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CLACKAMAS SWCD HEADQUARTERS LANDSCAPE PLAN 100% CD SPECIFICATIONS

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SECTION 03 3053 – MISCELLANEOUS CAST-IN-PLACE CONCRETE

1. GENERAL

1. SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following applications of concrete:
 - 1. Footings.
 - 2. Slabs-on-grade.
 - 3. Walkways.
 - 4. Concrete Stairs.
 - 5. Retaining walls.
- B. Related Sections include the following:
- C. Concrete forms, mixing, placing, and curing shall conform to ACI Manual of concrete practice and its specifications.
- D. Concrete Testing:
 - 1. Notify Owner's Representative to coordinate concrete compressive cylinder tests. Three sets of tests are required for each 100 cubic yards; conform to ASTM Specifications. Test 1 at 7 days and 2 at 28 days. Cost of testing by Owner.
 - 2. Failure of strength tests:
 - a. In the event the concrete compressive cylinder strengths fall below that permitted, the Owner's Representative may require hardened concrete core tests, load testing, additional structural computations and any other remedial measures required with all cost paid by the Contractor.
 - b. If remedial measures are not acceptable, the Contractor is responsible for the costs of removing the defective work and replacing it to the Owner's Representative's satisfaction at no additional cost to the Owner.

2. DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

3. SUBMITTALS

- A. Test reports: Submit copies to Owner's Representative.
- B. Product Data: For each manufactured material and product indicated.
- C. Design Mixes: For each concrete mix indicated.
- B. Qualification Data: For Installer, manufacturer, testing agency.

4. ENVIRONMENTAL REQUIREMENTS

- A. Placement during rain or adverse conditions shall not be permitted. Surface temperature must be 45 degrees Fahrenheit and air temperature rising.
- B. Place no concrete when temperature is below 45 degrees Fahrenheit, without written approval of the Owner's Representative. Contractor assumes full responsibility, including costs for retesting concrete. Concrete damaged by freezing shall be removed and replaced at Contractor's expense, at no additional cost to the Owner.
- C. Placement of concrete in excessively hot weather, windy or dry conditions shall be in accordance with requirements of ACI-605.
- D. Remove and replace defective work as directed by the Owner's Representative, at no additional cost to the Owner.

5. PROTECTION

- A. Protect surrounding areas, surfaces, work, trees, and shrubs to preclude damage, excessive compaction of adjacent soil and intrusion of materials into soil during execution.
- B. Protect base rock from intrusion of foreign materials. Protect finished concrete paving from traffic and vandalism to provide adequate curing time.

6. TRAFFIC CONTROL AND TEMPORARY ACCESS

- A. Provide barricades, cones and signs required for driveway closures and detours. See Division 01 Section "Temporary Facilities and Controls" for additional requirements.

7. QUALITY ASSURANCE

- C. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Source Limitations: Obtain each type of cement of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- D. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing

Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

- C. Comply with ACI 301, "Specification for Structural Concrete," including the following sections, unless modified by requirements in the Contract Documents:
 - 1. "General Requirements."
 - 2. "Formwork and Formwork Accessories."
 - 3. "Reinforcement and Reinforcement Supports."
 - 4. "Concrete Mixtures."
 - 5. "Handling, Placing, and Constructing."
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete," **Sections 1 through 5.**
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- D. Formwork Observation: Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed. Notify Owner's Representative 24 hours minimum prior to placing concrete that formwork is in place and ready for observation. Do not proceed with concrete placement prior to obtaining Owner Representative's approval that formwork meets the lines and grades intended on the Drawings. Concrete placed without the Owner Representative's approval of formwork shall be removed and replaced at no additional cost to the Owner.

2.PRODUCTS

- 1. FORMWORK
 - A. Furnish formwork and formwork accessories according to ACI 301.
 - B. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces. Provide appropriate form liner material to shape the reveal patterns indicated on the Drawings.
 - C. 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. STEEL REINFORCEMENT
 - A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
 - B. Dowel Bars: ASTM A 615/A 615M, Grade 60, non-deformed.
- 3. STRUCTURAL STEEL AND MISCELLANEOUS IRON
 - A. Structural steel shall conform to ASTM A-36.

- B. Anchor bolts shall conform to ASTM A-307, Grade A. Galvanize all embedded items.

4. CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout Project:

- 1. Portland Cement: ASTM C 150, Type I II or I/II. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class C or F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

- B. Portland Cement Concrete shall develop minimum 28 day laboratory cured compressive cylinder strength of **3000** PSI, min. 5-1/2 sacks of cement per cubic yard. Slump of the concrete shall not exceed 3-1/2 inches. Use one source for all concrete throughout Project.

- A. Normal-Weight Aggregate: ASTM C 33, graded. Provide aggregates from a single source with documented service record data of at least 10 years satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials. Meet requirements of crushed rock in Section 02690 "PCC Aggregates" of the "Specification Manual" as prepared by the Oregon Department of Transportation, latest edition.

- 1. Maximum Coarse Aggregate Size: 1-1/2-inch
- 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

- B. Water: ASTM C 94/C 94M and potable.

5. ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

- 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.

6. RELATED MATERIALS

- A. Vapor Retarder: Multi-ply reinforced polyethylene sheet, ASTM E 1745, Class C, or polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

- B. Expansion Joint Filler Strips: ASTM D 3575, closed-cell polyethylene foam backing, with removable joint cap, for joints wider than 1/4-inch; Sonneborn Sonolastic Expansion Joint Filler, or equal.
- C. Joint Primer: ASTM C 920, Type S, Grade P, Class 25. Solvent based primer for preparing concrete surfaces for adhesion to sealant. Sonneborn Sonolastic Primer 733, or equal.
- D. Joint Sealant: ASTM C 920, Type S, Grade P, Class 25. nonpriming, single-component, polyurethane sealant, Sonneborn Sonolastic SL1, or equal. Color to be selected by Owner's Representative from Sonneborn's Rainbow of Colors palette.
- E. Backer Rod: Non-gassing, reticulated closed-cell polyethylene rod designed for use with cold-applied joint sealants where joint depth exceeds manufacturer's recommended depth for joint sealant. Comply with ASTM C 1330, Type C. Size as required for joint design. Sonneborn Sonolastic Closed-Cell Backer Rod, or equal.
- F. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775.

7. CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 309, Type 1, Class A and B; AASHTO M-148. Sonneborn Kure-n-Seal WB or equal.

8. CONCRETE MIXTURES

- A. Comply with ACI 301 requirements for concrete mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash: 25 percent.
 - 2. Combined Fly Ash and Pozzolan: 25 percent.
 - 3. Ground Granulated Blast-Furnace Slag: 50 percent.
 - 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
 - 5. Silica Fume: 10 percent.
 - 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- D. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:
 1. Minimum Compressive Strength: **3000 psi for walkways and staris, and As indicated on structural drawings for footings** at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: **0.50, or As indicated by structural drawings for footings.**
 3. Slump Limit: 4 inches without Water-Reducing Admixtures; and 5 inches with Water-Reducing Admixtures.
 4. Air Content: Maintain within range permitted by ACI 301. Where required for exposed surfaces, add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 4.5 to 6 percent within a tolerance of plus 1.0 or minus 1.5 percent. Do not allow air content of floor slabs to receive troweled finishes to exceed 3 percent.
9. CONCRETE MIXING
 - A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 1. When air temperature is above 90 degrees Fahrenheit, reduce mixing and delivery time to 60 minutes.
 - B. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.
10. STEPS, STAIR TREADS AND LANDINGS
 - A. Barrier Free Access Warning Strip for Stair Treads and Steps: Comply with requirements of applicable codes, and the following. Provide 2.25 inch wide extruded aluminum strip with continuous extruded anchor for embedded installation in cast-in-place concrete stair treads, and steps. Strips shall have a permanent, non-slip, epoxy matrix filling in color selected by the Owner's Representative. Provide components of single manufacturer for all installations: American Safety Tread Co. Inc., Balco, or equal
 1. Provide on all steps, stair treads and landings as indicated on the Drawings and not more than one inch from tread nose.

3.EXECUTION

1. INSPECTION

- A. Examine subgrade scheduled to receive concrete for conditions that will adversely affect the execution, quality, and performance of Work. Do not start Work until unsatisfactory conditions have been corrected to the satisfaction of the Owner's Representative.

2. SUBGRADE

- A. The subgrade within the limits of trenches constructed under this Contract shall be constructed as follows: Compact the subgrade to 95 percent of the maximum density by ASTM D1557. Accomplish supplementary compaction where required with approved mechanical vibrating or power tampers.

3. CRUSHED AGGREGATE

- A. Crushed aggregate base course shall be placed under all pavements to be constructed or replaced. Place aggregate base course on the previously conditioned, compacted, and tested subgrade to the specified thickness as shown on the Drawings and as specified in Division 31 Section "Earth Moving."
- B. Compact aggregate base course to 95 percent of the maximum as determined by ASTM D1557. Notify Owner's Representative to allow for density tests before placing crushed aggregate base course.

4. FORMWORK

- A. Design, construct, erect, brace, and maintain formwork according to ACI 301.
- B. Install forms to line and grade required.
- C. Notify the Owner's Representative at least 24 hours before an intended pour. Place no concrete until forms have been inspected and approved by the Owner's Representative.

5. REINFORCING STEEL

- A. See Structural Drawings for reinforcing of footings, walls, slabs, and location of dowelled joints.
- B. All reinforcing steel shall be detailed, fabricated and placed in accordance with ACI Detailing Manual 315.
 - 1. All reinforcing steel shall be accurately and securely placed.
 - 2. Reinforcing shall not be bent or displaced for the convenience of other trades unless approved by the structural engineer or Owner's Representative.
 - 3. Splay reinforcing steel around openings with 1 inch in 10 inches splay unless otherwise shown in the Drawings.
 - 4. Minimum cover from concrete surfaces to reinforcing steel shall be:
 - a. 3 inches \pm 1/2 inch to bottom of footing
 - b. 1 1/2 inches \pm 1/4 inch to earth face of wall

- c. 1 inch \pm 1/4 inch to exposed face of wall
- 5. Lap all bars a minimum of 36 bar diameters except as noted otherwise on Drawings.
- C. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

6. JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
 - 1. Unless shown on the Drawings, a jointing and placement plan shall be prepared by the Contractor and approved before concrete placement begins.
 - 2. When approved by the Owner's Representative, make minor adjustments in joint location to make them coincide with drainage structures or other appurtenances.
 - 3. Contraction Joints in the concrete curbs shall be spaced at 10-foot intervals with Isolation Joints at 30-foot intervals or as shown on the Drawings. Joints shall be struck vertically and full depth. Align joints in concrete curbs with joints in finish paving.
 - 4. Contraction Joints in the concrete walls shall be spaced at 30-foot intervals with Isolation Joints at 90-foot intervals or as shown on the Drawings. Joints shall be struck vertically and full depth. Align joints in concrete walls with joints in finish paving.
- B. Construction Joints: Locate and install so strength and appearance of concrete are not impaired, at locations indicated on the Drawings, or as approved by Owner's Representative.
 - 1. Construction joints shall be keyed at bottom of form.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated on the Drawings. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to a radius of 1/4 inch. 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 shatter-proof 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 concrete develops random contraction cracks. Joints shall be continuous across the slab, and extend completely across curbs. Joint openings wider than 1/4 inch shall be cleaned and sealed before opening area to traffic.
- D. Isolation Joints (Expansion Joints): Install joint-filler strips at junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, drainage structures, and other locations, as indicated.
 - 1. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated on the Drawings.
 - 2. Remove joint filler cap; prime concrete surfaces to receive sealant; and fill void with sealant to match concrete color. Protect sealant from traffic until cured.

3. If joint filler depth exceeds 3/8 inch, install backer rod prior to installing joint sealant.

7. CONCRETE PLACEMENT

- A. Comply with ACI 301 for measuring, batching, mixing, transporting, and placing concrete.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- C. Do not add water to concrete during delivery, at Project site, or during placement.
- D. Consolidate concrete with mechanical vibrating equipment.
- E. Stripping of forms shall not be performed until concrete has set sufficiently to retain its true shape.

8. FINISHING FORMED SURFACES

- A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch.
 1. Apply to concrete surfaces **exposed to public view**.
- B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated on the Drawings.

9. FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Nonslip Broom Finish: Apply a nonslip broom finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Provide sample panel; do not proceed with Work until finish is approved by Owner's Representative.

