for installation. Include:
   a. Quantity.
   b. Size.
   c. Botanical Name.
   d. Plant Unit Price.
   e. Installation Unit Price.
7. Bulk Materials: Submit a certificate of delivery for all material in containers or bulk.

C. PLANTING SCHEDULE: Submit proposed planting schedule at least two weeks prior to planting any materials, indicating dates for each type of landscape work coinciding with normal seasons for such work. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. If dates need to be revised after acceptance of planting schedule, document reasons for delays and submit for acceptance.

D. Submit two photos of each tree with a person in the image, as well as a representative photo of each shrub/groundcover to be used on the project to the architect for review. No plants may be delivered or planted prior to approval by Architect.

1.7 QUALITY ASSURANCE

A. QUALIFICATIONS
1. Nursery Qualifications: Regularly engaged, for the preceding ten years, in the production of planting materials equivalent in species and size to those required.
2. Stocked, and having a demonstrated ability to provide plant materials required within the constraints of the accepted construction schedule.
3. Landscaper's Qualifications: Regularly engaged and specializing, for the preceding ten years, in the installation and maintenance of planting materials equivalent in species and size to those required.
   a. Capable of furnishing a verifiable list of not less than five projects of equivalent type successfully completed within the preceding two years.
   b. Subcontracts: Landscape work to a single firm specializing in landscape installation.

B. Pre-Installation Conference: Schedule in advance of beginning work of this section. Arrange for attendance by Owner, Architect, and landscaping subcontractor. Review intent of Contract Documents and resolve conflicts. Prepare minutes of conference and distribute to attendees within five (5) days.

C. SOURCE QUALITY CONTROL
   1. General: Comply with regulations applicable to shipping of landscape materials.
   2. Analysis and Standards: All materials shall be of standard, approved and first-grade quality and shall be in prime condition when installed and accepted. Any commercially processed or packaged material shall be delivered to the site in the original unopened container bearing the manufacture's guaranteed analysis. The Contractor shall supply the Architect with a sample of all materials accompanied by analytical data from a approved laboratory source illustrating compliance of bearing the manufactures guaranteed analysis.

D. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

E. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
   1. Report suitability of topsoil for plant growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.

F. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 3/4-inches (19 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
   1. Obtain topsoil only from naturally, well drained sites where topsoil occurs in a depth of not less than 4"; do not obtain from bogs or marshes. All topsoil is to be tested and analyzed by an independent laboratory before delivery to site, as indicated in Article 3.3.
   2. Obtain imported topsoil from approved local sources.
   3. Soil obtained from the Lot 10A stockpile shall not be placed or otherwise used in any way in landscape areas.
   4. Spoils from demolition or ground up concrete buildings shall not be placed, or otherwise used in landscape areas.
   5. Refer to Section 32 9119 for topsoil specifications.

G. Contractor shall provide the Architect with location of soil, crops previously planted on such soil within the last two years, and the USGS soil survey classification and name.

H. Trees, Shrubs and Plants: Provide trees, shrubs and plants of quantity, size, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1-1980 "American Standard for Nursery Stock". Provide healthy, vigorous stock, grown in recognized nursery in accordance with good horticultural practice and free from disease, insects, insect eggs, larvae and defects such as knots, sun-scald, injuries, abrasions, overlapping surface roots, or disfigurement. Central leaders of all trees shall be intact, undamaged, with evenly spaced lateral branches.
   1. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches (150 mm) above the ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

I. Label all trees and shrubs with securely attached waterproof tag bearing legible designation of botanical and common name. Where formal arrangements and consecutive order of trees is shown, select stock for uniform height/spread, and label with number to assure symmetry in planting.

J. Stock Review: The Architect will review trees and shrubs either at place of growth or at site before planting at his option, for compliance with requirements for genus, species, variety, size and quality. The Architect retains right to further review trees and shrubs for size and condition of balls and root systems, insects,

injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of the work. Remove rejected vegetation immediately from project site. Contractor shall request review of such stock by the Architect by delivering notice, in writing, 72 hours in advance.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver exterior plants freshly dug.
   1. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.

B. Packaged Materials: Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.
   1. Protect plants from sun or drying winds. Protect and maintain plants that cannot be planted immediately upon delivery.
   2. Do not drop plant material.
   3. Do not pick up container plant material by stems or trunks.
   4. Protect from wind.
   5. Water as required.

C. Do not prune trees and shrubs before delivery except as approved by Architect. Do not bend or bind trees or shrubs in such manner as to damage bark, break branches or destroy natural shape. Provide protective covering during delivery, and provide protection on site from traffic, pedestrians, and deleterious effects of climate while planting operations are in progress. Dropped or damaged stock will not be accepted.

D. Deliver trees and shrubs after preparations for planting have been completed and plant immediately after approval of plant materials locations. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture. Do not remove container grown stock from containers until planting time.

E. Do not pick up plants by stems or truck. Handle planting stock by root ball.

F. Plant material shall not be stored on the jobsite for more than 48 hours before planting. Contractor shall schedule nursery deliveries in sub-groups as necessary to comply with this requirement.

G. All trees are pre-tagged and available through the Nursery.

H. Deliver accessory materials in manufacturer's original, unopened packaging with identifying labels affixed and legible in accordance with state law. Deliver plants with identifying tags affixed. Contractor shall notify Architect 48 hours in advance of plant material delivery for observation. Review plants with Architect to confirm that they are the plants which had previously been tagged and supplied. The Architect reserves the right to reject the following:
   1. Plant materials not identifiable as previously selected.
   2. Materials not accompanied by required certificates.
   3. Plant materials where damage to rootball, trunks, or desiccation of leaves has been caused by inadequate protection during delivery.
   4. Plant material not matching the form, shape, or growth habit required for the design intent of the Project.
   5. Horticultural or visual defects in material.

