ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this Section consists of furnishing and applying asphalt mixes, tack coats, and placing asphalt concrete pavement in accordance with the applicable requirements of the standards listed below.
   1. The asphalt concrete shall be constructed on a prepared underlying course in accordance with these specifications and shall conform to the dimensions and typical cross and with the lines and grades section shown on the plans.
   2. The referenced specification for this Section is the "Oregon Standard Specifications for Construction" latest edition as prepared by the Oregon Department of Transportation and the Oregon Chapter of the American Public Works Association, and its revisions and supplements.
   3. Public Right-of-Way: All public work construction in the public right-of-way shall be in accordance with the applicable requirements of the Clackamas County Standards.

1.2 RELATED SECTIONS

A. Section 31 20 00 – Earth Moving.

1.3 PREINSTALLATION MEETINGS

A. A preinstallation meeting shall be held on-site.
   1. Review methods and procedures related to asphalt paving including, but not limited to, the following;
      a. Review proposed sources of paving material, including capabilities and location of plant that will manufacture asphalt.
      b. Review requirements for protecting paving work, including restriction of traffic during installation period and for the remainder of the construction period
   2. Review methods and procedures related to pavement marking including, but not limited to, the following;
      a. Pavement aging period before application of pavement markings.
      b. Review location of pavement markings.
      c. Review requirements for protecting pavement markings, including restriction of traffic during installation.

1.4 SUBMITTALS

A. Include technical data and tested physical and performance properties.

B. Job-Mix Designs

C. Material Test Reports

D. Pavement Overlay Geotextile product information.

E. Pavement Marking product information

F. Pavement Marking: samples may be requested.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Asphalt Mix Design

1. Provide mix design for ½" Dense, Level 2 HMAC as specified on the plans in accordance with the Standard Specifications, and the applicable requirements of the City of Milwaukie and Clackamas County Standards.
2. Asphalt binder should be performance graded and conform to PG 64-22 or better.

B. Tack Coat
1. Tack coat material shall be CSS-1 or CSS1h in accordance with the Standard Specifications, and the applicable requirements of City of Milwaukie and Clackamas County Standards.

C. Pavement Overlay Geotextile

D. Pavement Markings
1. Traffic striping and markings shall comply with the Clackamas County Engineering Design Manual and the MUTCD and the Oregon Supplements to the MUTCD.
2. Pavement Marking Materials shall conform to the specifications in the Oregon Standard Specifications for Construction and Oregon Standard Drawings.
3. Permanent pavement striping and markings;
   a. Manufactures; Ennis-Flint, EF Series Low VOC Solvent Based Traffic Paint. Sherwin Williams, Setfast premium alkyd zone marking paint. Or approved equal.
4. Pavement Markings with in ADA Zones shall follow current ADA guidelines.

PART 3 - EXECUTION

3.1 PLACEMENT

A. Tack Coat: Per the Standard Specifications
1. All curbs, longitudinal and transverse joints shall be coated with a sufficient amount of tack coat material prior to placing the adjacent panel. This may be accomplished with hand distribution equipment.
2. Contractor shall be responsible for removing any tack applied to exposed curb faces or other finish surfaces. Tack all surfaces between layers.

B. Pavement Overlay Geotextile
1. Per Standard Specifications section 00350
2. Surface shall be free of obstructions, depression and debris.
3. Do not drag the geotextile on the ground.
4. Lap the geotextile ends to ensure closure, maximum 6 inches.
5. Surface preparation; clean and fill cracks exceeding 1/8inch width with crack filler.

C. Asphalt Concrete Paving Surface Course
1. Meet requirements of the Standard Specifications, and the applicable requirements of the Clackamas County.
2. Obtain approval for aggregate base course before placing paving surface course.
3. Place asphalt surface course when temperature shall be 40 degrees F. and rising, and when base is dry and free of frost.
4. Place asphalt materials at temperatures between 200 and 250 degrees F.
5. Compact asphalt surface course thoroughly and uniformly to at least 92% of maximum density as determined in conformance with ASTM D 2041, per the requirements of the Clackamas County Standards.

D. Pavement Marking
1. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect and Owner.

2. Allow paving to age for a minimum of 30 days before starting pavement marking, or as recommended by the manufacturer.
3. Sweep and clean surface to eliminate loose material and dust.
4. Apply paint as recommended by the manufacture.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to [ASTM D 979] [or] [AASHTO T 168].
1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
    a. One core sample will be taken for every 1000 sq. yd or less of installed pavement, with no fewer than three cores taken.
    b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

D. Replace and compact asphalt where core tests were taken.

E. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.3 PROTECTING AND CLEANING

A. Protect asphalt areas and pavement markings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by pavement marking manufacturer.

END OF SECTION

CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:
   1. Walkways / Sidewalks.
   2. Ramps.
   3. ADA detectable warning tile.
   4. Driveways.
   5. Curbs.