10. WARNING STRIPPING AT STAIR TREADS and LANDINGS

- A. Embed detectable warning strip in plastic concrete where indicated on Drawings per manufacturer's printed instructions. Hold ends of warning strip 1 inch from edges of concrete and 1 inch from face of stair nosing. Finish concrete around warning strip to match adjacent stair and landing finish. Protect warning strip from concrete splatter throughout process.

11. CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures and mechanical injury after placement. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.
- B. 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.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 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. Cure for not less than seven days. 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.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.
- E. When concrete is being placed in cold weather and the temperature may drop below 35 degrees Fahrenheit, straw, hay, insulated curing blankets, or other suitable material shall be provided along the line of work to prevent freezing of concrete. Concrete injured by frost action shall be removed and replaced at the Contractor's expense.
- F. Take precautions to protect concrete from vandalism during curing. Replace all damaged or vandalized areas to the satisfaction of the Owner's Representative at no additional cost to Owner. Replace concrete starting at transition joints only.

12. FIELD QUALITY CONTROL

- A. Testing Agency: **Engage** a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.
- B. Tests: Perform according to ACI 301.
 - 1. Testing Frequency: One composite sample shall be obtained for each day's pour of each concrete mix exceeding 5 cubic yard but less than 25 cubic yard, plus one set for each additional 50 cubic yard or fraction thereof.
 - 2. Testing Frequency: One composite sample shall be obtained for each 100 cubic yard or fraction thereof of each concrete mix placed each day.

13. CLEANUP

- A. Clean all excess concrete, other materials, and debris on a weekly basis and remove from the project site and disposed of in a lawful manner.

END OF SECTION 03 3053

SECTION 05 5000 - METAL FABRICATIONS

1. GENERAL

1. SUMMARY

A. Section Includes:

1. Steel Edge @ Plaza planters.
2. Metal roofing @ Canopy Structure.
3. Metal downspouts @ Canopy Structure.
4. Metal gutters @ Canopy Structure.

B. Related Requirements:

1. Section 03 3053 "Misc. Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Section 32 1400 "Unit Paving" for metal edge restraint.

2. INFORMATIONAL SUBMITTALS

A. Welding certificates.

3. QUALITY ASSURANCE

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

B. 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/D1.6M, "Structural Welding Code - Stainless Steel."

4. FIELD CONDITIONS

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

5. PRODUCTS

A. Metal Roofing @ Canopy Structure

1. Manufacturer: Taylor Metal 'Versa-Span' or approved equal, see construction details for product information.

6. METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- D. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- E. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

7. FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
 - 3. Provide stainless-steel fasteners for fastening nickel silver.
 - 4. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3 (ASTM A 325M, Type 3); with hex nuts, ASTM A 563, Grade C3 (ASTM A 563M, Class 8S3); and, where indicated, flat washers.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593 (ASTM F 738M); with hex nuts, ASTM F 594 (ASTM F 836M); and, where indicated, flat washers; Alloy [Group 1 (A1)] [Group 2 (A4)].
- E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- G. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
 - H. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
 - I. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
 - J. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
 - K. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
8. FABRICATION, GENERAL
- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
 - B. 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.
 - C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
 - D. Form exposed work with accurate angles and surfaces and straight edges.
 - E. Weld corners and seams continuously to comply with the following:
 - 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 welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
 - F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
 - G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
 - H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads

9. MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

10. FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.EXECUTION

1. INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 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 welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 1. Cast Aluminum: Heavy coat of bituminous paint.

2. Extruded Aluminum: Two coats of clear lacquer.

2. ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded 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.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 05 5000

SECTION 05 5212 – EXTERIOR METAL RAILINGS

1. GENERAL

1. SUMMARY

A. This Section includes the following:

1. Powder-coated steel **flat bar, pipe and tube** railings, including handrails and guard rails.

B. Related Sections include the following:

1. Division 03 Section “Miscellaneous Cast-In-Place Concrete” for forming joints and recesses in cast concrete.

2. PERFORMANCE REQUIREMENTS

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

1. Steel: 72 percent of minimum yield strength.

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

1. Handrails:

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

2. Top Rails of Guards:

- a. Uniform load of **50 lbf/ ft. applied in any direction** and **50 lbf/ ft. applied horizontally and concurrently with 100 lbf/ ft. applied vertically downward.**
- b. Concentrated load of 200 lbf applied in any direction.
- c. Uniform and concentrated loads need not be assumed to act concurrently.

3. Infill of Guards:

- a. Concentrated load of **50 lbf** applied horizontally on an area of 1 sq. ft.
- b. Uniform load of 25 lbf/sq. ft. applied horizontally.
- c. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Provide railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other

detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 degrees Fahrenheit, ambient; 180 degrees Fahrenheit, material surfaces.

- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

3. SUBMITTALS

- A. Product Data: For the following:

1. Grout, anchoring cement.
2. Powder coat paint products
3. **Galvanic paint products.**

- B. Shop Drawings: Show fabrication and installation of railings. Include plans, elevations, sections, component details, and attachments to other Work.

- C. Samples for Initial Selection: For products involving selection of color, texture, or design.

- D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of owners.

- E. Welding certificates.

- F. Product Test Reports: From a qualified testing agency indicating railings comply with ASTM E 985, based on comprehensive testing of current products.

4. QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of handrail and railing through one source from a single manufacturer.

- B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

5. STORAGE

- A. Store railings in a dry, well-ventilated, weathertight place.

6. PROJECT CONDITIONS

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

7. COORDINATION AND SCHEDULING

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

2.PRODUCTS

1. MANUFACTURERS

- A. Product information provided by owner see detail sheet L5.0.

2. METALS, GENERAL

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

3. STEEL AND IRON

- A. Tubing: [**ASTM A 500 (cold formed)**] [or] [**ASTM A 513, Type 5 (mandrel drawn)**].
- B. Pipe: ASTM A 53, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- C. Plates, Shapes, and Bars: ASTM A 36.

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

4. FASTENERS

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

5. MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primer for Galvanized Steel: Zinc-phosphate wash formulated for priming zinc-coated steel and for compatibility with finish powder-coat paint systems indicated, and complying with SSPC-Paint 5.
- C. Exterior Finish Coat: Polyester Powder Coating (TGIC) complying with AAMA 603.8-85 and compatible with primer. Finish coat to comply with the following tests: Adhesion (ASTM D-3363), Pencil Hardness (ASTM D-3363), Impact Resistance (Modified ASTM D-2794) Flexibility Mandrel (Modified ASTM D-522), and Abrasion Resistance (Modified ASTM D-4060). Use "degassing" grade polyester powder only. Add anti-blistering agents, such as polyethylene oxide, to the powder to prevent pinholing and promote good adhesion as recommended by paint manufacturer.
 - 1. Color: **Match Existing Rails.**
 - 2. Average Film Thickness: 3 mil
 - 3. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. BASF.
 - b. Benjamin Moore.
 - c. Sherwin-Williams.

d. Or equal.

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

6. FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated on the Drawings. 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.
- F. Provide weep holes to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.
- G. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- H. Connections: Fabricate railings with welded connections, unless otherwise indicated on the Drawings.
- I. 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.
- J. Form changes in direction as follows:
 1. By radius bends of radius indicated on the Drawings.
 2. By mitering and welding at elbow bends.
- K. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated on the Drawings.
- 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 steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with steel plate forming bottom closure.
- P. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.
7. 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: Noticeable variations in the same piece are not acceptable. Retain paragraph below if exposed fasteners are allowed, especially with color anodic finish.
 - C. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
8. STEEL AND IRON FINISHES
 - A. Galvanized Handrails and Railings:
 1. Hot-dip galvanize steel and iron railings, including hardware, after fabrication.
 2. Eliminate passivation-quenching process which is normally performed immediately after galvanizing; quenching solutions interfere with paint and powder-coat adhesion and must be removed prior to painting.
 3. Comply with ASTM A 123/A for hot-dip galvanized railings.

4. Comply with ASTM A 153/A for hot-dip galvanized hardware.
- B. Fill vent and drain holes that will be exposed in the finished Work, unless utilized as weep holes, by plugging with zinc solder and filing off smooth.
- C. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- D. Preparation for Shop Priming: After galvanizing, eliminate protrusions and slightly roughened the surface to provide an anchor profile. Thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter.
- E. Shop prime surfaces within 12 hours after galvanizing to reduce zinc oxidation.
- F. Prime prepared surfaces by zinc-phosphate wash process. Comply with requirements ASTM D 6386 and recommendations of TGCI polyester powder-coat manufacturer.
- G. Apply TGCI polyester powder-coat finish to dry surfaces, preheating steel prior to coating and allow to cure.

3.EXECUTION

1. INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required to install railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.
 1. Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.
- 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.

2. 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.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending

2 inches beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within 6 inches of post.

3. ANCHORING POSTS

- A. Anchor posts as indicated in the Drawings.
- B. 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.
- C. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- D. Cover anchorage joint with flange of same metal as post, **welded to post after placing anchoring material, or attached to post with set screws.**
- E. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch buildup, sloped away from post.

4. ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

5. PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05 5212

SECTION 061063 - EXTERIOR ROUGH CARPENTRY

1.GENERAL

1. SUMMARY

A. Section Includes:

1. Canopy structure **support framing**.

2. DEFINITIONS

- A. Boards: Lumber of less than 2 inches nominal (38 mm actual) in thickness and 2 inches nominal (38 mm actual) or greater width.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.
- C. Timber: Lumber of 5 inches nominal (114 mm actual) or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 2. NLGA: National Lumber Grades Authority.
 3. RIS: Redwood Inspection Service.
 4. SPIB: The Southern Pine Inspection Bureau.
 5. WCLIB: West Coast Lumber Inspection Bureau.
 6. WWPA: Western Wood Products Association.

3. DELIVERY, STORAGE, AND HANDLING

- A. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

2.PRODUCTS

1. LUMBER, GENERAL

- A. Lumber: Comply with DOC PS 20 and with applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by ALSC's Board of Review. Provide lumber graded by an agency certified by ALSC's Board of Review to inspect and grade lumber under the rules indicated.
 1. Factory mark each item with grade stamp of grading agency.

2. For items that are exposed to view in the completed Work, **[mark grade stamp on end or back of each piece] [or] [omit grade stamp and provide certificates of grade compliance issued by grading agency]**.
 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
 4. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Certified Wood: Wood products shall be 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."
2. DIMENSION LUMBER
 - A. Exposed Lumber: Provide material hand selected for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.
 - B. Dimension Lumber Posts: Per structural. **[No. 2] [Construction or No. 2] [Construction, Stud, or No. 3]** grade and **[any of]** the following species:
 1. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
 3. BOARDS
 - A. Maximum Moisture Content: **19 percent**.
 - B. Provide boards hand selected for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.
 4. TIMBER
 - A. Maximum Moisture Content: **19 percent**
 - B. Dressing: Provide **[dressed timber (S4S)] [or] [timber that is rough sawn (Rgh)]**, per drawings.
 - C. Timber Posts: Douglas Fir
 5. METAL FRAMING ANCHORS
 - 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]**:

- B. Basis-of-Design Products: Subject to compliance with requirements, provide [**products indicated on Drawings**] <Insert manufacturer's name; product name or designation> or comparable products by one of the following:
1. Cleveland Steel Specialty Co.
 2. Harlen Metal Products, Inc.
 3. KC Metals Products, Inc.
 4. Simpson Strong-Tie Co., Inc.
 5. Southeastern Metals Manufacturing Co., Inc.
 6. USP Structural Connectors.
 7. <Insert manufacturer's name>.
- C. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those [**indicated on Drawings**]. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- D. Joist Hangers: U-shaped, with 2-inch- (50-mm-) long seat and 1-1/4-inch- (32-mm-) wide nailing flanges at least 85 percent of joist depth.
1. Thickness: [**0.050 inch (1.3 mm)**] [**0.062 inch (1.6 mm)**].
- E. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
1. Strap Width: [**1-1/2 inches (38 mm)**] [**2 inches (50 mm)**].
 2. Thickness: [**0.050 inch (1.3 mm)**] [**0.062 inch (1.6 mm)**].
- F. Post Bases: Per Structural
- G. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
1. Width: [**3/4 inch (19 mm)**] [**1-1/4 inches (32 mm)**].
 2. Thickness: [**0.050 inch (1.3 mm)**] [**0.062 inch (1.6 mm)**].
 3. Length: [**16 inches (400 mm)**] [**24 inches (600 mm)**] [**As indicated**].