1.9 Project CONDITIONS

A. Proceed with and complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required.
   1. Plant or install materials during normal planting seasons for each type of landscape work required.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed without having detrimental effects on the plant material, or finished product.

C. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns unless otherwise acceptable to Architect.
   1. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

D. Contractor shall verify locations of all existing utilities, whether shown on plans or not. The Contractor shall notify members of Underground Service Alert (U.S.A.) two (2) working days in advance of performing any excavation work by calling the toll-free number 1-800-227-2600

E. After determining location of underground utilities, perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

F. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify the Architect before planting. Remove all material deemed unsuitable for plant growth as directed by the Architect.

G. No landscape materials may be planted before an irrigation operation and coverage test is completed and approved by the Architect.

H. No landscape materials may be planted before finish grade is inspected and approved by the Architect.

1.10 SCHEDULING

A. Within one month after the commencement of initial grading, furnish documentation to the Architect that all plant material has been obtained. Contractor shall be responsible for payments required by the grower to secure, maintain, and grow plant material indicated on the Contract Drawings.

1.11 WARRANTY

A. Warrant plant material, shrubs and trees installed, or relocated under the contract, in writing, for a period of one year (after beginning of maintenance period) against defects including death, and unsatisfactory growth, except for defects resulting from neglect, abuse or damage by others, or unusual phenomena or incidents which are beyond landscape installer's control, as determined by the Architect.

B. Remove and replace trees, shrubs or other plants found to be dead, yellowing, defoliating, or in unhealthy condition, or other defective materials during warranty period at no additional cost to the Owner. Replace trees and shrubs, which in the opinion of the Architect, are in unhealthy condition at end of warranty period. The Architect shall be the sole judge as to the condition of the material. All replacement materials and installation shall comply to the drawings and specifications. Another inspection will be conducted at end of warranty period to determine acceptance or rejection.

C. Upon receipt of written notice from Owner of the loss of any warranted plant materials during the warranty period, the subject plant materials shall be promptly replaced with the same species originally planted, and of a size closely approximating the size of the plant, if normal growth had occurred since the original planting. Replacements shall be subject to the requirements of this specification.

D. When plants are replaced, advise the Owner, in writing, of the new establishment maintenance period.

E. Plant material must be replaced within fifteen (15) days of written notification, and shall be installed in accordance with these specifications.

F. Refer to Section 32 0190 “Landscape Maintenance” for maintenance work beyond Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design is based on the use of products manufactured by the following:
1. Best Fertilizer Company, Lathrop, CA
2. Cabot Stains, Samuel Cabot, Inc. Newburyport, MA 508-465-1900.
3. Cascade Rock, Sacramento, CA 916-383-1300.
4. Curlex Erosion Control Fabric, American Excelsior CO 800-777-7645.
5. Deep Root Corporation, Burlington, CA 800-458-7668.
6. Fore Sight Products, Inc. Commerce City, CO 800-925-5360.
7. Greenstake USA, 877-205-2400
8. Horizon, Roseville, CA 916-780-2033.
9. Landscape Forms, represented by John Towns Associates 800-222-6036.
10. Mirafi, Inc. Charlotte, NC., 800-438-1855.
11. NDS Drainage Products, 800-726-1998.
12. Pacific Sod, Patterson, CA 800-542-7633.
13. S&S Seeds, Camarillo, CA 805-684-0436.
14. Silverado Building Material, Sacramento, CA 916-361-7374.
15. Stabilizer, Inc. Phoenix, AZ 800-336-2468.
16. Stoneware, Carson City, NV 800-297-8663.
17. Sunland Analytical Labs, Rancho Cordova, CA 916-852-8557.
18. V.I.T. Company, Escondido, CA 760-480-6702.
19. Wayside Lumber, Rancho Cordova, CA 916-635-9090.
20. Whitecap, Inc. Rancho Cordova, CA 916-636-3215.
21. EPIC Plastics, Cerritos, CA 562-403-3848.
22. Redi-row Corporation, Sacramento, CA 800-654-4358.

B. Materials shall be the products of one manufacturer and shall be either the ones upon which the design is based, or the products of manufacturer accepted in advance in accordance with Division 01 Section Submittal Procedures.

2.2 SOIL

A. TOPSOIL: Site to be rough graded to elevations shown on Civil Drawings. Topsoil will be required behind curb areas and in planting area. Provide on-site, import, or non-processed topsoil in planting areas as needed to complete rough grading which is fertile, friable, and natural loam in accordance with Article 2.3. Topsoil shall be from agricultural sources, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 3/4-inch in any dimension, and other extraneous or toxic matter harmful to plant growth.

B. All topsoil to be used for planting, regardless of whether import or on-site in origin, shall be tested as described in Part 3 of this Section.