B. Related Sections include the following:
   1. Division 31 Section “Earthwork” for subgrade preparation, grading, base course, and subbase course.
   2. Division 03 Section "Cast-in-Place Concrete" for concrete stairs, concrete bases, walls, wall substrates, and footings.
   3. Division 31 Section “Trenching”
   4. Division 31 Section “ Erosion and Sediment Control”
   5. Division 32 Section “Aggregate Base Courses”

C. Related Requirements include the following:
   1. The referenced specification for this Section is the “Oregon Standard Specifications for Construction” latest edition as prepared by the Oregon Department of Transportation and the Oregon Chapter of the American Public Works Association, and its revisions and supplements.
   2. Public Right-of-Way: All work constructed in the public right-of-way shall be in accordance with the applicable requirements of Clackamas County Standards and Specifications.
   3. Roadways, sidewalks, curbs, and driveways shall be constructed in accordance with this Specification and related Sections, at the respective locations shown on the plans to the lines, grades, dimension and design as shown on the plans or established by the Architect.

1.2 DEFINITIONS

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

1.3 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings: Include details of steel reinforcement placement including material, grade, bar schedules, spacing, bent bar diagrams, arrangement, and supports. Provide plans and details for each paving section.

D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

E. Field quality-control test reports.

F. Minutes of preinstallation conference.

1.4 QUALITY ASSURANCE

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

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

C. Standard Specifications: Perform site concrete Work in compliance with the latest edition of the "Standard Specifications for Construction" prepared by Oregon Department of Transportation (ODOT). Comply with the more stringent of the ODOT Sections of Part 02000 and applicable Special Provisions or the ASTM Standards listed below.

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

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
   1. A preinstallation meeting shall be held on-site.
      a. Review the methods and procedures related to concrete paving including, but not limited to, review proposed sources of paving materials, including capabilities and location of plant that will supply concrete, and review requirements for protecting paving work, including restriction of traffic during installation period and for the remainder of the construction period.
      b. Review concrete forms to ensure ADA tolerances are met.

F. 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 48 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's Representative's approval that formwork meets the lines and grades intended on the Drawings. Concrete placed without the Owner's Representative's approval of formwork shall be removed and replaced at no additional cost to the Owner.

1.5 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities. Provide barricades, cones and signs required for driveway closures and detours. See Division 01 Section "Temporary Facilities and Controls" for additional requirements.

PART 2 PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces. Provide appropriate form liner material to shape the reveal patterns indicated on the Drawings.

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

2.2 STEEL REINFORCEMENT

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

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

C. Reinforcing and Tie Bars: ASTM A 615/A, Grade 60; deformed.

D. Steel Bar Mats: ASTM A 184; with ASTM A 615, Grade 60, deformed bars; assembled with clips.

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

F. Deformed-Steel Wire: ASTM A 496.

G. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

H. Joint Dowel Plates: Steel load plates, ASTM A36, ASTM A615 or A108-03 grade 1018, with high density ABS plastic pocket former.
   1. Product: PNA, Inc. 'Diamond Dowel,' or equal.
   2. Load plate size: 3/8-inch thick by 4 1/2 inches x 4 1/2 inches.

I. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete.

J. Slip Dowel Bar Sleeves: Proprietary plastic sleeve consisting of a polypropylene plastic sleeve and a reusable base. Greenstreak, 'Speed Dowel,' or equal.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:
   1. Portland Cement: ASTM C 150, Type I or II or I/II, gray. 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. Normal-Weight Aggregates: ASTM C 33, Class 4M coarse aggregate, uniformly graded. Provide aggregates from a single source.
   1. Maximum Coarse-Aggregate Size: Not exceeding 1 inch nominal.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement, when tested in accordance with ASTM C 1260.

C. Water: ASTM C 94.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
   1. Water-Reducing Admixture: ASTM C 494, Type A.
   2. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
   3. Concrete Mix Design Constituents shall be per Clackamas County Standards and Specifications.

2.4 RELATED MATERIALS

A. Joint Filler Strips: Where isolation joints are indicated, provide ASTM D 3575, closed-cell polyethylene foam backing, with removable joint cap.

B. Joint Primer: ASTM C 920, Solvent based primer for preparing concrete surfaces for adhesion to sealant. Provide product recommended for use by joint sealant manufacturer.

C. 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 approved equal.

D. Joint Sealant: ASTM C 920, Type M, Grade NS or SL, Class 25, multi-component, traffic grade, polyurethane sealant. MasterSeal SL2, Sikaflex-2C NS TG, or Pecora DynaTred. Color to be selected by Owner's Representative.