3.EXECUTION

1. EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

2. PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3. INSTALLATION, GENERAL

- A. Set exterior rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit exterior rough carpentry to other construction; scribe and cope as needed for accurate fit.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction" unless otherwise indicated.
- C. Install metal framing anchors to comply with manufacturer's written instructions.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- F. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron (SBX) for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- H. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 3. Table 23-II-B-1, "Nailing Schedule," in ICBO's Uniform Building Code.
 - 4. Table 2305.2, "Fastening Schedule," in BOCA's BOCA National Building Code.
 - 5. Table 2306.1, "Fastening Schedule," in SBCCI's Standard Building Code.
 - 6. Table R602.3(1), "Fastener Schedule for Structural Members" and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
- I. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads unless otherwise indicated.
- J. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

END OF SECTION 061063

SECTION 12 9300- SITE FURNISHINGS

1.GENERAL

1. SUMMARY

- A. This Section includes the following site furnishings:
 - 1. Benches.
- B. Related Sections include the following:
 - 1. Division 03 Section "Cast-in-Place Concrete" for installation of anchor bolts cast in concrete footings and for formed voids in concrete.

2. QUALITY ASSURANCE:

- A. Manufacturing standards: provide each item of equipment as a complete unit produced by a single manufacturer, including fittings, accessories, bases and anchorage devices.
- B. Conflicts: Compare manufacturer's shop drawings of all products with the products shown on the Drawings. If conflicts arise between shop drawings and the Drawings, notify Owner's Representative before proceeding with the Work.

3. SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details.
- B. Product Schedule: For site furnishings. Use same designations indicated on Drawings.
- C. Shop Drawings: Submit manufacturer's shop drawings of all products for approval by Owner's Representative prior to fabrication or supplying. Shop drawing shall include installation and leveling methods for each type of site furnishing, including hardware intended to be utilized.
- D. Maintenance Data: For site furnishings to include in maintenance manuals.

2.PRODUCTS

1. SITE FURNISHINGS

- A. Products: Subject to compliance with requirements, provide the following:
 - 1. Wood Bench – Type 1:

- a. Manufacturer: **Columbia Cascade, Timberforms Phone 1-503-223-1157**
- b. Model: **Timberforms Colossus Giant Timber Seat, Model No. 2219**
- c. Size: **12x12x10**
- d. Finish: **Treated Douglas Fir**

2. ACCESSORIES

- A. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or non-corrodible materials; commercial quality; tamperproof, vandal and theft resistant; concealed, recessed, and capped or plugged. Provide as required for site furnishings' assembly, mounting, and secure attachment.
- B. Non-shrink, Nonmetallic Grout: Premixed, factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

3.EXECUTION

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.
- B. Notify the Owner's Representative of any conditions detrimental to the proper and timely completion of the work. Do not proceed with installation until unsatisfactory conditions have been corrected and are acceptable to the installer. Notify Owner's Representative for observation of layout prior to installation.

2. INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions, unless more stringent requirements are indicated. Complete field assembly of site and street furnishings, where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed. Obtain approval of layout location from Owner's Representative prior to installing.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- D. For installing items requiring concrete footings within concrete, asphalt or gravel paving, install item and footing prior to paving. Allow paving to be placed over top of footing. Where this is not feasible, see subparagraph below.
- E. For installing products in sawcut or blocked-out concrete or asphalt paving, match exposed grout, concrete, or asphalt with color and texture of surrounding pavement.

- F. Where anchor bolts are exposed after setting of site furnishing, cut tops of bolts flush with nut and grind smooth. Apply matching finish.

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 12 9300

SECTION 31 1000 - SITE CLEARING

1. GENERAL

1. SUMMARY

A. This Section includes the following:

1. **Protecting existing trees shrubs groundcovers plants and grass to remain.**
2. Removing existing trees shrubs groundcovers plants and grass.
3. Clearing and grubbing.
4. Remove existing above- and below-grade improvements as indicated on the Drawings and as necessary to facilitate new construction.
5. Stripping and stockpiling topsoil and decomposed granite paving.
6. Temporary erosion and sedimentation control measures.
7. Alleviation or prevention of dust nuisance.

B. Related Sections include the following:

1. Division 32 Section "Soil Preparation" for finish grading including preparing and placing topsoils, planting soil mixes and testing of topsoil material.

2. DEFINITION

- A. Clearing is defined as removal of debris, trees, brush, vines, sod, and other vegetative growth at or above the ground surface.
- B. Grubbing is defined as removal of vegetative growth or natural wooden items at or below ground surface, which remain after clearing work.
- C. Disposal is defined as removal of refuse resulting from clearing, grubbing, and demolition work.
- D. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
- E. 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.

3. OWNERSHIP OF MATERIALS

- A. Unless otherwise shown, specified, indicated to remain or designated for salvage, all materials resulting from the grubbing, clearing and demolition Work shall become the property of the Contractor and shall be disposed of off-site in a lawful manner. All topsoil material is to remain on the site and be stockpiled at approved location during grading. Care shall be taken not to contaminate existing topsoil.

4. PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 - 3. Provide flaggers as needed to ensure public safety.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on the Owner's premises where directed by Owner's Representative.
- C. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

5. EXISTING UTILITIES

- A. Contractor shall be responsible for determining which utility agencies, public or private, have underground or surface facilities. Contact Owner to obtain copies of Record Documents for existing on-site utilities.
- B. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing. Call Northwest Utility Notification Center (800) 424-5555.
- C. Locate and identify, with visible marking, existing underground utilities in the areas of Work. If utilities are to remain in place, provide adequate means of protection during excavation operations.
- D. Should uncharted piping or other utilities be encountered during excavation, consult the utility owner immediately for directions. Cooperate with the owner and public and private utility companies in keeping their respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility owner. The cost of repairing charted utilities shall be paid by the Contractor.
- E. Do not interrupt existing utilities service facilities occupied and used by the owner or others, except when permitted in writing by the Owner's Representative and then only after acceptable temporary utility services have been provided.

2.PRODUCTS [(Not Applicable)].

3.EXECUTION

1. INSPECTION OF SITE

- A. Prior to commencement of Work under this section, the Owner's Representatives shall inspect the site to fully determine the extent of work requirements and limitations.
- B. Mark or flag improvements to be removed prior to the inspection.

2. PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly flag trees and vegetation to remain or to be relocated. Do not use paint to mark trees to remain.
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to the Owner or Owner's Representative at no additional cost to the Owner.

3. TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, at plaza drains in particular.
- B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

4. PLANT PROTECTION

- A. Protect all trees, shrubbery, and grass areas not designated for removal under this Contract. Temporary, continuous barriers shall be erected where necessary to assure their safety. Repair any trees, vegetation or grass areas damaged as a result of Work under this section in an approved manner.
- B. 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, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
 - 1. Cover exposed roots with burlap and water regularly.
 - 2. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
 - 3. Coat cut faces of roots more than 1-1/2 inches in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
 - 4. Backfill with soil as soon as possible.
- C. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Owner's Representative.
 - 1. Replace trees that cannot be repaired and restored to full-growth status, as determined by Owner's Representative.

5. UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner, leasors or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner's Representative not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without written permission of the Owner's Representative.
- C. Excavate and remove underground utilities indicated to be removed on the Drawings. Disconnect existing service lines to be abandoned and cap exposed service lines to be maintained.

6. DUST CONTROL

- A. Contractor shall provide a dust control media, such as water, to control on-site dust and to prevent dust from leaving the site. Failure may result in Owner providing dust control measures at Contractor's expense.
- B. The watering Work shall be subject to the control of the Owner's Representative. Watering shall be done only when and where directed by the Owner's Representative. The rates of application shall be as directed, and the manner of application shall be as approved by the Owner's Representative.
- C. Watering shall be performed at any hour of the day and on any day of the week that the Owner's Representative may determine necessary for adequate alleviation of dust nuisance. Wastage of water or watering which is detrimental to other Work shall be avoided and such operations ceased until the Owner's Representative determines what corrective measures shall be taken.

7. CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 - 3. Grind stumps and remove roots larger than one inch in diameter, obstructions, and debris extending to a depth of 24 inches below exposed subgrade.
 - 4. Use only hand methods for grubbing within tree protection zone.
 - 5. Chip removed tree branches and stockpile or spread onto areas approved by Owner's Representative.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

8. TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Limit height of topsoil stockpiles to 72 inches.
 - 2. Do not stockpile topsoil within tree protection zones.
 - 3. Stockpile surplus topsoil to allow for respreading deeper topsoil.
 - 4. Dispose of excess topsoil as specified for waste material disposal.

9. SITE IMPROVEMENTS DEMOLITION

- A. Remove existing above- and below-grade improvements as indicated on the Drawings and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated on the Drawings.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain at the nearest control joint before removing existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.
- C. Remove all structures or portions of structures shown, specified, or required to be removed in areas of Work. For salvage items, deliver to Owner or store on site as noted on Drawings for reuse. Remove all debris from the demolition work from the site as specified in this section.
 - 1. The removal of debris, construction materials, loose rocks and other materials at or below grade encountered while grading is considered incidental to the site preparation work.

10. DISPOSAL OF WASTE MATERIAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, cleared vegetation, and waste materials including trash and debris, and legally dispose of them off Owner's property.
 - 1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION 31 1000

1. SECTION 32 1400 – UNIT PAVING GENERAL

1. SUMMARY

A. This Section includes the following:

1. Concrete pavers set in aggregate setting bed.
2. Steel edge restraints.

B. Related Sections:

- 1.
2. Division 05 5000 Section “Metal Fabrication” for steel edge restraints for unit pavers.

2. SUBMITTALS

A. Product Data: For the following:

1. Pavers.
2. Geotextile.

B. Sieve Analyses: For aggregate setting-bed materials and joint sand according to ASTM C 136.

3. QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed unit paver installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations: Obtain each type of unit paver, joint material, and setting material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

C. Pre-construction Coordination: Review installation procedures and coordinate paving work with other work affected by the unit paving work. Field verify that layout shown on Drawings coincides with paver critical dimensions by constructing mockup as described below. Submit evidence to Architect that this coordination work has been completed.

D. Mockups: Prior to full installation, provide mock-up of unit paver to be verified by Owner's Rep. or Architect:

1. Notify Architect in advance of dates and times when mockups will be constructed.
2. Demonstrate the proposed range of aesthetic effects and workmanship.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

4. DELIVERY, STORAGE, AND HANDLING

- A. Protect unit pavers and aggregate during storage and construction against soiling or contamination from earth and other materials.
 - 1. Cover pavers with plastic or use other packaging materials that will prevent rust marks from steel strapping.

5. PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

2. PRODUCTS

1. CONCRETE PAVERS

- A. Concrete Paver Types:
 - 1. Concrete Paver Type 1:
 - a. Manufacturer/Supplier: **Mutual Materials, Tel. (800) 477-3008**
 - b. Product: **Holland Pavers.**
 - c. Color: **NW Blend.**
 - d. Pattern: **Muster K.**
 - e. Sizes: **Mix of Double and Tripple Sizes [Double 2-3/8" x 7-7/8" x 7-7/8" and Tripple 2-3/8" x 11-13/16" x 7-7/8"]**

2. ACCESSORIES

- A. Steel Edge Restraints: Raw steel edging with steel loops welded to face to receive stakes at on-center spacing anchored with 24-inch long 1/2-rebar stakes at 32 inches o.c Size of edging is 1/4 inch thick by 15 inches high. Color to be **raw steel. Refer to Section 05 5000 Metal Fabrications.**

3. AGGREGATE SETTING-BED MATERIALS

- A. Dense Graded Aggregate for Subbase: Sound crushed stone or gravel with sieve analysis as determined by AASHTO T-27 shown in Table 1 below, and complying requirements of Division 31 Section "Earth Moving."
- B. Dense Graded Aggregate for Base: Sound crushed stone or gravel with sieve analysis as determined by AASHTO T-27 shown in Table 2 below, and complying requirements of Division 31 Section "Earth Moving."
- C. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements of ASTM C-33 shown in Table 3 below, for fine aggregate.
- D. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with sieve analysis as determined by AASHTO T-27 and ASTM C-144, complying with gradation requirements shown in Table 4 below.

Table 1
Dense Graded Aggregate for Subbase (1-inch to 0)
Grading Requirements

| <u>Sieve Size</u> | <u>Percent Passing</u> |
|-------------------|------------------------|
| 1 1/2 in. | 100 |
| 1 in. | 90 to 100 |
| 1/2 in. | 55 to 75 |
| 1/4 in. | 40 to 55 |
| No. 10 | * |
| Sand Equivalent | 30 min. |

* Of the fraction passing the 1/4 sieve, 40 to 60 percent shall pass the No. 10 sieve.