C. Refer to Section 32 9119 for topsoil specifications

2.3 SOIL AMENDMENTS

A. On Grade:

1. The initial application of fertilizers and amendments to be tilled into the soil during soil preparation operations shall be established after soil testing has been conducted by Contractor. An estimated quantity is indicated below for bid purposes only. This estimated quantity does not include mulching, fertilizer tablets, additional topsoil necessary to meet specified grades and fertilizer applications for after planting. After soils analysis recommendations are made to the Architect quantifying the actual amount of amendments required and recommendations have been accepted by the Architect, the Contractor shall, without delay, determine any cost impacts whether credit, no change, or addition, to the Contract Amount. As an integral part of the bid for Landscape Work, provide a Lump Sum bid amount for fertilizers and amendments as described below.
2. Application Rates (FOR BID PURPOSES ONLY):
    a. Sixty (60) lbs. of Tri-C Humate per 1,000 square feet.
    b. Nineteen (19) lbs. of 6-20-20 fertilizer per 1,000 square feet.
    c. Six (6) cubic yards of Aguiñaga GPS2, nitrogen stabilized compost per 1,000 square feet.
    d. 50-lbs Agricultural Gypsum, per 1,000 square feet.

B. Pot Soil Mix:: Prepare and backfill pots with a mix of the following per cubic yard:
1. Jardinier Capillary Soil
2. 12-12-12 Commercial Fertilizer
3. Organic Amendment - 1/3 cubic yard
4. Fine Sand - 1/3 cubic yard
5. 12-12-12 Commercial Fertilizer - 1 pound
6. Iron Sulfate - 2 pounds

C. Imported Topsoil
1. Provide natural, fertile, friable soil free from stones, noxious weeds, seeds, roots, subsoil or other material detrimental to normal plant growth. Topsoil acidity range (pH) shall be between 6.5 to 7.5 containing a minimum of 4 percent and a maximum of 25 percent organic matter.
2. Obtain imported topsoil from local sources acceptable to the Architect.
3. Silt plus clay content of soil shall not exceed 15 percent by weight with a minimum 95 percent passing a 2-millimeter sieve.
4. Soil obtained from the Lot 10A stockpile shall not be placed or otherwise used in any way in landscape areas.
5. Spoils from demolition or ground up concrete buildings shall not be placed, or otherwise used in landscape areas.
6. Refer to Section 32 9119 for topsoil specifications.

D. After soils testing is completed, amendment and/or fertilizer recommendations may include one or more of the following:
1. Nitrified Redwood Compost: 0.56 to 0.84% N based on dry weight, treated with relative form of nitrogen (NH3).
    a. Particle Size
    b. 95% - 100% passing 6.35 mm standard sieve.
    c. 80% - 100% passing 2.33mm standard sieve.
    d. Salinity: The saturation extract conductivity shall not exceed 3.5 millimhos/centimeter at 25 degrees (25N) centigrade as determined by saturation extract method.
    e. Iron Content: Minimum 0.08% dilute acid soluble Fe on dry weight basis.
    f. Ash: 0 - 6.0% (dry weight)
    g. Acidity range (ph) shall be between 5.5 and 7.5.
    h. Actual organic content shall be a minimum 280 pounds (lbs.) per cubic yard.
    i. As available from:
        Redi-Grow Corporation
        8909 Elder Creek Road
        Sacramento, CA 95828
        (916) 381-6063
        (800) 654-4358

E. Fertilizers
   1. Tri-C Humate. Provide per manufacturers specification.
   2. Fertilizer Tablets: Fertilizer Tablets: The following is to be used in the planting of container grown material. Follow manufacturer's application rates.
      a. Best-Paks “20-10-5" fertilizer packets. Packets to be made up of a minimum of 20% Nitrogen, 10% Phosphorus, 5% Potash. Use 1 Pak per 1-gallon container, (G.C.), 3 Paks per 5 G.C., 9 Paks per 15 G.C. and 12 Paks per boxed specimen. Evenly distribute as shown in details.
   3. Commercial Fertilizer: First Quality Commercial Fertilizer, as specificed in Agronomic Soils Report.
   4. Related Materials:
      a. Pre-Planting Herbicide: Round-up, or equal.
      b. Pre-Emergent Weed Control: Ronstar-G, Treflan, Eptam, Vegitex, or equal.
      c. Organic Soil Amendment:
      d. Peat Moss: Sphagnum peat moss, Canadian or European variety., free from alkali.
      e. Soil Sulfur: First quality commercial grade.
      f. Ferrous Iron Sulfate: Chelated first quality commercial grade.
      g. Agricultural Gypsum: First quality commercial grade.
      h. Best “Ammonium Phosphate” 16-20-0 with net less than 16% total nitrogen, 20% available phosphoric acid and 0% soluble potash.
      i. Good Humus:
      j. Root Hormone: Super Thrive.

2.4 PLANT MATERIALS

A. Furnish trees from the Nursery that have been pre-selected and pre-tagged by Architect.

B. Quality: Provide trees, shrubs, and other plants of size, form, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock".

C. Deciduous Trees: Provide trees of height and caliper scheduled or shown and with branching configuration recommended by ANSI Z60.1 for type and species required. Provide single stem trees except where special forms are shown or listed.
   1. Lateral scaffolds shall be radially distributed around the trunk. The lateral branch shall be no more than 2/3 the diameter of the trunk. Trunk to be measured 1" above the branch (lateral scaffold).
   2. The minimum acceptable length of the most recent season's shoot growth for slow growing trees shall be not less than 8"; for fast growing trees not less than 12".
   3. The minimum acceptable height of 15 gallon size trees is 6’-0” when planted, or as determined by Architect.