E. Silica Sand: Spherical, round or subangular quartz sand, clear to light grey in color, No. 70 mesh, or equal.

F. Bonding Agent: ASTM C 1059, Type II, non-re-dispersible, acrylic emulsion or styrene butadiene.

G. Curing Compounds for Non-Colored Cement Concrete: Clear, ASTM C 309, low gloss, non- staining.

H. ADA Detectable Warning Tile:
   1. Vitrified polymer concrete cast-in-place detectable/tactile warning surface tiles shall be epoxy polymer composition with an ultra-violet stabilized coating employing aluminum oxide particles in the truncated domes. The tile shall incorporate an in-line pattern of truncate domes measuring nominal 0.2 inch height, 0.9 inch base diameter, and 0.45 inch top diameter, spaced center-to-center 2.35 inches as measure on a diagonal and 1.67 inches as measure side by side.
   2. For wheelchair safety the field area shall consist of a non-slip surface with a minimum of forty 90 degree raised points 0.045 inch high per square inch.
   3. Approved product: 'Armor-Tile' #17038 as manufactured by Engineered Plastic, Inc. Tel.: 800-682-2525, or approved equal.
   4. Size: see plan.
   5. Color: Federal Yellow per Federal Standard 595b Table IV, color no. 33538.
   6. Detectable warning tile shall be compliant with ADA Standards for Accessible Design, Clackamas County, and Oregon Transportation Commission Standards for Accessible Parking Places.

I. Wheel Stops: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate.
   1. Dowel: Galvanized steel, ¾ inch diameter, 10 inch minimum length.

2.5 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
   1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:
   1. Select strength from options in subparagraph below or revise to suit Project. Select 3500 psi if the pavement is a County sidewalk. Add flexural strength if required. For climates requiring snow-removal equipment, like Spokane, edit to require compressive strength of 4000 psi minimum.
   2. Compressive Strength (28 Days): 3000 psi.
   3. Slump Limit: 4 to 4-1/2 inches without Water-Reducing Admixtures; 5 inches with Water-Reducing Admixtures.
      a. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: When a high-range water-reducing admixture is used, the maximum limit may be increased an additional 2 inches.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 4 to 6 percent.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing admixture and/or high-range, water-reducing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements as follows:
   1. Fly Ash: 20 percent.
   2. Ground Granulated Blast-Furnace Slag: 50 percent.
   3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 20 percent.

2.6 CONCRETE MIXING

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

B. Project-Site Mixing: Comply with requirements and measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
   1. For concrete mixes of 1 cubic yard or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
   2. For concrete mixes larger than 1 cubic yard, increase mixing time by 15 seconds for each additional 1 cubic yard.

C. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 EXECUTION

3.1 EXAMINATION

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

B. Examine existing grade conditions where proposed work will adjoin. Verify proposed gradients and elevations can be achieved and meet existing grade conditions on site. Any nonconforming conditions shall be brought to the attention of the Owner’s Representative and corrected before proceeding with concrete placement operations.

3.2 PREPARATION

A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

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

C. Cement concrete shall be constructed on a prepared underlying course in accordance with these Specifications and shall conform to the dimensions and typical cross section and with the lines and grades shown on the plans.

D. Areas on which sidewalks, curbs, driveways, and raised intersections are to be constructed shall be brought to proper lines and grade and compaction specified on the Drawings. The base shall be moistened before cements is place thereon and shall also be moist and firm at the time the concrete is places.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Formwork: Design, construct, erect, shore, brace, and maintain formwork according to ACI 301.

B. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

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

3.4 STEEL REINFORCEMENT

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

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

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

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

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5 JOINTS

A. General: Form all joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and where pavement operations are stopped for more than 1/2-hour. Termination points shall occur at a scoring location indicated on the plans.
   1. Install dowel plates at construction joints in concrete paving.
      a. Install pocket former and dowel plate per manufacturer's printed instructions.

C. Butt Joints: Use a bonding agent at butt joints where fresh concrete is placed against hardened or partially hardened concrete surfaces.

D. Isolation Joints: Form isolation joints abutting building slabs, walls, catch basins, manholes, inlets, light pole bases, structures, other fixed objects and where indicated on the Drawings.
   1. Joint Filler and Sealant Installation: Install joint filler strips and sealant as follows at isolation joints.
      a. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
      b. Extend joint fillers full width and depth of joint.
      c. Terminate joint filler flush with top of paving for joint fillers having removable joint cap.
      d. Terminate joint filler 1/2 joint width below top of paving for joint fillers without removable joint cap.
      e. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
      f. Allow concrete to cure minimum of 28 days.
      g. Remove joint filler cap; clean and prime concrete surfaces to receive sealant per manufacturer's recommendations.
      h. If joint filler depth from top of paving exceeds 3/8 inch, install backer rod prior to installing joint sealant. Backer rod to be 25 percent wider than joint width. Sealant depth to be 1/2 width of joint, not to exceed 3/8 inch, whichever is smaller. Install backer rod and sealant per manufacturer's recommendations.
      i. Fill void with sealant to match concrete color unless indicated otherwise, and top with silica sand while still wet.
      j. Protect sealant from pedestrian and vehicular traffic until cured.
      k. Clean excess sealant from paved surfaces.