Table 2
Dense Graded Aggregate for Base (3/4 inch to 0)
Grading Requirements

| <u>Sieve Size</u> | <u>Percent Passing</u> |
|-------------------|------------------------|
| 1 in. | 100 |
| 3/4 in. | 90 to 100 |
| 3/8 in. | 55 to 75 |
| 1/4 in. | 40 to 60 |
| No. 10 | * |
| Sand Equivalent | 30 min. |

* Of the fraction passing the 1/4 sieve, 40 to 60 percent shall pass the No. 10 sieve.

Table 3
Fine Aggregates for Bedding Sand
Grading Requirements

| <u>Sieve Size</u> | <u>Percent Passing</u> |
|-------------------|------------------------|
| 3/8 in. | 100 |
| No. 4 | 90 to 100 |
| No. 8 | 70 to 100 |
| No. 16 | 50 to 85 |
| No. 30 | 25 to 65 |
| No. 50 | 5 to 30 |
| No. 100 | 0 to 10 |
| No. 200 | 0 to 4 |

Table 4
Joint/Opening Filler Sand
Grading Requirements

| <u>Sieve Size</u> | <u>Percent Passing</u> |
|-------------------|------------------------|
| No. 4 | 100 |
| No. 8 | 95 to 100 |
| No. 16 | 70 to 100 |
| No. 30 | 40 to 75 |
| No. 50 | 10 to 35 |
| No. 100 | 2 to 15 |
| No. 200 | 0 to 10 |

4. GEOTEXTILES

- A. Installation per product manufacture's specifications.

3.EXECUTION

1. PREPARATION

- A. Proof-roll prepared subgrade. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive subbase and base course for unit pavers.
- B. Clean aggregate base course to remove dirt, dust, debris, and loose particles. Check elevations and slope of the aggregate base course.
- C. Remove substances, protrusions and fins from concrete edge restraints that could impair tight joints.

2. INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, and voids, which exceed the tolerances listed under Part 2. Do not use unit pavers outside the approved color range or unit pavers with discolorations and other defects that might be visible or cause staining in finished work.
- B. Pavers shall be clean and free of foreign materials prior to installation.
- C. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- D. Cut unit pavers with motor-driven masonry saw equipment. Hammer cut edges of pavers to match tumbled cobble look on whole units. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Where cutting is required, use the largest size unit possible. Avoid the use of small pieces less than 1/3 of unit length or large joint spaces greater than 1/8 inch.

- 1. Block splitter may be not used. Hammer cutting is not acceptable.

- E. Joint Pattern: **Muster K, Mutual Materials layout.**
 - 1. Path widths to be composed of whole, uncut pavers unless otherwise indicated. Layout pavers in advance of setting edge restraints to determine required width.
- F. Tolerances: Do not exceed 1/16 - inch unit-to-unit offset from flush (lippage) nor 1/8 inch in 10 feet from level, or indicated slope, for finished surface of paving.
- G. Provide edge restraints at the perimeter of unit pavers adjacent to landscape areas, and as indicated on Drawings. Install edge restraints before placing unit pavers.
 - 1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after unit paver installation.
 - 2. For metal edge restraints with top edge exposed, drive stakes 1 inch below top edge.
 - 3. Install job-built concrete edge restraints to comply with requirements in Division 32 Section "Concrete Paving."
 - 4. Maintain edges of paver field perpendicular and parallel with the building and other paved surfaces after unit paver installation and compaction.
 - 5. Install **metal** edge restraints wherever sand set unit pavers are not bound by structures or other job-built concrete edge restraints.
 - 6. Where pavers embedded in concrete are indicated as edge restraints for pavers set in aggregate setting bed, install pavers embedded in concrete and allow concrete to cure before placing aggregate setting bed and remainder of pavers. Hold top of concrete below aggregate setting bed.

3. AGGREGATE SETTING-BED PAVER APPLICATIONS

- A. Test compaction of soil subgrade to verify condition at least 95 percent of ASTM D-1557 laboratory density.
- B. Proof-roll prepared subgrade to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Owner's Representative, and replace with compacted backfill or fill as directed.
- C. Place separation geotextile over prepared subgrade, overlapping ends and edges at least 12 inches.
- D. Place aggregate subbase and base, compact to 100 percent of ASTM D 1557 maximum laboratory density, and screed to depth indicated.
- E. Place sand leveling course and screed to a thickness of 1 inch maximum, taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.
- F. Treat leveling course with herbicide to inhibit growth of grass and weeds.
- G. Set pavers with a minimum joint width of 1/16 inch and a maximum of 1/8 [**3/32**] inch, being careful not to disturb leveling base. If pavers have spacer bars or lugs, place pavers hand tight against spacer bars/lugs. Use string lines to keep straight lines.

- H. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz. Use vibrator with neoprene mat on face of plate or other means as needed to prevent cracking and chipping of pavers. Perform at least three passes across paving with vibrator.
 - 1. Compact pavers when there is sufficient surface to accommodate operation of vibrator, leaving at least 36 inches of uncompacted pavers adjacent to temporary edges.
 - 2. Before ending each day's work, compact installed concrete pavers except for 36-inch width of uncompacted pavers adjacent to temporary edges (laying faces).
 - 3. As work progresses to perimeter of installation, compact installed pavers that are adjacent to permanent edges unless they are within 36 inches of laying face.
 - 4. Before ending each day's work and when rain interrupts work, cover pavers that have not been compacted and cover leveling course on which pavers have not been placed with nonstaining plastic sheets to protect them from rain.
 - I. Spread jointing sand and sweep to fill joints completely immediately after vibrating pavers into the leveling course. Remove the excess sand and vibrate pavers to firm up the joints. Repeat the process until the joints are completely packed to the top of the paver chamfer, or 1/8 inch below top of pavers without chamfers.
 - J. Sweep the surface with a fine bristle brush and remove all residues with a leaf blower.
 - K. Gently saturate the surface with a fine mist of water to activate the stabilizer.
 - L. Do not allow traffic on installed pavers until sand has been vibrated into joints.
 - M. Repeat joint-filling process 30 days later or end of Maintenance Period whichever is later.
4. REPAIR, CLEANING, AND PROTECTION
- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units (color, spacing and elevation) as intended. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement at no additional cost to the Owner.

END OF SECTION 32 1400

SECTION 32 1540 – CRUSHED STONE SURFACING

1.GENERAL

1. SUMMARY

- A. This section covers the work necessary for the construction of crushed rock walking surface as shown on Drawings and specified herein.

2. QUALITY ASSURANCE

- A. Design Intent: Finished walking surface should be firm, stable, and compacted as specified with the characteristics and feel of decomposed granite. It should not show signs or tracks of pedestrian foot prints or vehicle tracks when used. Surface movement of rock should be minimal.

3. SUBMITTALS

- A. None required.

2.PRODUCTS

1. BASE COURSE

- A. 3/4-inch minus compacted crushed rock meeting APWA or ODOT requirements, with less than 5 percent passing a #200 sieve.

2. CRUSHED STONE WALK SURFACING

- A. Decomposed Granite salvaged from that removed from plaza area and supplemented with owners on site stockpile.

4. WATER

- A. Clean, water, ASTM C 94.

3.EXECUTION

1. INSPECTION

- A. Prior to all work of this section, carefully inspect work installed by other trades and verify that all such work is complete to the point where this installation may properly commence. Start of work denotes acceptance of existing conditions.

2. PREPARATIONS

- A. Make all necessary measurements in the field to ensure conformance to dimensions and finish elevations as shown on Drawings.

3. BASE COURSE

- A. Place crushed stone base course on the previously conditioned, compacted, and tested subgrade to the thickness shown on the Drawings. Place base course layers in separate, single lifts with a maximum thickness of 0.35 feet. Compact base course to 95 percent of the maximum density as determined by ASTM D-1557.
- B. Slope finished base courses at 2% for drainage.
- C. Provide and apply water to the material being placed to prevent material drying and enhance compaction characteristics as required to maintain moisture content necessary to achieve specified density.
- D. Each completed layer shall have a smooth, tight, uniform surface true to the line, grade, and cross-section indicated on the plans and/or as staked.

4. CRUSHED STONE WALK SURFACING

- A. General: Install all crushed stone work true to grade, properly coinciding with adjacent work and elevations. Provide a finished surface uniform in texture and appearance. Do not permit finished work to vary more than 1/8 inch in 10 feet from true profile and cross section.
- B. The following is a highly recommended guideline to install crushed stone surfacing. This guideline has been successfully used previously and provides the required finished walking surface. The Contractor is responsible to provide crushed stone surfacing that achieves the design intent using this or another approved method:
 - 1. Place crushed stone walk surfacing material roughly into position. Place sufficient material to allow for compaction.
 - 2. Level the crushed rock surface, using a square edge shovel.
 - 3. Fully saturate the entire thickness of crushed rock surfacing with water. Do not underwater.
 - 4. Quickly work the surface with a push broom to bring fines back to the surface. Repeated forward and backward motions with the broom may be needed to bring fines up to the surface.
 - 5. Using the flat side of a rake (do NOT use the prongs), make final adjustments to level the surface.
 - 6. Compact surface to a minimum of 92 percent maximum density as determined by ASTM D-1557, using a vibratory roller or flat plate compactor.
 - 7. Keep people, bicycles, and other vehicles away from the compacted surface until it dries to a stable moisture content. This may take one or more days, depending on weather conditions.
 - 8. When surface areas have been rolled and it becomes necessary to add a thin layer of material to bring the surface to grade, the previously rolled or compacted area shall be raked to provide a bond with the added material.

9. The finished surface shall be uniform in appearance as to texture and color.
 10. Inspect final surface. Repair any damaged or unacceptable areas by reworking the crushed rock material and repeating steps 2 through 7.
 11. Repair and replace damaged or defective paving as directed by Owner's Representative and in accordance with these Specifications at no additional cost to the Owner.
- C. If necessary, lightly sweep the surface to remove excess loose material and dispose of off-site.
5. CLEANING
- A. Remove excavated soil and all debris from site upon completion or sooner if directed by the Owner's Representative.
6. PROTECTION
- A. Protect all adjacent work by others, reference points, monuments and markers. Replace or repair damaged items at no cost to Owner and as acceptable to Owner's Representative.

END OF SECTION 32 1540

DOCUMENT 328400 - PLANTING IRRIGATION

1. GENERAL

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.

2. SUMMARY

- A. Section Includes:

- 1. Piping.
- 2. Sleeving for piping.
- 3. Manual valves.
- 4. Automatic control valves.
- 5. Sprinklers.
- 6. Drip irrigation.
- 7. Boxes for automatic control valves.

3. DEFINITIONS

- A. Circuit Piping: Downstream from control valves to sprinklers, specialties, and drain valves. Piping is under pressure during flow.
- B. Drain Piping: Downstream from circuit-piping drain valves. Piping is not under pressure.
- C. Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.
- D. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

4. PERFORMANCE REQUIREMENTS

- A. Irrigation zone control shall be automatic operation with existing controller, and existing and proposed automatic control valves.
- B. Location of Sprinklers and Specialties: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions. Maintain 100 percent irrigation coverage of areas indicated.
- C. Minimum Working Pressures: The following are minimum pressure requirements for piping, valves, and specialties unless otherwise indicated:
 - 1. Irrigation Main Piping: 200 psig.
 - 2. Circuit Piping: 150 psig

5. SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Zoning Chart: Show each irrigation zone and its control valve.
- C. Operation and Maintenance Data: For sprinklers and automatic control valves to be included in operation and maintenance manuals.

6. DELIVERY, STORAGE, AND HANDLING

- A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

7. PROJECT CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
 - 1. Notify Architect no fewer than two days in advance of proposed interruption of water service.
 - 2. Do not proceed with interruption of water service without Architect's written permission.

8. QUALITY CONTROL

- A. This Work shall be performed by an experienced irrigation system installer, possessing the equipment, expertise, and personnel to successfully perform the work in a timely manner, with minimal impact to the construction schedule, and as shown on the drawings or as specified.
- B. The contractor shall have a current valid license for landscape contracting/installations with the State of Oregon.
- C. The contractor's day-to-day supervisor shall have a minimum of 5 years of experience with irrigation installation projects of similar size and scope.

9. EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Spray Sprinklers: Equal to 10 percent of the amount installed for each type and size indicated.
 - 2. Drip-Tube System Tubing: Equal to 10 percent of total length installed for each type and size indicated, but not less than 100 feet.

2.PRODUCTS

1. PIPES, TUBES, AND FITTINGS

- A. Comply with requirements in the piping schedule for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.
- B. PVC Pipe: ASTM D 1785, PVC 1120 compound, Schedules 40 and Class 200
 - 1. PVC Socket Fittings: ASTM D 2466, Schedule 40.
 - 2. PVC Threaded Fittings: ASTM D 2464, Schedule 40.