D. Needle Leafed And Broad Leafed Evergreen Trees: Provide evergreens of sizes shown or listed. Where dimensions are shown, they indicate minimum spread for spreading and semi-spreading type evergreens and height for other types, such as globe, dwarf, cone, pyramidal, broad upright, and columnar. Provide normal quality evergreens with well-balanced form complying with requirements for other size relationships to the primary dimension shown.
   1. The minimum acceptable height of 15 gallon size trees is 6’-0” when planted, or as determined by Architect.

E. Multi-Trunk Trees: Provide sizes shown or listed. Tree is to have a minimum of three (3) dominant trunks with appropriate caliper size and adequate spread.

F. Shrubs: Provide shrubs of the size shown and with not less than the minimum number of canes required by ANSI Z60.1 for type of shrub required. Provide container grown stock.

G. Ground Cover: Provide plants established and well-rooted in removable containers, in flats, or integral peat pots and with not less than minimum number and length of runners required by ANSI Z60.1 for the size shown or listed.

H. Vines: Provide vines with good, well-established root systems within the container, and devoid of any abrasions, and or damage to stem.

2.5 SOD

A. Lawn Sod:
1. Nursery-grown sod shall have the following characteristics:
   a. Sod shall be dense, healthy, field-grown on fumigated soil with the grass having been mowed at 1-inch height before lifting from field.
   b. Sod shall be dark green in color, relatively free of thatch, free from disease, weeds and harmful insects.
   c. Sod shall be reasonably free of objectionable grassy and broadleaf weeds. Sod shall be considered weed free if no more than 10 such weeds are found per 100 square feet of sod.
   d. Sod shall be rejected if found to contain the following weeds: common bermudagrass, quackgrass, johnsongrass, nimbleweed, thistle, bindweek, bentgrass, perennial sorrel, and bromegrass.
2. Sod variety shall be:
   a. Medallion Plus 90% Tall Fescue/10% Bluegrass Blend, as produced by Pacific Sod.
   b. No Mow Fine Fescue Blend, as produced by Pacific Sod.

B. Lawn Seed:
1. Turf Grass: Seed mix shall consist of 90% Shortstop II Dwarf Fescue and 10% Nustar Kentucky Bluegrass at a rate of 523/ lbs/acre.
2. As indicated on Contract Drawings.

2.6 TREE GRATES

A. Tree Grates and Frames: ASTM A 48/A 48M, Class 35 (Class 250) or better, gray-iron castings and ASTM A 36/A 36M steel-angle frames of shape, pattern, and size indicated; steel frames hot-dip galvanized.

B. Shape and Size: As indicated.

C. Finish: Powder-coat finish.
1. Color: Low-gloss black.

2.7 MISCELLANEOUS LANDSCAPE MATERIALS:

A. Tree Stakes: Provide stakes of sound new lodgepole pine 2" minimum diameter with minimum height, as indicated on Contract Drawings. Stakes shall have been treated with copper napthanate to a minimum wood depth of 1/16". All stakes shall be free of knots larger then 1/2" in diameter, holes and other defects.

B. Tree Straps: Provide VIT "Cinch-tie" tree straps. Tree straps shall be attached to tree stake as shown in staking detail on the plans, color to be black.
1. Provide for 24-inch box size and smaller tree.
2. 36-inch box size and larger tree; provide VIT “Cinch-Belt” tree straps.

C. Vine Ties: Plastic vine ties, as specified on plans.

D. Guying Materials
1. At On-Grade Planting:
   a. Guy Wire: No. 9 gage, galvanized, twisted clothesline type.

b. Anchor System: Duckbill Earth Anchor System, as manufactured by Fore Site Products, Inc.
   1) Box trees, sizes 24-inch box to 72-inch box: Model 68 DTS.
   2) Box trees, sizes 84-inch and larger: Model 88 DTS.
c. Hose: White neoprene hose, 3/4-inch diameter, covering the entire length of wire.

2. At Raised Planters:
   a. Guy Wire: No 9 gage, galvanized, twisted clothesline type.
   b. Anchors for Holding Guys: 1-inch galvanized eyebolt with lead expansion shield.
   c. Hose: White neoprene hose, 3/4-inch diameter, covering the entire length of wire.
3. Turnbuckle: 51/16 inches by 6 inches long galvanized steel type.

E. Headerboards And Edging
1. Wood Polymer
   a. All wood used shall be "Trex" or “EPIC Plastics” wood-polymer lumber.
   b. Headerboards shall be:
      1) 2" x 6" (for straight runs)
      2) 1" x 6", double thickness (for smooth curves)
   c. Splices shall be made with 1" x 6" not less than 12" in length.
   d. Stakes shall be made with 1" x 3" x 16" or 1” x 2” x 18”.
   e. 1¼”, #8 plated deck screws.
   f. Refer to manufacturer’s literature for product handling and installation.
   g. Backing at splices, 1” x 4”.
2. Concrete edger: Dimension as specified on plans, poured in place concrete edger, color per plan.
3. Steel Edge Restraint for Decomposed Granite Walk or Landscape Areas:
   a. Available Manufacturers and Products: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
      1) Pave Tech, Inc.
      2) J.T. Ryerson & Son, Inc.
      3) Or equal (no known equal)
   b. Material: Steel.
   c. Size: 1/4" x 5".
   d. Color: Black.
   e. Stakes: 4 foot maximum spacing.
4. Aluminum: Black anodized finish aluminum with 12-inch long aluminum stakes. Cleanline, as manufactured by Permaloc Corporation.