E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated on the Drawings. Construct contraction joints for a depth of no less than 1/4 the overall concrete thickness. Locate at intervals of 10 feet maximum, unless otherwise indicated on the Drawings. Install contraction joints as follows:
   1. Tooled Joints: Form contraction joints and score (decorative) joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4 inch radius. Repeat grooving of joints after applying surface finishes. Eliminate grooved marks on concrete surfaces leaving no "shiner" bands.

2. Sawed Joints: Form contraction joints and score (decorative) joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks. Extend saw cuts to the edge of concrete paving or face of adjacent vertical element.

F. Joints at Existing Paving: Install dowel bars and joint filler strips where new concrete paving meets existing concrete paving. Drill and epoxy one-half of bar into existing paving. Provide a slip dowel sleeve on the half of dowel embedded in new concrete to prevent bonding. Install dowel bars per manufacturer's directions and parallel to finish concrete surface.

G. Edging: Tool exposed edges of ramps, sidewalks, walkways and joints in concrete after initial floating with an edging tool to a 1/2 inch radius. Tool edges of concrete paving to a 1/4 inch radius where adjacent to other paving. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces leaving no "shiner" bands.

3.6 CONCRETE PLACEMENT

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

B. No concrete shall be placed or finished in the rain. It shall be the Contractor's responsibility to schedule his operations such that concrete will not be placed or finished in the rain.

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

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

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

F. Do not add water to concrete during delivery, at Project site, or during placement.

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

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

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

J. Place concrete pavement in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
   1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Owner's Representative.

K. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

L. When adjoining concrete pavements are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

M. Cold-Weather Placement: Comply with ACI 306R-10 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 degrees Fahrenheit, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees Fahrenheit and not more than 80 degrees Fahrenheit at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

N. Hot-Weather Placement: Comply with ACI 305R-10 and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 degrees Fahrenheit at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 CONCRETE FINISHING

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

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

C. Concrete Finish: After final floating, apply a hand-trowel finish followed by a broom finish to concrete unless indicated otherwise on the Drawings.
1. Medium Textured Broom Finish: Draw a medium stiff bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, medium-line texture perpendicular to line of traffic.

3.8 CONCRETE PROTECTION AND CURING

A. General:
1. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
2. The completed concrete surface shall be protected from damage until the project is accepted. The Contractor shall repair damaged concrete and clean concrete discolored during construction. Surfaces that are damaged shall be removed and reconstructed for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Removed portions shall be disposed of off the project site by the Contractor at no additional cost to the Owner.

B. Comply with ACI 306R-10 for cold-weather protection; and ACI 305R-10 for hot-weather protection.

C. If evaporation rate in first paragraph below is exceeded, ACI 305R states that plastic shrinkage cracking is probable. See manufacturers' literature or ACI 305R for estimated moisture-loss chart relating relative humidity, air and concrete temperature, and wind velocity to rate of evaporation.

D. 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.

E. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

F. Select curing method from paragraph and subparagraphs below.

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

1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practical width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3.9 PAVEMENT TOLERANCES

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

3.10 FIELD QUALITY CONTROL

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

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
   1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
      a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
   3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
   4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 degrees Fahrenheit and below and when 80 degrees Fahrenheit and above, and one test for each composite sample.
   5. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
      a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

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

D. Test results shall be reported in writing to Owner’s Representative, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of

concrete batch in work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7-day and 28-day tests.

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

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

G. Remove and replace concrete where test results indicate that it does not comply with specified requirements at no additional cost to the Owner.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements at no additional cost to the Owner.

3.11 ADA DETECTABLE WARNING TILE INSTALLATION

A. Follow manufacturer's printed instruction for installation of tiles. The factory-installed sheeting must remain in place during the entire installation process.

B. Place and finish the concrete true to line and grade prior to the tile placement. Place the tile true and square to the curb edge as indicated.

C. When preparing to set the tile, do not remove freshly placed concrete in the area to accept the tile. Set the tile directly into freshly placed concrete.

D. Ensure that the tile is flush with adjacent concrete surfaces and true to line and indicated grade.

E. Provide a 3/8 inch radius edge around the perimeter concrete where it meets the tile.

F. After the concrete has cured, remove the protective plastic wrap completely from the tile.

3.12 REPAIRS AND PROTECTION

A. Remove and replace concrete that is broken, damaged, or defective or that does not comply with requirements in this Section at no additional cost to the Owner.

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

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

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

3.13 CLEANING

A. Remove all excess material, debris, and equipment from site upon completion of work in this Section. Keep work area clean and in an orderly condition during the course of the Work.

B. Do not dispose of waste concrete or wash out materials on the site unless otherwise directed by the Owner's Representative. Areas to be paved may be acceptable for concrete truck wash areas only as approved by the Owner's Representative.

END OF SECTION

PAVEMENT MARKINGS

1PART 1 - GENERAL

1.1 WORK INCLUDED

A. Pavement marking as indicated on Drawings.

1.2 REFERENCES

A. Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD): MUTCD and the Oregon Supplements to the MUTCD.