2. PIPING JOINING MATERIALS

- A. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
- B. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

3. MANUAL VALVES

- A. Plastic Ball Valves:
 - 1. Manufacturers: provide products by one of the following:
 - a. American Valve, Inc.
 - b. NIBCO INC.
 - c. Sloane, George Fischer, Inc.
 - d. Spears Manufacturing Company.
 - e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

4. AUTOMATIC CONTROL VALVES

- A. Plastic, Automatic Control Valves:
 - 1. Basis-of-Design Product: product indicated on Drawings.
 - 2. Description: Molded-plastic body, normally closed, diaphragm type with manual-flow adjustment, and operated by 24-V ac solenoid.

5. SPRINKLERS

- A. General Requirements: Designed for uniform coverage over entire spray area indicated at available water pressure.
- B. Plastic, Pop-up Spray Sprinklers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.

C. Plastic Shrub Sprinklers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.

6. DRIP IRRIGATION

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

1. Netafim USA.
2. Rain Bird Corporation.
3. Hunter Corporation.

B. Drip lines, air-relief valves, control zone valves:

1. Subject to compliance with requirements, provide product indicated on Drawings.

C. Drip Tubes with Direct-Attached Emitters:

1. As shown on the drawings; custom install at water feature.

7. CONTROLLERS

A. Manufacturers: Subject to compliance with requirements if existing controller is not functioning.

1. Wiring: UL 493, Type UF multiconductor, with solid-copper conductors; insulated cable; suitable for direct burial.
 - a. Feeder-Circuit Cables: No. 12 AWG minimum, between building and controllers.
 - b. Low-Voltage, Branch-Circuit Cables: No. 14 AWG minimum, between controllers and automatic control valves; color-coded different from feeder-circuit-cable jacket color; with jackets of different colors for multiple-cable installation in same trench.
 - c. Splicing Materials: Manufacturer's packaged kit consisting of insulating, spring-type connector or crimped joint and epoxy resin moisture seal; suitable for direct burial.

8. BOXES FOR AUTOMATIC CONTROL VALVES

A. Plastic Boxes:

1. 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]:
 - a. Carson Industries LLC.
 - b. Oldcastle, Inc.
 - c. NDS
2. Description: Box and cover, with open bottom and openings for piping; designed for installing flush with grade.
 - a. Size: As required for valves and service.
- B. Drainage Backfill: Cleaned gravel or crushed stone, graded from 3/4 inch minimum to 2 inches maximum.

3.EXECUTION

1. EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."
- B. Provide minimum cover over top of underground piping according to the following:
 1. Irrigation Main Piping: 24 inches
 2. Circuit Piping: 12 inches
 3. Drain Piping: 12 inches
 4. Sleeves: 24 inches

2. PREPARATION

- A. Set stakes to identify locations of proposed irrigation system. Obtain Architect's approval before excavation.

3. PIPING INSTALLATION

- A. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings.
- B. Install piping free of sags and bends.
- C. Install groups of pipes parallel to each other, spaced to permit valve servicing.
- D. Install fittings for changes in direction and branch connections.
- E. Install underground thermoplastic piping according to ASTM D 2774 and ASTM F 690.
- F. Lay piping on solid subbase, uniformly sloped without humps or depressions.

- G. Install PVC piping in dry weather when temperature is above 40 deg F. Allow joints to cure at least 24 hours at temperatures above 40 deg F before testing.
- H. Install piping in sleeves under parking lots, roadways, and sidewalks.
- I. Install sleeves made of Class 200 PVC pipe with socket fittings, and solvent-cemented joints.

4. JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. PVC Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. PVC Pressure Piping: Join schedule number, ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 3. PVC Nonpressure Piping: Join according to ASTM D 2855.

5. VALVE INSTALLATION

- A. Throttling Valves: Install in underground piping in boxes for automatic control valves.
- B. Drain Valves: Install in underground piping in boxes for automatic control valves.

6. SPRINKLER INSTALLATION

- A. Install sprinklers after hydrostatic test is completed.
- B. Install sprinklers at manufacturer's recommended heights.
- C. Locate part-circle sprinklers to maintain a minimum distance of 4 inches from walls and 2 inches from other boundaries unless otherwise indicated.

7. Drip Irrigation System:

- A. Install drip irrigation tubing and system components as shown on the Contract Drawings and as recommended by the manufacturer.
- B. Coordinate installation of drip systems with installation of planting materials.
- C. Prior to installation of drip system, meet with Construction Manager to review proposed locations of all components, including orientation of the drip tubing. Parallel drip tubing to be staggered so as to create a triangle with the drip emitters, in effect creating a 6 inch spacing.
- D. Prior to drip tubing installation, all debris, stones and other deleterious material shall be removed. Tubing shall not be laid on unstable materials.
- E. Drip tubing shall be installed as shown on the drawings at the spacing specified and staked using specified stakes at 36 inch maximum on center spacing. Additional stakes may be required to hold the tubing in place and shall be installed.
- F. Manual Line Flush Point: Install at low point in the exhaust header as far away from water source as possible. Install flush valve in valve box with a gravel sump adequate to drain 1 gallon of water.
- G. After installation, flush all lines and clean filters.

8. CONNECTIONS

- A. Comply with requirements for piping specified in Division 22 Section "Facility Water Distribution Piping" for water supply from exterior water service piping, water meters, protective enclosures, and backflow preventers. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment, valves, and devices to allow service and maintenance.
- C. Connect wiring between controllers and automatic control valves.

9. IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."
- B. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on each automatic controller.
 - 1. Text: In addition to identifying unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Warning Tapes: Arrange for installation of continuous, underground, detectable warning tapes over underground piping during backfilling of trenches. See Division 31 Section "Earth Moving" for warning tapes.

10. FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Any irrigation product will be considered defective if it does not pass tests and inspections.

11. STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Verify that controllers are installed and connected according to the Contract Documents.
 - 3. Verify that electrical wiring installation complies with manufacturer's submittal.

12. ADJUSTING

- A. Adjust settings of controllers.
- B. Adjust automatic control valves to provide flow rate at rated operating pressure required for each sprinkler circuit.
- C. Adjust sprinklers and devices, except those intended to be mounted aboveground, so they will be flush with, or not more than 1/2 inch above, finish grade.

13. CLEANING

- A. Flush dirt and debris from piping before installing sprinklers and other devices.

14. DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain automatic control valves and controllers.

15. PIPING SCHEDULE

- A. Install components having pressure rating equal to or greater than system operating pressure.
- B. Piping in control-valve boxes and aboveground may be joined with flanges or unions instead of joints indicated.
- C. Underground irrigation main and lateral piping shall be the following:
 - 1. As shown on the drawings.

END OF SECTION 32 8400

SECTION 32 9113 - SOIL PREPARATION

1. GENERAL

1. SUMMARY

- A. Section Includes:
 - 1. Top Soil.
 - 2. Manufactured Soils.
 - 3. Organic Soil Amendments
- A. Furnish labor, material and equipment required for placement and amendment of topsoils for areas to be planted, and the establishment of finish grades as shown on the Drawings and as specified herein.
- B. Coordinate work with installation of other site work including earthwork, irrigation, seeding, and planting.
- C. Related sections include the following:
 - 1. Division 31 Section "Site Clearing," stripping and stockpiling of topsoils.
 - 2. Division 32 Section "Plants" for planting placement of amended topsoil backfill.
 - 3. Division 32 Section "Planting Irrigation"

2. DEFINITIONS

- A. Amendment: material added to Topsoil to produce Planting Soil Mix. Amendments are classified as general soil amendments, fertilizers, biological, and pH amendments.
- B. Biological Amendment: Amendments such as Mycorrhizal additives, compost tea or other products intended to change the soil biology.
- C. Amended Topsoil: Native or imported topsoil or surface soil modified with soil amendments and fertilizers.
- D. AAPFCO: Association of American Plant Food Control Officials.
- E. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- F. CEC: Cation exchange capacity.
- G. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.
- H. Finish Grade: Elevation of finished surface of amended topsoil soil.
- I. Imported Soil: Soil that is transported to Project site for use.
- J. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
- K. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.

- L. Noxious Weed: any plant designated by a Federal, State or county government as injurious to public health, agriculture, recreation, wildlife or property.
- M. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."
- N. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- O. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- P. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.
- Q. SSSA: Soil Science Society of America.
- R. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- S. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- T. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- U. Topsoil: See Part 2 – Products.
- V. USCC: U.S. Composting Council.
- W. Weeds: Invasive, obnoxious or unwanted plants and their viable seeds or roots, including but not limited to:
1. *Centaurea stoebe* (spotted knapweed)
 2. *Centaurea diffusa* (diffuse knapweed)
 3. *Cirsium arvense* (Canadian Thistle)
 4. *Convolvulus spp.* (Morning Glory)
 5. *Cyperus esculentus* (Yellow Nutsedge)
 6. *Cytisus scoparius* (Scotch Broom)
 7. *Dipsacus sylvestris* (Common Teasel)
 8. *Festuca arundinaceae* (Tall Fescue)
 9. *Hedera helix* (English Ivy)
 10. *Holcus canatus* (Velvet Grass)
 11. *Lolium spp.* (Rye Grasses)
 12. *Lotus corniculatus* (Bird's Foot Trefoil)
 13. *Lythrium salicaria* (Purple Loose Strife)
 14. *Melilotus spp.* (Sweet Clover)
 15. *Myriophyllum spicatum* (Eurasian Milfoil)
 16. *Phalaris arundinaceae* (Reed Canary Grass)
 17. *Rubus discolor* (Himalayan Blackberry)
 18. *Salsola tragus* (Russian thistle)
 19. *Solanum spp.* (Nightshade)
 20. *Trifolium spp.* (Clovers).

3. SUBMITTALS

- A. Product Data. Include Material Safety Data Sheets (MSDS) where applicable: For the following:
 - 1. Fertilizers, including application rates.
 - 2. Soil Amendments.
 - 3. Manufactured Soils
- B. Product Certificates: For each type of manufactured product, signed by product manufacturer, and complying with the following:
 - 1. Manufacturer's certified analysis for standard products.
 - 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- C. Material Test Reports:
 - 1. Soil Fertility and Agricultural Suitability Analyses and Recommendations Reports for the following:
 - a. Manufactured Soil: Minimum 30 days prior to beginning soil preparation work.
 - 2. Compost Analysis: Provide analysis for one representative sample of compost minimum 30 days prior to compost being delivered to Project Site
- D. Delivery Slips: Provide delivery slips as proof of shipment of specified materials.

4. QUALITY ASSURANCE

- A. Soil Fertility and Agricultural Suitability-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.
 - 1. Acceptable Soil Testing Laboratories are:
 - a. A & L Western Agricultural Laboratories, <https://al-labs-west.com/> (503) 968-9225.
 - b. Western Laboratories, Inc, <https://westernlaboratories.com/> (208) 649-4360.
- B. Soil Analyses: Furnish soil analyses by a qualified soil-testing laboratory stating:
 - 1. Soil Composition: USDA particle size analysis indicating percentages of sand, silt and clay, and percent organic matter.
 - 2. Macro and micro nutrient fertility tests as determined by pH, salinity, nitrate nitrogen, ammonium nitrogen, phosphate phosphorous potassium, calcium, magnesium, soluble copper, zinc, manganese, iron, saturation extract boron and sodium analyses.
 - 3. Sodium Absorption Ratio (SAR).
 - 4. Recommendations by the soil testing lab for fertilizer and soil amendments in pounds per 1,000 square foot or tons per acre, as necessary to correct soil deficiencies.
- C. Compost Testing Laboratory Qualifications: An independent laboratory, with the experience and capability to conduct the testing indicated following U.S. Composting Council Seal of Testing Assurance (STA) procedures, or equivalent.
 - 1. Acceptable STA Compost Testing Laboratories are:

- a. A & L Western Agricultural Laboratories, <https://al-labs-west.com/> (503) 968-9225.
 - b. Control Laboratories, controllabs.net (831) 322-3065.
 - D. Compost Analysis: Provide documentation from supplier that compost has reached a monitored temperature of 140 degrees Fahrenheit for at least one week. Engage an independent soil testing laboratory to test representative sample(s) of compost and furnish compost analysis report for the following parameters:
 1. Percent organic matter, percent moisture, percent inerts (foreign matter), pH, soluble salts, and particle size.
 2. Nutrient content, including: Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca), and Magnesium (Mg) and Sulfur (S).
 3. Trace Metals, including: Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), and Zinc (Zn).
 4. Maturity Indicator. Provide bio-assay results. Provide Carbon-Nitrogen ratio.
 5. Stability Indicator: Provide respiration test results.
 - E. Request inspection and allow observation by Owner's Representative of prepared soils before planting.
5. DELIVERY, STORAGE AND HANDLING
- A. Deliver packaged materials in manufacturer's unopened containers fully identified by name, brand, type, weight and analysis.
 - B. Store and handle packaged materials to prevent damage and intrusion of foreign matter.
 - C. Store stockpiled topsoil in area designated by Owner's Representative. Provide erosion control measures for stockpiled topsoil on site to prevent contamination of the soil. Refer to Division 31 Section "Site Clearing" for control of dust and erosion.
 - D. Deliver manufactured soils in quantities that can be placed immediately into planting beds. Do not stockpile manufactured soils on site.
6. SOIL AMENDMENT BID QUANTITIES
- A. Bid quantities and types of soil amendments shall be based upon those listed in this Section. Types of amendments required and quantities shall be adjusted as necessary based upon actual results of soil fertility and agricultural suitability analyses and recommendations for on-site topsoils.
 - B. Amount per 6-inch lift of topsoil over 1000 square-feet of landscape area:
 1. 6 cu-yds Compost
7. SITE CONDITIONS
- A. Topsoil placement and soil preparation shall not take place during periods where saturated soil or surface water is present in work areas.