F. Mulch
1. Rock Mulch: Washed drain rock blend consisting of 1-1/2 to 3 inch diameter cobbles. Place 8” minimum depth on top of Mirafi 14ON weed control fabric.
2. Bark Mulch:
   a. Mulch shall be walk-on fir bark mulch. (Shredded bark is not acceptable).
      1) Physical properties:

         <u>Percent Passing Sieve Size</u>
         90-100 1” (25.4mm)Dia.
         80-100 1/2" (12.7mm)Dia.
         20-60 1/4" (6.35mm)Dia.

      2) Chemistry
         a) Acid in reaction, max pH 5.0.
         b) Maximum ash Chemistry: 7% based on dry weight.
         c) Minimum moisture 35% at time of delivery based on fresh weight.
      3) As available from Redi-Grow Corporation, Sacramento, CA.

G. Weed Control Fabric: Place Mirafi Mirascape landscape fabric below rock mulch or as shown on drawings. Overlap all seams 12" minimum and pin down every 36" typical. Mirascape fabric available from: Towns & Associates, 800-222-6036

H. Root Control Barriers: High-density polyproylene root control barriers. Acceptable products include:
   1. Deep Root; Deep Root Corporation.
   2. Install per manufactures details.

I. Drainage Materials
   1. Gravel in raised planters on structural slab and in pots shall be clean, coarse 3/8-inch to 3/4-inch diameter.
   2. Synthetic filter membrane cover over drainage course shall be woven synthetic fabrics.
      a. Model 140N, as manufactured by Mirafi.
   3. Drain Pipe: 4-inch diameter NDS styrene perforated, or non-perforated PVC drain pipe with 4-inch black ABS cleanout plug and 4-inch styrene female adapter.

J. Sand: Washed plaster sand.

K. Jute Netting: A uniform open plan weave, single jute yarn not varying in thickness by more than 1/2 of its normal diameter, in rolled strips approximately 50 to 75 yards long and 50 to 60 inches wide. Contractor shall submit sample for approval prior to installation.
   1. Staples: 11 gage with 1-inch top and 6-inch legs.

L. Sod Pegs: 1-inch square by 6-inch long pine or 6-inch lengths of lath.

M. Weed Control: Round-up, Rodeo, or equal.

N. Landscape Drainage System:
   1. Catch Basin: NDS Model #1200 12x12 catch basin; black color with NDS #1217 riser extension as necessary.
   2. Grate: NDS Model #1290 atrium grate in planting area, NDS Model #1211 in turf area; black color.
   3. Outlet adapter: NDS Model#1266 universal outlet; as necessary. NDS Model #1206 universal plug; as necessary.
   4. Pipe: PVC (Polyvinyl Chloride) Sewer Pipe and Fittings: ASTM D 3034, SDR 35, for solvent cement.
   5. Solvent Cement: ASTM D 2564.

O. Hydromulch Bonded Fiber Matrix (BFM)
   1. The BFM shall be Hydro-Blankt GFM as manufactured by Profile Products LLC. 1-866-325-6262, www.profileproducts.com.
   2. Uniformly apply at a rate of 3500 pounds per acre. Install per manufacturers instruction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected, and Architect has reviewed and accepted materials as defined within the section.

3.2 SITE OBSERVATION SCHEDULE

A. General: Notify Architect at least 48 hours in advance when requesting on-site reviews.

B. Prior to commencement of site visits, items noted in previous observation reports shall have been either completed or remedied, unless such compliance has been waived. Failure to complete prior tasks or failure

to prepare adequately for scheduled observations shall obligate Contractor to reimburse Architect for additional hourly services, plus transportation costs.

C. Schedule For On-Site Reviews by the Landscape Architect:
   1. Pre-construction conference with general contractor, grading contractor, landscape contractor, project arborist and landscape architect to discuss grading and protective measures to be followed in the vicinity of existing trees, or existing structures.
   2. Review of soil sampling.
   3. At completion of finish grading, and roto-tilling prior to installation of any planting material.
   4. Review of irrigation coverage prior to installation of any planting material.
   5. At completion of fine grading and at delivery of plant materials, together with plant layout; prior to excavating pits.
   6. Review of drainage system, standpipes, and plant material locations.
   7. After planting pits have been excavated, but prior to backfilling.
   8. After initial planting operations (One tree with each type of specified staking shall be approved prior to planting of trees).

D. See “Final Review and Acceptance” at the end of Part 3 in this Section for final site observations and acceptance of work.

3.3 TESTING

A. Planting Soil: Agronomic Soil Testing
   1. Test shall be paid for by the Contractor. Testing lab shall be:
      a. Wallace Labs.
      b. Soil and Plant Labs.
      c. Sunland Analytical Labs.
   2. Agronomic Soils Testing
      a. Take four samples of site soil at a depth of 6 to 12 inches, within proposed planting areas, after completion of final grading and prior to weed control and soil preparation. See Plans for sampling locations.
      b. Take samples to agronomic soils testing laboratory indicated above for soil evaluation.
      c. Request testing for fertility and suitability analysis with written recommendations for soil amendment, fertilizer and chemical conditioners, application rates for soil preparation, planting backfill mix, pot-soil mix, hydrospray, and post-maintenance fertilization programs. Test shall specify the rate of grow power or TRI-C Humate.
      d. Soils report recommendations shall take precedence over the amendment and fertilizer application rates specified in this section.
      e. Submit testing laboratory’s interpretation, recommendations, and comments to Architect within 14 days after the completion of rough grading.
   3. Furnish a soils analysis of import soil, and organic soil amendment prior to backfill.
      a. Submit soil testing laboratory’s findings to Architect within 5 days prior to backfilling.
   4. Take four additional soil samples after completion of planting in the soil preparation and backfill mix areas, to be determine effectiveness to amendments prior and during planting. Submit to the testing laboratory the original amendment specification with previously issued bulletins for soil amendments and installation procedures. Re-apply necessary amendments based on recommendation of new soils test.