1.3 SUBMITTALS

A. Include Technical Data And Tested Physical And Performance Properties.
   1. Pavement Marking Product Information.
   2. Pavement Marking: Samples may be requested.

1.4 PRE-INSTALLATION MEETINGS

A. A pre-installation meeting shall be held on-site.
   1. Review methods and procedures related to asphalt paving including, but not limited to, the following;
      a. Review requirements for protecting pavement marking work, including restriction of traffic during installation period and for the remainder of the construction period.
   2. Review methods and procedures related to pavement marking including, but not limited to, the following:
      a. Pavement aging period before application pf pavement markings.
      b. Review location of pavement markings.
      c. Review requirements for protecting pavement markings, including restriction of traffic during installation.

1.5 SURFACE MOISTURE REQUIREMENTS

A. Schedule painting work when paving and curb surfaces are dry.

PART 2 - PRODUCTS

3.1 PREPARATION

A. Cleaning: Clean and dry pavement surfaces prior to applying paint.

B. Layout: Obtain Architect's approval of line and symbol layout prior to starting work.

3.2 PAVEMENT MARKINGS

A. Traffic striping and markings shall comply with the MUTCD and the Oregon Supplements to the MUTCD.

B. Pavement Marking Materials shall conform to the specifications in the Oregon Standard Specifications for Construction and Oregon Standard Drawings.

C. Permanent pavement striping and markings shall be non profile Methyl Methacrylate durable permanent pavement marking material.

D. Striping and markings shall have a minimum static coefficient of friction of 0.60, conforming to ADA guidelines for slip-resistance.

PART 3 - EXECUTION

3.1 PAVEMENT MARKING

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

B. Allow paving to age for a minimum of 30 days before starting pavement marking, or as recommended by the manufacturer.

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

D. Apply paint as recommended by the manufacture.

E. Minimum Dimensions:
1. Standard parking stalls: 4” stripe
2. Mile per hour stencils shall have a minimum of 2’-6” height with a 3” thick line.
3. All letter and number stencils shall be a minimum of 1’ high and 2” thick.
4. Directional arrows shall be a minimum of 5’ in length, 3’ wide and 1’ thick.
5. Symbols of accessibility to conform to ADA requirements.

3.2 ADJUSTING

A. Remove misplaced paint from concrete and asphaltic concrete surfaces. Covering misplaced paint with black paint is not acceptable.

END OF SECTION

GATE OPERATORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Swing gate operators (2 required).

B. Concrete mounting pads for opener mounting (2 required).

C. Internal receivers with coaxial antennae (2 required).

D. Gate edge contact sensors with wireless remotes (4 required).

E. Monitored infrared eyes with heater (1 required).

F. Magnetic locks (2 required).

G. Vehicle presence loops:
1. Free exit loop (1 required).
2. “Shadow” loop (1 required).

H. Fire District Switch:
1. Lock box (1 required).

1.2 RELATED SECTIONS

A. Section 32 31 13 - Chain Link Fences and Gates: Adjoining fences.

B. Section 03 30 00 - Cast-in-Place Concrete: Concrete mounting pads.

C. Division 26 - Requirements for line voltage, low voltage and communications wiring to each device.

D. Items by General Contractor or Other Subcontractors:
1. Permits.
2. Bonds.
3. Trenching.
4. Conduits.
5. Sleeves.
6. Piping.

1.3 REFERENCES

A. National Electrical Manufacturers Association (NEMA): NEMA ICS 6 - Industrial Control and Systems: Enclosures.

B. Underwriters Laboratories (UL): UL 325 - Standard for Safety for Door, Drapery, Gate, Louver, and Window Operators and Systems.

C. Underwriters Laboratories (UL): UL 991 - Standard for Tests for Safety-Related Controls Employing Solid-State Devices.

D. International Organization for Standardization: ISO 9001 - Quality Management Systems.

GATE OPERATORS

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Equipment list, system description, electrical wiring diagrams for installation, and manufacturer's data
sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, edge conditions, and accessories.
1. Operation, installation, and maintenance manuals including wiring diagrams.
2. Risers, layouts, and special wiring diagrams showing any changes to standard drawings.

D. Operation and Maintenance Manual: Submit one (1) set on portable drive.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials and products in strict compliance with manufacturer's instructions and Industry standards.

B. Store products indoors in manufacturer's original containers and packaging, with labels clearly identifying product name and manufacturer. Protect from damage.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 Certified Manufacturer.

B. Installer Qualifications: Installation performed by factory authorized contractor specifically trained in gate operation systems of the type found within this Section.
1. Provide documentation of maintenance and repair service availability for emergency conditions.
2. Provide quarterly maintenance for one year following Substantial Completion of the Project.