- B. Work shall not take place when temperature is less than 32 degrees Fahrenheit, or when frozen soil exists on site.

8. COORDINATION

- A. Coordinate soil preparation with Division 31 Section "Site Clearing" such that topsoil, soil amendments and fertilizers are incorporated into ground fill areas in specified lifts to specified depths below finish grade for both planting areas and seeded areas.
- B. Coordinate work with installation of other site work, including irrigation, seeding, and planting.

2.PRODUCTS

1. TOPSOIL

- A. Topsoil Definition: ASTM D 5268; natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles, conforming to USDA classification for Loam or Sandy Loam; 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 1 inches in any dimension; and free of weeds, roots, and other deleterious materials, with the following physical properties:
 - 1. Organic Matter: 6 percent minimum.
 - 2. Sodium Adsorption Ratio (SAR): less than 6.0.
 - 3. Saturation Extract concentration for Boron: less than 1.0
 - 4. pH range of from 6 to 8 (plus 0, minus 0.5).
 - 5. Saturation Extract Conductivity: less than 4.0 dS/m @ 25 degrees Celsius as determined in a saturation extract.
 - 6. Non-soil components: less than 1 percent by volume.
 - 7. Heavy metal concentrations: below the USDA per year load limit.
 - 8. Minimal weed seed.
 - a. If regenerative noxious weeds (including, but not limited to, quack grass, nutsedge grass, and horsetail) are present in the soil, all resultant growth including roots shall be removed throughout one-year period after acceptance of work at no additional cost to Owner.
- B. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth. Ensure no contamination of the soils occurs during earthwork and grading, and that the soil remains friable and free of debris.
 - 1. Import Topsoil: Supplement on-site topsoil with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs or marshes.

2. MANUFACTURED SOIL

- A. Soil Mixes: Available from ProGro Mixes and Materials. <https://pro-gromixes.com/green-rooftop-materials/>. Telephone: (503)682-3500. 26045 SW Grahams Ferry Rd., Sherwood, OR 97140, or approved equal.

1. Intensive Soil Mix: commercially blended soil used in roof garden applications with maximum saturated bulk density of 85 pounds per cubic foot.

3. ORGANIC SOIL AMENDMENTS

- A. Compost: Well-decomposed, commercially manufactured, stable, and weed-free organic matter **[from agricultural, food, biosolids, or yard debris sources]**; pH range of 5.5 to 8.0; 100 percent passing through 1[3/4][1/2]-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and shall conform as follows:
 1. Tested, at minimum, every six months for noxious weeds.
 2. Organic matter source (feedstock): Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
 3. Organic Matter Content: 60 to 80 percent of dry weight as determined by ash method.
 4. Moisture Content: 35 to 55 percent by weight
 5. Free of refuse (less than 1 percent by dry weight), plastics, contaminants or any material toxic to plant growth.
 6. Processed to meet U.S. Composting Council's Seal of Testing Assurance Program, or equivalent.
 7. Carbon to Nitrogen Ratio: 40 to 1 or lower.
 8. Composted for a minimum of 9 months and reach a monitored temperature of 140 degrees Fahrenheit for at least one week.
 9. Available Suppliers:
 - a. Rexius Forest By-Products, Inc., phone (800) 285-7227.
 - b. McFarlane's Bark, phone (503) 286-0886.
 - c. American Compost & Recycling, LLC, phone (503) 286-0886.
 - d. Or equal.

3.EXECUTION

1. EXAMINATION OF SITE CONDITIONS

- A. Examine for site conditions that will adversely affect execution, permanence, quality of work, and survival of plant material and grasses.
- B. Verify that subgrades and slopes of lawn and planting areas are acceptable to Owner's Representative prior to commencing work of this Section.
- C. Should the Contractor find any discrepancies between the Drawings and the physical conditions, inform the Owner's Representative immediately for clarification.
- D. Begin Work required under this Section only after conditions are satisfactory.

2. PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, and existing lawns and exterior plants from damage caused by soil preparation operations.

- B. Prepare soils at a time when moisture conditions will permit proper cultivation.
 - C. Remove stones over 1-inch diameter, sticks, roots, mortar, concrete, rubbish, debris, and all materials harmful to plant life, and legally dispose of them off Owner's property.
 - D. Remove as required to eradicate noxious weed growth and roots.
 - 1. Achieve complete removal or kill of all weeds within all areas receiving new plantings and lawn areas.
 - 2. In planting beds, kill achieved by working soil is permissible for annual non-noxious broad-leaf type weeds.
 - E. Locate and securely mark or flag irrigation sprinkler heads, area drains, catch basins, clean outs, manholes, valve boxes, and other site improvements not extending above finish grade.
 - F. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, in accordance with Division 31 Section "Site Clearing".
3. SOIL PREPARATION FOR EXISTING PLANTING AREAS
- A. This article pertains to those shrub bed areas indicated as "Planting Areas" on the Drawings where mass plantings of trees, shrubs and ground cover plants are scheduled, and where native soil is already in place. This article excludes the newly created planting areas in Plaza and Rock Garden slope, where manufactured soil will be used.
 - B. Protect shrubs or groundcover indicated to remain in place on drawings, in accordance with Division 31 Section "Site Clearing".
 - C. Remove existing vegetation, strip lawn, except where vegetation is indicated to remain. Dispose of off site.
 - D. Place 2" compost over soil surface, rototill thoroughly to a depth of 6 inches. Place sufficient topsoil allowing for compaction and natural settlement.
 - E. Water lightly and allow planting mix to settle. Add additional topsoil if needed to bring soil level to grades shown on the Drawings with allowance at pavement edges for mulch placement. Provide compaction to 85 percent relative density. Meet lines, grades and elevations shown, after light rolling and natural settlement. Fine grade shrub and ground cover areas to smooth even surface with loose, uniformly fine texture. Rake and drag shrub and ground cover areas to remove ridges and fill depressions to obtain firmness and finish grades preparatory to receiving planting.
 - F. Remove stones over 1/2-inch in any dimension and sticks, roots, rubbish and other extraneous matter.
4. PLACING MANUFACTURED SOIL IN PLAZA PLANTERS
- A. This article pertains to the newly created planting areas in Plaza, where manufactured soil will be used.

- B. Fill planter with planting soil. Place soil in lightly compacted layers of 6 inch lifts to shape and elevation indicated on drawings, allowing natural settlement.
- C. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

5. SOIL PREPARATION FOR SEEDED LAWN ALTERNATIVE

- A. This article pertains to new seeded areas as shown on Drawings.
- B. Complete shaping of surface grades as indicated on plans.
- C. Place 2" compost over soil surface, rototill thoroughly to a depth of 6 inches. Place sufficient topsoil allowing for compaction and natural settlement.
- D. Leveling Rolling: Drag with flexible tine harrow (or approved equipment) to remove ridges and fill depressions, as required to meet finish grades. Roll areas (minimum roller weight 10 pounds per square inch) in two opposing directions.
- E. Repeat rolling procedures and drag lightly to establish a smooth uniform compacted surface free of rocks and other extraneous matter. Provide compaction to 85 percent relative density.
- F. Water lightly and allow planting mix to settle. Add additional material at mixture indicated in paragraph above to bring soil level to grades shown on the Drawings with allowance at pavement edges. Provide compaction to 85 percent relative density or as indicated in Division 31 Section "Site Clearing."
- G. Meet lines, grades and elevations shown, after light rolling and natural settlement. Fine grade seeded areas to smooth even surface with loose, uniformly fine texture. Rake and drag lawn areas to remove ridges and fill depressions to obtain firmness and finish grades preparatory to receiving seed planting.
- H. Remove stones over 1/2-inch in any dimension and sticks, roots, rubbish and other extraneous matter.
- I. Finish Grading: Grade seeded areas to smooth, even surface with a loose uniformly fine texture. Finish grade of soil shall be 1/2 inch below adjacent pavement. Limit preparation to areas which will be planted promptly after preparation.
- J. Moisten prepared seeded 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.

6. SOIL PREPARATION FOR PLANTING PITS OF TREES

- A. This article pertains to tree planting when occurring on an individual basis.
 - 1. Backfill Mix: Prepare backfill mix and place in planting pits as specified in Division 32 Section "Plants."
 - 2. Grade smooth to elevations shown.

7. SOIL PREPARATION UNDER EXISTING TREES
 - A. Remove vegetation not indicated to remain beneath canopy of existing trees. Take care not to disturb roots of existing trees.
 - B. Lightly rake areas and add topsoil to meet proposed grades.
8. FINE GRADING
 - A. Finish grade after full settlement including mulch, shall be 1 inch below tops of curbs, walks, or existing grades in shrub areas and 3/4 inch lower in lawn areas.
 - B. Slope all areas to prevent puddling and drain surface water toward catch basins, drains, curbs, or off-site as shown on Drawings.
 - C. Soil in all areas shall be thoroughly settled, with a smooth surface free of humps and hollows, and shall be firm enough to resist undesirable impressions when stepped upon.
 - D. Use levels, screens, drags, or any other equipment necessary to establish and verify grades and surfaces.
 - E. Finish grade lawn, grass and planting areas to smooth, even surface with loose, uniformly fine texture.
 - F. Roll, rake, and drag lawn areas, remove ridges and fill depressions with amended topsoil to obtain firmness and finish grades as indicated.
 - G. Notify Owner's Representative 36 hours in advance to review fine grading of planting or seeded areas. Finish grades shall be prepared to the satisfaction of the Owner's Representative prior to planting.
 - H. See Division 32 Section "Plants," for mulch placement.
9. CLEAN-UP
 - A. Clean up excess materials and debris from project site upon completion of work or sooner if directed by the Owner's Representative.
 - B. Leave in neat and tidy condition daily.
10. DISPOSAL
 - A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 32 9113

SECTION 32 9300 – PLANTS

1. GENERAL

1. SUMMARY

A. Section Includes:

1. Plants.
2. Herbicide.
3. Planting Fertilizers.
4. Mulches.
5. Root Barriers.
6. Tree Stabilization.
7. Edgings.

B. Related Sections:

1. Division 32 Section "Soil Preparation" for preparation of planting soils.
2. Division 32 Section "Planting Irrigation"

2. DEFINITIONS

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

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Bare-Root Stock: 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 the minimum root spread according to ANSI Z60.1 for type and size of plant required.

D. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a 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 plant required.

E. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted 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 plant.

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

- H. Manufactured Topsoil/Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- I. Pesticide/Herbicide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.
- J. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- K. Planting Area: Areas to be planted.
- L. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 32 91 13 "Soil Preparation" for drawing designations for planting soils.
- M. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- N. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- O. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- P. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- Q. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- R. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

3. REFERENCES

- A. Standards: Comply with botanical names, sizes, and conditions provided in:
 - 1. Botanical Names: American Joint Committee on Horticultural Nomenclature, "Standardized Plant Names."
 - 2. Sizes and Conditions: ANSI Z60.1 "American Standards for Nursery Stock", (latest edition).
 - 3. Perennials: "Perennial Plant Association Standards."
 - 4. Native Species: Hitchcock, C.L. and A. Cronquist, "Flora of the Pacific Northwest," 1973.