3.4 PREPARATION

A. Final Grades
   1. Finished grading shall insure proper drainage of the site. Conform to Section 31 0000 "Earthwork and Grading" and Section 32 9119 “Landscape Grading”.
   2. The following areas shall be graded so that the final grades shall be established below adjacent paved areas, sidewalks, valve boxes, headers, clean outs, drains, manholes, etc. as follows:

a. Shrub/Groundcover Areas: 1-1/2 inches.
b. Turf areas: 1-inch.

3. Surface drainage shall be away from all building foundations, 2% minimum.
4. Dispose of excess or unacceptable soil from the site at no expense to the Owner.
5. Verify that final grades have been established prior to beginning planting operations.

B. Parking Lot Planting areas
1. All aggregate base rock, soil sterilents, lime treated soil, and other non-organic materials shall be removed from all parking lot planting areas down to the level of native soil. Backfill planting areas to specified finish grade with native or approved topsoil and amend as specified.

C. Protect planting areas from compaction by trucks and heavy equipment.

3.5 Planting Bed Establishment

A. Preparation Of Planting Area
1. Cross-rip on-grade planting areas to a minimum depth of 12 inches. Remove stones over 1 inch (13mm) in any dimension and sticks, roots, rubbish and other deleterious matter per Section 32 9119 "Landscape Grading".
2. Where additional soil is needed, place approximately ½ of total amount of topsoil required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil.
3. Broadcast soil amendments uniformly over surface of the area to be treated. Roto-till the top eight inches (8") of planting areas to evenly distribute the amendments and conditioners into the soil.
4. Leach soil prior to amending. After approximate finished grades have been established, and soil has been leached, soil shall be conditioned and fertilized in the following manner. Soil conditioner shall, at the rate specified in the approved soils test recommendations, be uniformly spread and cultivated thoroughly by means of mechanical tiller into the top eight inches (8") of soil.
5. All soil areas shall be compacted and settled by application of irrigation to a minimum depth of six (6) inches prior to any plant materials being installed.
6. At time of planting, the top 12 inches of all areas to be planted shall be free of stones, stumps, or other deleterious matter one 1-inch in diameter or larger, and shall be free from all debris, or similar objects that would be a hindrance to planting and maintenance.

B. Weed Control: All planting areas, both turf and shrub/groundcover shall be weed free at the time of plant material installation.
1. Irrigate all areas to be planted for one week prior to spraying herbicide.
2. Apply herbicide to actively growing weeds, in warm, sunny weather if possible. Avoid overspray onto non-target plant material. Follow manufacturer's recommendations for mixing and application of herbicide.
3. Spray all planting areas with Roundup (Glyphosate) or approved equal to kill all weeds per manufacturer's instructions.
4. Irrigate all areas to be planted an additional two weeks to germinate any residual weed seed.
5. Apply a second application of Roundup (Glyphosate) or approved equal to all planting areas.
6. Planting can begin 48-hours after the second application has been completed.
7. Pre-planting Herbicide: Apply pre-planting herbicide to visible weeds, before and after soil placement.
8. Pre-emergent Weed Control: Immediately after planting, apply pre-emergent weed control to planted areas which will not be seeded.

C. Excavation For Trees And Shrubs
1. Excavate pits, beds, and trenches as shown in details on the drawings.

D. Preparation for Lawn Areas: Limit preparation to areas which will be planted promptly after preparation.

1. Fine grade lawn areas to smooth, even surface with loose, uniformly fine texture. Roll, rake and drag lawn areas, remove ridges and fill depressions, as required to meet finish grades. Establish smooth uniform surface. Limit fine grading to areas which can be planted immediately after grading.
2. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not create a muddy soil condition.

E. Restore lawn areas to specified conditions if eroded or otherwise disturbed after fine grading and prior to planting.

3.6 JUTE MESH

A. Make check slots before the netting is rolled out. Dig a narrow trench across the slope perpendicular to the direction of the flow. Fold jute, the same length as the trench, and press together. Location of check slots shall be maximum of 50 feet apart.

B. Installation: Roll netting parallel to slope contours. The netting shall completely cover all areas as indicated on Contract Drawings. Overlaps shall be ample and well stapled.
1. Lay netting smoothly, and in continuous contact with the soil surface at all points.
2. Install without stretching. Where one roll of netting ends and a second roll starts, the up slope piece shall be brought over the buried end of the second roll so that there is a 12-inch overlap. Where two or more widths of netting are applied, side by side, the overlap shall be not less than 3 inches.

C. Staple overlapping edges that run parallel to the direction of the flow at 2-inch intervals. Outside edges, centers, and overlaps on banks shall be stapled across the slope at 6-inch intervals.

D. Top dress jute netting area with a thin layer of topsoil. After the top dressing, the yarns shall still be visible.

E. Spread loose topsoils over outside edges of netting to allow for smooth entry of water.

F. Clods that hold the jute off the ground shall be stamped into the soil. Force jute netting down into depressions and hold there with a staple.