1.7 WARRANTY

A. Swing Gate Operator Manufacturer's Standard Limited Warranty:
1. Warranty Period: Five (5) years.

B. Labor Warranty: One (1) year.

PART 2 - PRODUCTS

2.1 MANUFACTURER - SWING GATE OPERATORS

A. Acceptable Manufacturer: LiftMaster; 300 Windsor Drive; Oak Brook, IL 60523. ASD. Toll-Free: 800.282.6225. Email: specs@LiftMaster.com. Web: LiftMaster.com.

B. Or accepted substitute.

2.2 SWING GATE OPERATORS

A. Swing Gate Operator Manufacturer/Model: Liftmaster Elite CSW-24UL, or accepted substitute.
1. Quantity Required: Two (2).

GATE OPERATORS

B. Operator Overview:
1. Gate Length Maximum: Dependent on weight.
2. Gate Weight Maximum: 1200 lbs at 12’; 800 lbs at 16’; 600 lbs at 18’.
3. Rate of Travel: 13 seconds to 90 degrees open.
4. Temperature:
   a. Without Heater: -4 degrees F to 140 degrees F (-20 degrees C to 60 degrees C).
   b. With Heater: -40 degrees F to 140 degrees F (-40 degrees C to 60 degrees C).
5. ETL Listed UL35.
6. Specific to Location: I, II, III, IV available.
7. User Controls: Built-in receiver, full system compatible.

C. Power Specifications:
1. Voltage:
   a. Input: 4 Amps at 120 VAC.
2. Accessory Power:
   a. Input: 6 Amps at 220 VAC.
3. Main AC Supply: 120 VAC.
4. Main Supply (Motor): 24 VDC.
5. Heater Draw: 325 Watts (120 VAC only).
6. Daily Cycle Rate AC Power: Continuous.
7. Fuse Protection Battery: 30 Amp.
8. Fuse Protection DC Power: 30 Amp.
9. Solar Power Maximum: 24 VDC at 50 Watts max.
10. Battery Backup:
   a. Run Gate to Open.
   b. Run Gate up to 100 cycles.

D. Included Items:
1. Warning Signs (2).
2. Warranty Card (1).
3. Batteries 12 VDC (2).
4. Keys (2).

2.3 CONCRETE MOUNTING PADS

A. Provided by others as indicated on Drawings.

2.4 INTERNAL RECEIVERS WITH COAXIAL ANTENNAE

A. Provide type as required.
1. Quantity Required: Two (2).

2.5 GATE EDGE CONTACT SENSORS

A. Monitored Wireless Edge Kit (LMWEKITU).
1. Low-energy Bluetooth transmission.
2. 2 year battery life.
3. Sensing distance up to 130 feet.
4. NEMA 4X rated.
5. Compatible with Liftmaster gate operators with safety inputs.
6. Wire Outlet Location: Field verify if right, left, or end.
7. Quantity Required: Two (2).

B. Monitored Large Profile Edges (L50).
1. Large profile edge (cut to exact length on-site).
2. Pressure sensitive edge sends signal to stop and/or reverse operation when sensing obstructions.
3. IP65 rated.
4. Compatible with Liftmaster monitored edge kit and transceiver.
5. Code Compliant: Gate contact sensors are required wherever a pinch point is created by a moving gate. A pinch point is considered to be any object between 4" and 16" away from any moving portion of the gate.
6. Quantity Required: Two (2).

2.4 INFRARED PHOTO CELL WITH HEATER

A. IR-55 Photo Cell: Liftmaster LMTBUL.
1. Features:
a. Multiple mounting options.
b. Flexible sensor.
c. Acceptable for all gate types.
2. Code Compliance:
a. UL325 Type B1 entrapment protection non-contact sensor.
b. Usable as a secondary type of entrapment protection.
3. Quantity Required: One (1).

2.6 MAGNETIC LOCKS

A. Elite MG-1300.
1. Quantity Required: Two (2).

2.7 LOOPS

A. Loop Types:
1. Free Exit Loop: Sawcut and install in paving inside property where indicated on Drawings. When activated, loop will open a closing gate.
2. "Shadow" Presence Loop: Sawcut and install in paving where indicated on Drawngs. Position in the path of a swing gate and is active only when the gate is in the open position.
3. Quantity Required: One (1).

B. Loop Wire Specification: 14 gage 19STR 600V XLP insulated orange PVC-Polyvinyl Chloride tube.
1. Number of Wraps Based on Loop Size:
a. Three (3) wraps for loop perimeters 14' - 26'.
b. Two (2) wraps for loop perimeters 27' - 80'.
2. Quantity Required: One (1).

2.8 FIRE DISTRICT SWITCH

A. Lock Box: Type as indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Inspect and prepare substrates using the methods recommended by the manufacturer for achieving best result for the substrates under project conditions.

B. Do not proceed with installation until substrates have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

C. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions. Test for proper operation and adjust until satisfactory results are obtained.

3.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

CHAIN LINK FENCING AND GATES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
Chain-Link Fences
Gates: Single and double swing
Chain Link Fence Modification

1.02 REFERENCES

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.