4. INSTALLER QUALIFICATIONS

- A. For landscape Installer. Include list of 3 similar projects completed by Installer demonstrating Installer's capabilities and experience with procuring and installing native plants in the Willamette Valley. Include list of primary native plants used, as well as project names, addresses, and year completed, and include names and addresses of owners' contact persons.

5. QUALITY ASSURANCE

- A. Contractor: Provide one person who shall: Be present at all times during execution of work in this section; be familiar with the materials and best methods for installation; direct work performed under this section.
- B. Government Inspection: All plants and planting material shall meet or exceed the specifications of Federal, State, and County laws requiring inspection for plant disease and control.
- C. Secure plant material and maintain in a climate similar to that of the project site for a minimum period of one year.
- D. All plant material to be grown from cuttings or seed. Collected plants are not acceptable.

6. SUBMITTALS

- A. Within 30 days after Contract award, submit:
 - 1. A list of local/regional suppliers for each plant species to be installed. List to include plant quantities, sizes and root conditions. Certify in writing, confirmed orders for plants by submitting a Bill of Sale for each plant to be installed. Each plant species shall be supplied by one grower only unless otherwise approved by Owner's Representative.
 - a. Requests for substitutions of plants not available in size, quantity or type specified must be made within 30 days after Contract award. Submit written evidence that a specified plant cannot be obtained and has been unobtainable since Contract award.
 - 2. Plant Material Inspection Certificates for all plant material shipped from out of state.
 - 3. Product Data: For the following:
 - a. Mulch.
 - b. Fertilizer
 - c. Tree stabilization products.
 - d. Root barriers.
 - 4. Submit copy of herbicide applicator's Commercial Applicator's License to Owner's Representative before application of herbicides (includes pesticides). Submit a copy of the application record to the Owner's Representative immediately after each herbicide or pesticide application.
- B. Upon completion of the Work, submit:

1. Written notification to Owner's Representative requesting review for Substantial Completion.
 2. Written notification to Owner's Representative of Punch List Completion.
- C. With application for final payment, submit:
1. Copies of delivery invoices, labels, or other acceptable proof of quantities of materials used.

7. SITE OBSERVATION

- A. Site observations herein specified shall be made by the Landscape Architect (**Kyla Tanaka (510) 207 5100**). The Contractor shall provide a minimum of three (3) days notice before Observation is required.
1. Pre-Construction Meeting: Explain Owner Representative's role to Contractor, review construction sequence.
 2. Upon the completion of grading prior to planting.
 3. When trees and shrubs are spotted in place for planting, but before planting holes are excavated. **For Phase 1 work: if more than (2) site visits during are needed for this step, Contractor shall reimburse Landscape Architect for travel time and time spent on site at current billable rates.**
 4. Pre-final observation after planting, and all other indicated or specified work has been completed—Substantial Completion—acceptance and written approval shall establish beginning of the Maintenance Period.
 5. Final Observation—Final Acceptance—at the completion of the **ninety (90) day Maintenance Period**. Successful completion of this observation shall establish the beginning date for the **one (1) year guarantee of all trees**.
- B. Upon completion of the Final Observation and the Work of this Section, the Contractor will be notified in writing: (1) whether the work is acceptable; and (2) of any requirements or corrective measures necessary for completion and acceptance, i.e. Punch List.
- C. Contractor shall be on site at the time of each observation. Contractor shall speak English.
- D. No site visits shall commence unless all items in previous observation reports are either completed or remedied unless Owner has waived, in writing, such compliance. Failure to accomplish Punch List shall make Landscape Contractor responsible for reimbursement to the Architect for time and travel at current billing rates.
- E. Construction observation visits shall be made in proper sequence of the installation of the work. No visits will be made until all soil submittals have been made and approved. Out of sequence construction visits shall make the Landscape Contractor responsible for reimbursement to the Landscape Architect for time and travel at current billing rates.

8. QUALITY CONTROL

- A. Inspection: Plants shall be subject to inspection by the Landscape Architect (**Kyla Tanaka (510) 207 5100**) at the job site upon delivery to the site. Plants not conforming to specifications shall be rejected and removed immediately from the site.
- B. The presence of noxious weeds in plant balls shall be cause for rejection of any or all plants from that source.

9. DELIVERY

- A. Deliver packaged materials to site in original unopened containers bearing manufacturer's guarantee chemical analysis, name, trade name, and trademark.
- B. Remove unacceptable plant material immediately from project site.
- C. Plant Materials:
 - 1. Deliver trees and shrubs after preparations for planting have been completed, and plant immediately.
 - 2. Do not prune prior to delivery unless otherwise approved by Owner's Representative.
 - 3. Do not bend or bind-tie trees or shrubs in such a manner as to damage bark, break branches, or destroy natural shape.
 - 4. Provide protective covering during delivery.
 - 5. Protect plants during delivery to prevent damage to root ball or desiccation of leaves.
 - 6. Apply anti-desiccant using a pump sprayer to provide adequate film over trunks, branches, stems, twigs and foliage of plants.
 - 7. If deciduous trees or shrubs are moved in full-leaf, spray with anti-desiccant at nursery before moving, and sprayed again 2 weeks after planting.
 - 8. Label one of each tree and shrub species with securely attached waterproof tag bearing botanical name and supplier's name.

10. STORAGE

- A. Contractors shall schedule and conduct planting operations to minimize storage of plant materials on the project site. The location and conditions of storage shall be reviewed for approval by the Contractor, Owner, and Owner's Representative.
- B. Plants that cannot be planted within one day after arrival shall be "heeled-in" in accordance with accepted horticultural practices and the following requirements:
 - 1. Protect root ball of balled and burlapped plants with moist earth, sawdust or other acceptable material.
 - 2. Protect plant at all times from injury, extreme weather conditions, and keep moist.
 - 3. Store plants in shade until planted.
 - 4. Store plants in upright position and allow sufficient ventilation.
- C. All plants that are to be stored longer than one month shall be planted in nursery rows and maintained at Contractor's expense.

11. HANDLING

- A. Do not drop plants.
- B. Do not pick up container or balled plants by stems, trunk, or foliage. Handle balled & burlapped plants by the ball of earth.

12. NOTIFICATIONS

- A. Notify Landscape Architect a minimum of 72 hours in advance of plant material delivery so that plants may be inspected upon site delivery. Unapproved materials to be immediately removed from job site.
- B. Notify Landscape Architect a minimum of one week in advance for request of Substantial Completion and Final Acceptance inspections.

13. SITE CONDITIONS

- A. Existing Improvements to Remain: Locate underground utilities prior to start of work.
- B. Protect existing improvements from damage, soiling or discoloration. Repair or replace damaged, soiled or discolored improvements as directed by Owner's Representative.
- C. Planting Conditions: Planting not permitted during the following conditions, unless otherwise approved:
 - 1. Cold weather: less than 32 degrees Fahrenheit.
 - 2. Hot weather: greater than 90 degrees Fahrenheit.
 - 3. Wet weather: saturated soil.
 - 4. Windy weather: wind velocity greater than 20 m.p.h.

14. WARRANTY

- A. Warrant all plant material to be true to botanical name and specified size.
- B. After receiving notice of Substantial Completion, maintain all plant material in a vigorous condition for **90 days**
- C. Replace, in accordance with these specifications, during current, or if necessary, next planting season, at no cost to Owner, plant material not surviving or in poor condition within one year of Substantial Completion. Contractor shall provide, at his expense, a timely written diagnosis of plant health by a certified Arborist, should a dispute arise concerning plant vitality or viability. Arborist's report shall indicate reason for lack of vigor, potential remedies, if any, and estimate of time required to regain vigor and specified size.
- D. Plants used for replacement shall be same kind and size as originally specified and shall be furnished, planted and fertilized as originally specified.
- E. Repair damage to other plants, improvements and property caused by Contractor during replacement of plant materials during the Maintenance Period at no additional cost to Owner.

15. ACCEPTANCE

- A. Substantial Completion:
 - 1. Notify the Owner's Representative in writing of the completion of planting and ancillary landscape work.

2. Within 10 days after notification of completion of work, the Owner's Representative will inspect the work and prepare a Notice of Substantial Completion, along with a list of items that require completion or correction (Punch List).
3. Notice of Substantial Completion constitutes the commencement of the 90 day Maintenance Period.

B. Final Acceptance:

1. The final inspection of all planting will be made by the Owner, Owner's Representative and the Contractor and following replacement planting completion and/or correction of all Punch List items prior to the expiration of the Maintenance Period, but only after the Contractor has furnished the Owner's Representative, in advance, with a written response as to how Punch List items were corrected. If such written notification is not provided to the Owner's Representative, the requirements of the Maintenance Period shall remain in force indefinitely until such time as the written notification of completion is received. Any extension of the Maintenance Period due to the failure of the Contractor to respond to the Owner's Representative with a written notification of Punch List completion will be considered as incidental to the Work and shall be performed by the Contractor at no additional cost to the Owner.
2. Before Final Acceptance will be granted, the site must be in the condition stipulated under "Maintenance" article and all plant replacements completed.
3. Before Final Acceptance will be granted, all items of the Punch List shall be completed or corrected.

C. Necessary Observations Beyond Final Acceptance:

1. If any of the Punch List items as noted in the Notice of Substantial Completion have not been fully corrected or repaired to the complete satisfaction of the Owner's Representative, the contractor must reschedule another field observation to substantiate claim of correction. Contractor shall bear all financial responsibility to reimburse the Owner for all costs incurred by the Owner's Representative for time and travel to verify Punch List compliance.

2.PRODUCTS

1. PLANT MATERIALS

- A. Provide plant materials as scheduled on Drawings.
- B. Quantities indicated are for Contractor's convenience only. Contractor to verify and provide number of plants required to complete work graphically shown on Drawings.
- C. Pot sizes are specific. Alternative sizes must be approved by Landscape Architect.
- D. Plants shall be vigorous, well-formed and shaped, true to species and type, and free from disease, insects, and defects such as knots, girdled roots, poor branch attachment, sun-scald, windburn, injuries, abrasion, significant trunk scars, evidence of poor pruning, or disfigurement.
- E. Plants shall be full foliated when in-leaf.

- F. Christmas tree stock shall not be used for conifer, evergreen material.
- G. Conform to ANSI Z60.1, with additions and exceptions noted:
 - 1. Groundcover Plants: Well-established root systems, and grown in flats or removable containers.
 - 2. Containerized Plants: Grown in container in which delivered for at least 3 months, but not root-bound.
 - 3. Greenhouse Grown Plants: Acclimated outdoors for 360 days prior to delivery.
 - 4. Bare-root Stock: Well-branched, fibrous root system.
 - 5. Balled and Burlapped Plants and Containerized Trees: All evergreen trees and deciduous trees over 1-1/2 inch caliper to be balled and burlapped with hemp burlap and twine only or grown in container in which delivered for 9 months minimum. Soil balls to be a minimum of 10 inches per caliper inch of tree.
 - 6. Trees: Straight-trunked not varying from plumb more than 6 inches over 6 feet; well-branched, with no cross branches, dead or broken leaders, or broken major branches, no fresh cuts over 1 inch diameter, and not "topped" or sheared.
 - 7. Grafted Trees: Base grafted or budded only.

2. HERBICIDES

- A. Chemical herbicides are not allowed on project. If any are deemed necessary, contact Owner's Representative. If owner's representative approves herbicide use, refer to B and C below.
- B. Post-Emergent Herbicides: EPA registered and approved, of type recommended by manufacturer for selective herbicide application. "Round-Up," or approved equal.
- C. Pre-Emergent Herbicides: EPA registered and approved, of type recommended by manufacturer for selective weed prevention. "Ronstar-G" by Bayer, "Surflan," by Dowelanco, or equal. Products containing either pendimethalin or DCPA are prohibited.

3. FERTILIZER

- A. Available Products:
 - 1. PermaMatrix BSP Foundation combination of soil minerals, organics, biochar, and beneficial living soil micro-organisms including free living nitrogen fixing bacteria. Available from One Green World (877)-353-4028.
 - 2. 'PHC Plant Saver' blend of ecto and endomycorrhizal fungal spores, beneficial rhizosphere bacteria, 4-7-4 fertilizer, organic amendments, and micronutrients. Available from Plant Health Care, Inc. (800) 421-9051.
 - 3. Or approved equal.

4. MULCH

- A. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through a 1-inch (25-mm) sieve; soluble-salt content of [2 to 5] dS/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: **40 to 60** percent of dry weight.