G. Install plant material through netting.

H. Place bark mulch over the top of jute netting.

I. Maintenance: Maintain jute netting until work on the Project has been completed and accepted and during the 90-day maintenance period. Maintenance shall consist of the repair of eroded areas and the repair or replacement and re-stapling of loose or undermined netting. Replace damaged planting materials as required.

J. Install jute netting in all areas of 30 percent slope or greater.

3.7 SOD

A. Sod shall be laid with closely fitted joints on a smooth, level surface which has been prepared as previously specified. Ends of strips shall be staggered. On irregular areas, sod shall be laid in both directions from the longest straight line that can be drawn through the area.

B. After a light initial watering immediately after installation, the sod shall be rolled to eliminate all irregularities.

C. After compaction, the sodded area shall be wetted to a soil depth of at least 8 inches.

D. Sod shall be as specified on the Contract Drawings

3.8 HYDRO-MULCH / HYDRO-SEED

A. Hydromulch & Hydroseeding
   1. Examination:
      a. Verify that soil is prepared and fine graded in accordance with Division 02 “Finish Grading”..
      b. Verify that large trees and shrubs (5-gallon and larger) are installed if they occur in hydroseeded area.
      c. Verify that small trees and shrubs (1-gallon) and groundcover from flats are installed if they occur in hydroseeded area.
   2. Hydroseeding Operation:
      a. Before filling tanks, completely clean tank of seed and debris in the presence of, and to the satisfaction of, the Architect.
      b. Mixes shall be as indicated in Plant Legend on Contract Drawings.
      c. Hydroseeded areas shall be applied by an approved hydromulch company.
      d. The hydromulch shall be applied in the form of a slurry consisting of cellulose fiber, seed, chemical additives, commercial fertilizer, and water. When hydraulically sprayed on the surface, the hydromulching shall form a blotter-like groundcover impregnated uniformly with seed and fertilizer and shall allow the absorption of moisture and rainfall to percolate to the underlying soil.
      e. Preparation: The slurry preparation shall take place at the site and shall begin by adding water to the tank when the engine is half throttle. When the water level has reached the height of the agitator shaft, full re-circulation shall be established. At this time, the seed shall be added, followed by fertilizer and then mulch.
         1) The mulch shall only be added to the mixture after the seed and the tank is at least one-third filled with water. The mulch shall be added by the time the tank is two-thirds to three-fourths full. Spraying shall commence immediately when the tank is full.
      f. Application: The operator shall spray with a uniform visible coat by using the green color of the mulch as a guide. The slurry shall be applied 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 rate per acre.
      g. Time Limit: Slurry mixture that has not been applied within 2 hours after mixing shall be removed from the project and disposed of in a legal manner.
      h. Daily work sheets shall be prepared by nozzlemen. One copy shall be sent to the Architect. This worksheet shall be signed by the nozzleman and the Architect. The following information shall be indicated:
         1) Seed: Type and amount.
         2) Fertilizer: Analysis and amount.
         3) Mulch: Type and amount.
         4) Seeding Additive: Type and amount.
         5) Loads: Number.
         6) Water: Amount.
         7) Coverage: Area in acres.
         8) Equipment Used: Capacity, and vehicle license number, if applicable.
      i. Protection: Special care shall be exercised by the Contractor in preventing any of the slurry form being sprayed inside reservoir basin or into drainage ditches and channels that may impede the free flow of rain or irrigation water.
      j. Immediately following application of hydromulch, the Contractor shall wash excess material from previously planted materials and architectural features. Care shall be exercised to avoid washing or eroding mulch materials from area.
         1) Slurry spilled on restricted areas shall be cleaned up immediately.
      k. Equipment: Hydraulic equipment used for the application of the fertilizer, seed and slurry of prepared wood pulp shall have a built-in agitation system and operating capacity sufficient to agitate, suspend and homogeneously 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.

l. The slurry distribution lines shall be large enough to prevent stoppage and shall be equipped with a set of hydraulic spray nozzles that will provide a continuous non-fluctuating discharge. The slurry tank shall have a minimum capacity of 1500 gallons and shall be mounted on a traveling unit, either self-propelled or drawn by a separate vehicle that will place the slurry tank and spray nozzles within sufficient proximity to the areas to be seeded.

3. Apply slurry at the rate of 12 pounds per acre, mixed with commercial fertilizer at 600 pounds per acre. Mix the specified seed material with water and spray, resulting slurry under high-pressure and evenly, and uniformly over area to be seeded.

3.9 PLANTING

A. General
1. Actual planting shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted practice, as approved by the Architect.
2. Only as many plants as can be planted and watered on that same day shall be distributed in a planting area.
3. Container shall be opened and plants shall be removed in such a manner that the ball of earth surrounding the roots is not broken and they shall be planted and watered as herein specified immediately after removal from the containers. Containers shall not be opened prior to placing the plants in the planting area.

B. Layout individual tree and shrub locations and areas for multiple plantings. Stake locations and outline areas and secure acceptance by the Architect before start of planting work. Make minor adjustments as may be requested.

C. Excavation for Trees and Shrubs:
1. Excavate pits, beds and trenches as shown in details on the Drawings.
2. Roughen and score edges of planting pit to eliminate any glazing of the sides of the pit.
3. Field Samples: Prior to planting, prepare one plant pit with standpipe, gravel, filter fabric, and root barriers for each tree size to be reviewed by the Architect.
   a. Do not cover standpipes.
4. Excavation for planting shall include the stripping and stockpiling of all acceptable topsoil encountered within the areas to be excavated for trenches, tree pits, plant pits, and planting beds.