C. ASTM B221 – Aluminum and Aluminum Alloy Extruded Bars, Shapes and Tubes

D. ASTM D523 - Test Method for Specular Gloss.

E. ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.

F. ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

G. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

H. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

I. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

J. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.

1.03 SUBMITTALS

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

B. Shop Drawings: Show locations, components, materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

C. Maintenance Data

1.04 PRODUCT HANDLING AND STORAGE

A. Upon receipt at the job site, all materials shall be checked to ensure that no damages occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

PART 2 - PRODUCTS

CHAIN LINK FENCING AND GATES

2.01 CHAIN-LINK FENCE FABRIC

A. General: Fencing including all posts, supports, framing, wires, and fittings shall be galvanized including for all gates.

B. Height as noted on plan. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:
1. Steel Wire Fabric: Metallic-coated wire with a diameter of 0.148 inch.
Mesh Size: 2 inches.
Metallic (Zinc) Coating: ASTM A 392, Type II.

2. Selvage: Twisted and knuckled at both selvages.

2.02 FENCE AND GATE FRAMING

A. Posts and Rails: Round:
1. Fence Height: as noted on plan.

2. Duty Rating: Heavy.

3. Tube or Pipe Diameter and Thickness: According to ASTM F 761.
a. Brace Rail: 1.66 inches.
b. Gate Frame: 2.0".
c. Line Post: A2.375
d. End and Corner post: 2.875".
e. 30' tall support posts for backstop – Refer to Plans for diameter. Larger diameter posts shall be powder coated to match fence color.

4. Gate: Comply with ASTM F 654 and the following:
a. Type: II, double swing steel frame tubing.
b. Fabric Height: 2 inches.
c. Leaf Width: 36 inches as indicated.

5. Hardware: Latches permitting operation from both sides of gate, hinges, center stops. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.]

6. Metallic-Coated Steel: Posts, rails, and frames protected with an external coating of not less than 0.6 oz. of zinc/sq. ft., a chromate conversion coating, and a clear, verifiable polymer film; with an internal protective coating of not less than 0.6 oz. of zinc/sq. ft. or 81 percent, not less than 0.3-mil- thick, zinc pigmented coating.

2.03 TENSION WIRE

A. General: Provide horizontal tension wire at top and bottom of fence fabric.

B. Location: Extended along top of extended posts and top of fence fabric for supporting barbed tape.

C. Metallic-Coated Steel Wire: 0.177-inch- diameter, marcelled tension wire complying with ASTM A 817 and ASTM A 824.

1. Metallic Coating: Type III, Zn-5-Al-MM alloy.

2.04 FITTINGS

A. General: Comply with ASTM F 626.

B. Finish:
1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. zinc.
2. Aluminum: Mill finish.

2.05 CAST-IN-PLACE CONCRETE

A. Materials: Portland cement complying with ASTM C 150, Type I aggregates complying with ASTM C 33, and potable water.
1. Concrete Mixes: Normal-weight concrete with not less than 3300-psi compressive strength (28 days), 3-inch slump, and 1-inch maximum size aggregate.

2.06 BARBED WIRE

A. Aluminum Barbed Wire: Mill finished, ASTM B 211. 2-strand, 0.099-inch diameter line wire with 0.080-inch diameter, 4-point barbs spaced not more than 5 inches o.c., for the following alloys:

1. Line Wire: Alloy 5056-H32.
2. Barb Wire: Alloy 5000-H38 or Alloy 6061-T94.

2.07 ALUMINUM SWING GATE

A. Gate Frame Materials to be in accordance with ASTM F 900.
1. Grade, Size and Weight: Structural aluminum as noted:

Component	Tube dimension	Min weight /LF (lbs)	Grade
Primary Vertical Hinge Side Member	3” x 3”	3.300	6061-T6
Primary Vertical Catch Member	2” x 3”	1.426	6063-T52
Top and Bottom Horizontal Members	2” x 3”	1.426	6063-T52
Primary Internal Vertical Members	2” x 3”	1.426	6063-T52
Intermediate Vertical Members	1” x 3”	1.125	6063-T52

B. Construction:
1. Direction of swing and hinge placement for left-hand or right-hand swing is necessary in specifying or fabricating this gate.
a. Standard opening is 90˚ from the closed position.
2. Primary Vertical Members are to be equidistant and not to exceed 6 ft. spacing.

3. Intermediate Vertical Members are to be equidistant between the Primary Vertical Members.
4. Horizontal tension bracing is provided at each end of the panel.
5. Trussing:
   a. Each bay shall include four (4) ¼" thick aluminum gussets welded into each corner of the bay.
   b. A stainless steel wire rope with turnbuckle (truss cable assembly) shall be provided in each bay to provide directional adjustment if lift is required. Truss cable and turnbuckle size to be determined by the length of the gate leaf:

Leaf Length	Turnbuckle Size	Wire Size
< 14 '	3/8" x 6"	3/16"
14' +	1/2" x 6"	1/4"

   c. Wire rope will be attached to the top gussets with a single cable thimble and a crimped cable clamp.
   d. Wire rope will be attached to galvanized turnbuckles with a crimped cable clamp. The turnbuckle will be attached to the bottom gusset to allow for adjustment.
6. Gate frame construction shall adhere to standards set forth by UL325 and ASTM F2200 safety standards regardless of manual or automated operation.