2. Feedstock: Agricultural, food, yard trimmings; or source-separated or compostable mixed solid waste.
 - B. Mineral Mulch 1: Decomposed Granite at Rock Garden Planting in boulder slope – see plans.
 - C. Mineral Mulch 2: River rock at rain garden. 30 % large cobble, 4”-6” diameter. 80 % small cobble, ½” – 1 ½” diameter. **Do not use ‘Rainbow’ rock**
5. ANTI-DESSICANT
- A. Emulsion type, film-forming agent designed to permit plant transpiration but retard excessive loss of moisture from plants. "Wilt-Pruf" or equal.
6. PLANTING SOIL MIXES
- A. Refer to Division 32 Section “Soil Preparation.”
7. TREE STAKING AND GUYING
- A. Deciduous Tree Tie: Biodegradable woven webbing designed for tree stabilization, minimum 1 inch wide by 1/8 inch thick. ‘Nature Tie’ or approved equal.
 - B. Coniferous Tree Guy Wire: 12 gauge galvanized wire with 1/2 inch rubber hose collar, black color, to protect tree trunk.
 - C. Stakes: 2 inch x 2 inch x 8 feet untreated Douglas fir for staking of deciduous trees; and 3 inch x 2 inch x 36 inch untreated Douglas fir for guying of coniferous trees.
 - D. Provide miscellaneous hardware, wire, and accessories as shown on the Drawings.
8. TREE WRAP
- A. Corrugated or crepe paper, designed specifically to resist insect infestation and sun scald.
9. ROOT BARRIERS
- A. Rigid interlocking polypropylene panels: Deep Root, Inc; or equal.
 1. Root control barriers: 24 inches deep by 0.08 inch thick polyethylene panel with integral root directing ribs and self locking joiner strips. Model No. UB 24-2
10. DRAINAGE ROCK BACKFILL
- A. 1-1/2 to 1/2 inches round washed river rock; no fines for non-percolating soil.

11. FILTER FABRIC

- A. Non-woven filter fabric to cover drain rock: Mirafi 140N as available from TenCate, (360) 699-1426; Propex 451 as available from A.C.F. West Inc., (503) 771-5115; or equal.

3.EXECUTION

1. PREPARATION

- A. Verify finish grades are properly achieved and soil preparation has been completed in accordance with the specifications; start of Work denotes acceptance by the Contractor and Contractor assumes responsibility for final results.

2. SOIL PREPARATION

- A. As specified in Division 32 Section "Soil Preparation".

3. LAYOUT

- A. Mark locations of lines between the planting areas and the lawn areas on the finish with paint, chalk or equal material for approval by the Owner's Representative. The method of marking shall be approved by the Owner's Representative.
- B. Field place trees and shrubs in locations shown on Drawings. Landscape Architect may request rotation or slight movement of tree to give a better appearance with respect to adjacent plants and structures. Placement must meet approval of Landscape Architect prior to excavating planting pits.

4. EXCAVATION FOR TREES AND SHRUBS

- A. Excavate planting holes, with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage. Loosen hard subsoil in bottom of excavation.
- B. For trees and shrubs, make excavations at least 2 times wider than root spread; equal to the rootball height directly beneath the rootball; and 1-1/2 times deeper than rootball height around the perimeter of the planting pit, as indicated in the Drawings.
- C. If non-percolating soils are encountered, fill excavations for trees and shrubs with water and allow to percolate out before planting. If plant holes do not drain: Auger drill holes 36 inches deep by 8 inches wide and fill with drainage backfill. Cover top with filter fabric. Notify Owner's Representative to observe prior to planting.
- D. If conditions detrimental to plant growth are encountered, such as rubble fill, or obstructions, notify Owner's Representative and resolve before planting.
- E. Scarify bottom and sides of hole with shovel to eliminate "glazed" surfaces.
- F. Set plants on native soil where possible.

5. PLACING

- A. Set top of root ball slightly higher than finish grade; deep planting not permitted. If hole for trees is too deep, fill hole with native soil only where applicable or prepared soil to correct levels.
- B. Set plants plumb and faced for best appearance.
- C. Remove wire baskets, burlap, fasteners from rootball completely if rootball will not be damaged. If damage is suspected, notify Owner's Representative for concurrence and remove tops and sides of baskets minimum. Use bolt cutters on wire if necessary to remove wire baskets. Bending back not acceptable. Remove all burlap and twine from planting pit.
- D. Remove metal cans or plastic containers completely from rootball.
- E. Neatly cut off broken, girdling, or frayed roots and any root growth growing in a circular manner conforming to its container.

6. BACKFILLING - General

- A. Before mixing, clean topsoil of extraneous materials and other materials harmful or toxic to plant growth.
- B. Prepare planting backfill soil mix prior to backfilling. Stockpile on site.
- C. Planting backfill soil mix shall be as stated in the Soil Preparation Spec.
- D. Backfill half of plant pit around rootball with backfill soil mix, carefully tamp soil around rootballs.
- E. Add fertilizer to backfill, quantity per manufacturer's instructions.
- F. Complete backfilling, firming to surface grade.
- G. Form watering basin from site topsoil as shown on Drawings.
- H. Thoroughly hand water each plant and entire bed immediately after planting. Adjust rootball and soil as required if settlement of soil occurs.
- I. Remove plant tags and ribbons.

7. PLANTING TREES AND SHRUBS

- A. Set roots or rootball on layer of compacted planting soil backfill mix or native suitable topsoil from planting pit, plumb and in center of pit or trench with top of rootball at 1 inch above elevation of adjacent finished grade.
- B. Place additional planting soil backfill mix around base and sides of ball and eliminate voids and air pockets. When backfill is approximately 2/3 complete, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill. Cut burlap from top of rootball and roll back to sides of planting hole; form watering basin; stake and guy immediately after planting.

8. PLANTING GROUNDCOVER

- A. Space plants as shown or scheduled on Drawings. Dig holes 3 times the width and 1-1/2 times the depth of the rootball. Plant with planting soil backfill mix. Work soil around roots to eliminate air pockets. Water thoroughly after planting.

9. ROOT CONTROL BARRIERS AT NEW PLANTINGS

- A. Provide linear and surround root barrier applications at trees within 5 feet of paving, curbs, walls, utility ducts or other appurtenances.
 - 1. For linear applications provide sufficient lengths of panels to equal mature width of tree canopy plus 2 feet, 10 feet minimum length. Provide on both sides of the tree trunk adjacent to curb and paving per manufacturer's recommendations.
 - 2. For surround applications provide a minimum of five 24-inch long panels where trees are planted on an individual basis. Shape connected panels to form an oval around the tree rootball.
- B. Excavate planting hole as specified for tree planting.
- C. Begin backfilling with soil mix and install tree as specified. Backfill up to depth equal to depth of root control barrier panel. Install interlocking root control panels around rootball, with minimum 8 inches clearance to rootball and with top 1/2 inch above finish grade.
- D. Backfill around rootball with planting soil backfill mix as specified for tree planting. Backfill outside of root control barriers with 3/4 to 1-1/2-inch crushed gravel, no fines (not pea gravel), to full depth of panels and minimum 4 inch wide area.

10. TRUNK WRAPPING

- A. If planting takes place between the beginning of June and the beginning of November, deciduous trees over 1-1/2 inch caliper when within five feet of pavement shall be wrapped promptly after planting to prevent sun scald, wrapping as approved by American Association of Nurserymen. Wrap spirally from ground line to the height of the first branch. Wrap in neat and snug manner and secure with tape similarly colored to tree wrap at bottom, top and in the middle. Wrap before staking or guying.

11. STAKING

- A. Deciduous Trees 1-inch caliper and larger: Provide 2 stakes per tree 180 degrees from each other in the direction of prevailing winds. Drive plumb outside of rootball as shown on Drawings. Place tree ties around tree trunk, approximately 4 feet from ground level, one from each side.
- B. Coniferous Trees 4 feet tall and larger: Provide 3 guys evenly spaced around trunk of tree. Set guys at a 60 degree angle to the trunk at 2/3 the height of the tree. Drive 2 by 2 inch wood stakes perpendicular to angle of cable. Secure guys taut at trees passing each guy wire through a collar and setting the collar at the tree trunk where contact is made. Secure a warning flag on each cable as shown on Drawings.

12. MULCH

- A. Place mulch **1** inches deep in all planting beds. Rake smooth. Mulch shall be pulled away from crowns of shrubs, perennials and groundcover plants. Mulch shall be 1” below adjacent curbs and paving.
- B. Ground Cover Plantings:
 - 1. Mulch areas between groundcover plants; place minimum 1-inch thick specified mulch.

13. PRUNING

- A. Prune plant material if necessary and as directed by Owner’s Representative to balance root and top growth. Prune, thin, and shape trees and shrubs in accordance with standard horticultural practices.
- B. Prune all dead and broken limbs.
- C. Prune without distorting basic form of plant and only to the extent necessary for each plant except where directed by Owner's Representative. Do not prune plants into boxes or balls.

14. MAINTENANCE

- A. Begin plant maintenance immediately after planting and continue until the end of the Maintenance Period or through any extensions of the Maintenance Period due to failure to supply written notification of Punch List completion.
- B. Store maintenance materials and equipment where directed by Owner's Representative. Keep pavements clean and work areas in an orderly condition.
- C. Maintain plants for an additional **[90 days]** minimum after written notice of Substantial Completion of the Project and until Final Acceptance (which ever is later). If plants are not installed before the dormant period, November 15th to March 1st, maintain for a period of **[90 days]** after the dormant period or until Final Acceptance, whichever is later.
 - 1. Inspect plants at least once a week and perform maintenance promptly.
 - 2. Maintain trees, shrubs and ground covers by watering, pruning, spraying, cultivating, and weeding as required for healthy growth.
 - 3. Water when soil moisture is below optimum level for best plant growth.
 - 4. Remove and replace impaired or dead plants promptly during specified planting season.
 - 5. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical position as required.
 - 6. Eradicate all weeds, grass, and other undesired vegetation growth from planting areas. Remove dead weeds and dispose legally off-site. Remove all perennial weeds completely, including all underground parts.
 - 7. Restore all soil settlement to original grade.
- D. Ensure Irrigation system is functioning and adequately watering plants. Adjust as necessary and/or supplement irrigation with hand watering through 90 day maintenance period as needed for extreme hot weather or to get plants established.

15. CLEAN-UP AND PROTECTION

- A. During landscape work, keep pavements clean and work area in an orderly condition.
- B. Sweep and wash paved surfaces to remove soil and soil stains.
- C. Clean all mud and debris from catch basins, which is caused by Work of this Section.
- D. Remove plant containers, trimmings, clippings, and all extraneous debris unearthed or resulting from any operations specified herein, from Project Site and dispose in a lawful manner.
- E. Protect landscape work and materials from damage.
- F. Maintain protection during installation and Maintenance Period.
- G. Treat, repair or replace damaged Work as directed by Owner's Representative, at no additional cost to the Owner.

16. ACCEPTANCE

- A. Substantial Completion:
 - 1. Notify the Owner's Representative in writing of the completion of planting.
 - 2. Within 10 days after notification of completion of Work, the Owner's Representative will inspect the Work in the presence of the Contractor and the Owner, and prepare a Notice of Substantial Completion, along with a list of items that require completion and correction (i.e., Punch List).
 - 3. Notice of Substantial Completion constitutes the commencement of the Maintenance Period.
- B. Final Acceptance:
 - 1. The final inspection of all planting will be made by the Owner, Owner's Representative and the Contractor and following replacement planting and completion and/or correction of all Punch List items prior to the expiration of the Maintenance Period, but only after the Contractor has furnished the Owner's Representative, in advance, with a written response as to how Punch List items were corrected. If such written notification is not provided to the Owner's Representative, the requirements of the Maintenance Period shall remain in force indefinitely until such time as the written notification of completion is received. Any extension of the Maintenance Period due to the failure of the Contractor to respond to the Owner's Representative with a written notification of Punch List completion will be considered as incidental to the Work and shall be performed by the Contractor at no additional cost to the Owner.
 - 2. Before Final Acceptance will be granted, the site must be in the condition stipulated and all correction items on the Punch List completed to the satisfaction of the Owner and Owner's Representative.
 - 3. If Final Acceptance is not granted at the end of the Maintenance Period, continue maintaining plantings until Final Acceptance is granted, at no additional cost to the Owner.
- C. Necessary Observations Beyond Final Acceptance:

1. If any of the Punch List items as noted in the Notice of Substantial Completion have not been fully corrected or repaired to the complete satisfaction of the Owner's Representative, the contractor must reschedule another field observation to substantiate claim of correction. Contractor shall bear all financial responsibility to reimburse the Owner for all costs incurred by the Owner's Representative for time expenditure and travel costs to verify Punch List compliance.

END OF SECTION 32 9300