D. Container Removal
1. Cut containers on two sides with an acceptable cutter. Do not cut containers with spade or ax. Do not injure the rootball.
2. Carefully remove plants from containers without injury or damage to rootball.
3. After removing plants, superficially cut edge roots with knife on three sides.
4. For plants with sensitive roots, place container intact in flat pit 1½ times the size of a standard plant pit. Insert blades of sharp, needle-nose shears into a drain hole and cut the container bottom away. Remove bottom from pit. Follow with a cut down one side of the container from top to bottom. Repeat cut on opposite side. Fill plant pit with prepared plant pit mixture. Carefully remove the detached pieces.
5. Box Removal:
   a. Remove bottom of planting boxes before planting.
   b. Remove sides of box without damage to rootball after positioning plant and partially backfilling.

E. Planting Trees and Shrubs: Set container-grown stock, plumb and in center of pit or trench. Set top of rootball 2-inches above finish grade at trees, 1-inch above finish grade at shrubs, or as indicated on Contract Drawings. Do not use plant, if root system has severely kinked or circling roots, or if rootball is cracked, disturbed or broken. If root system is healthy, loosen spiraling roots and set in plant pit.

F. Planting pit shall be backfilled with the following soil conditioner and organic amendment, per cubic yard:

1. Application Rates, as determined by contractor's soils tests:
   a. Potassium Sulfate - 0-0-50, ¼-pound
   b. Single Superphosphate - 0-20-0, ¼-pound
   c. Ammonium Sulfate - 21-0-0, ¼-pound
   d. Agricultural Gypsum - 1.5 pounds
   e. Good Humus - 15% bv volume

G. When set, place additional fill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 1/2-full, place appropriate number of fertilizer tablets and complete backfill operations.

H. After backfilling, an earthen basin shall be constructed around each plant. Each basin shall be as indicated on the Contract Drawings. Basin shall be of a size suitable for the individual plant. In no case shall the basin for fifteen (15) gallon plant be less than four (4) feet in diameter; a five (5) gallon plant less than three (3) feet in diameter. The basins shall be constructed of amended backfill materials, and shall not be constructed for trees in turf areas.

I. Repeat watering until no more is absorbed.

J. Apply pre-emergent herbicide as per manufacturer's recommendations to all shrub and ground cover planting areas after planting.

K. Mulch all planted areas that do not receive jute netting, other than lawn areas, at not less than 2" thickness of mulch.
   1. Areas greater than 30% slope shall be protected with jute mesh.

L. Equally space and align trees and shrubs in both directions where designated on Contract Drawings.

M. Pull bark mulch away from the rootballs of all plants to insure proper air circulation.

N. Prune, thin out and shape trees and shrubs in accordance with standard horticultural practices. Prune trees and other plantings only if required. Pruning shall be limited to remove injured wigs and branches, and to compensate for loss of roots during transplanting, but never exceed 1/3 of the branch structure. Never prune without prior review with Architect.

O. Prune shrubs to retain natural character. Unless directed by the Architect, do not prune leaders or apices of any plant material. Do not prune into balled or boxed forms without prior written approval of the Architect.

P. Remove and replace excessively pruned or malformed stock resulting from improper pruning.

Q. Planting Ground Cover
   1. Space plants as shown or scheduled.
   2. Dig holes large enough to allow for spreading of roots and compact area around plant. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover crowns of plants with wet soils.
   3. Mulch areas between ground cover plants with not less than 2" deep mulch.

R. Miscellaneous Landscape Work: Install headers and edgings where shown. See appropriate details. Install 5" minimum layer of gravel, where shown, as specified in Section 2.04, compacted and leveled to fill voids at areas around building as shown on drawings.

S. Planting Vines: Plant in accordance with Section 3.06. Attach vine to columns with vine ties as per manufacturer's recommendations.

T. Tree Staking And Guying: Stake or guy all trees per landscape details, and tie with tree ties as specified. Remove all nursery stakes from trees unless directed otherwise by the Architect. Immediately after planting, stake and guy all trees in accordance with details indicated on Contract Drawings. One tree of each size shall be staked and guyed, and reviewed by Architect prior to continue work.

U. Hardpan Conditions
   1. Where hardpan exists, whether it is in the form of caliche, rock or other impervious matter, and it is within the top 2½ feet of soil, or within the plant pit, use powered equipment to break through completely at each plant location to allow drainage and root growth. Remove hardpan at least 1½ feet greater than the rootball diameter of plant. Backfill with soil mix as specified.
   2. Where hardpan is within the first 12-inches of soil, it shall be completely penetrated for all trees and shrubs.

3.10 CLEANUP AND PROTECTION:

A. During landscape work, keep pavements clean and work area in an orderly condition. Haul away and remove all debris from landscape areas, and do not leave any prunings, clippings, and or other material from landscape planting and/or maintenance period.

B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and/or other trades. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.

C. Powerwash all paving and flatwork as necessary to remove all staining and tire marks and provide a clean surface.

3.11 FINAL REVIEW & ACCEPTANCE

A. General: Notify Architect at least 48 hours in advance when requesting on-site reviews.

B. Final Site Observation requirements:
   1. Punch list at substantial completion.
   2. Final review of grading, irrigation and planting (to begin Maintenance Period).
   3. Final acceptance of project (at end of Maintenance Period).

C. Refer to Section 32 0190 - Landscape Maintenance.

END OF SECTION