C. Hardware:
1. All gate hardware; guide assemblies and hangers shall be manufactured from malleable iron, low carbon or pressed steel, galvanized as per ASTM A123 (ref: 1.02.B) after fabrication and furnished by the gate manufacturer.
2. Latches shall have a provision for locking devices.

D. Gate Frame Finish
1. Choice of Natural Aluminum or Polymer Powder Coated to match fence color as specified and approved by the architect.

E. Filler: Gates (regardless of manual or automated operation) shall adhere to the safety standards set forth by UL325 and ASTM F2200 (ref: 1.02.C and 1.02.D).
1. Chain Link Fence Fabric Filler:
   a. The chain link fabric filler shall be of the approved type and size as specified for the applicable fence project.
   b. Assembly:
      1) Attach the fabric to the gate frame by inserting a steel tension bar vertically through the last link of the fabric at both ends of the gate frame.
      2) The tension bars are secured to the gate frame by attaching steel tension bands around frame and through the last link of fabric containing the tension bar.
      3) A tension wire shall be stretched and attached along the top and bottom of the fabric filler and attached to the gate frame with tie wires looped through provided slots in each of the aluminum gussets in the corners of each bay. This ensures that the fabric filler is taut and secure thus adding support to the entire gate frame. Use standard fence industry aluminum ties to secure fabric in the middle to primary and intermediate verticals.
2. Ornamental Picket:

a. All vertical filler pickets shall be constructed from 1 in. x 1 in. x 0.125 wall square aluminum tubing members, 6063-T52 alloy, weighing no less than .516 lbs/ft.
b. Pickets will not extend below the bottom rail (ref: 1.02.C and 1.02.D).
c. Pickets are to be attached to rails by means of seam welding pickets to each rail at points of contact.
d. Each seal welded picket is to have a minimum of 1/8" diameter weep hole within ½ in. of its base.

F. Hinge Specifications, Mounting and Hardware.
1. Unless otherwise specified, 7 in. barrel hinges with capacities appropriate for the a pplication shall be provided as follows:
a. Gate leafs ≤ 14 ft.: Bolted or welded adjustable barrel hinges.
b. Gate leafs > 14 ft.: Elite Power Hinges with double ball bearings that pivot on a ¾ in. ground and tempered solid stainless steel shaft, maintenance free, self-lubricating and rated for a 1,000 lb capacity.

2. Manufacturer to provide detailed shop drawings of hinge assemblies.
a. Hinge attachment to gate frame: Hinge shall be welded to heavy gauge steel plate and bolted to the gate frame. Mating holes in the gate frame are to be drilled and sleeved to prevent members from tearing, collapsing or failing.
b. Hinge attachment to gate post: The hinges may be clamped or welded directly to the gate post.
c. All bolt-on hinge plates to be a minimum of ¼ in. thick steel plate with (6) pre-drilled holes unless otherwise specified.

3. Hinges shall be placed within 12 in. of the top and bottom horizontal member.

G. XLG Support Package: If the gate leaf is over 14 ft. long, an extension package shall be provided to allow for elevating the end of the gate leaf. Manufacturer to provide detailed shop drawings prior to manufacturing.
1. The extension package consists of an upper truss cable assembly, a hinge-end vertical member extension, an extended gate post, brackets and an upper hinge.
2. The height of the extended post and hinge member shall be equal to 18% of the overall gate leaf.
3. The upper hinge assembly and mounting brackets shall be placed between the extended post and hinge members and within 4 in. of the top.
4. Upper truss cable assemblies shall be made from ¼ in. stainless steel wire rope and include an adjustable turnbuckle to raise and support the nose of the gate to the proper elevation.
a. The upper end will be attached to the top hinge bracket plate with a single cable thimble and a crimped cable clamp.
b. The lower end will have a ½ in. x 6 in. galvanized turnbuckle with a crimped cable clamp. The turnbuckle will be attached to a gusset welded to the top horizontal frame member.
c. The gusset shall be located above the nearest Primary Vertical Member that provides the upper truss assembly an approximate 15°slope.

2.08 MANUFACTURER

A. The gate shall be a Jamieson Series 8630 Industrial Heavy Aluminum Swing Gate as manufactured by JAMIESON MANUFACTURING CO. 4221 Platinum Way, Dallas, TX 75237; PH: (888) 286-3362 www.jamiesonfence.com

B. Substitution of products from other manufacturers who possess documented industry experience in the manufacturing of Industrial Heavy Aluminum Swing Gates will be considered by the architect as equal if they meet all specifications for fabrication, design, size and gauge of all component parts.

C. Upon written notification prior to weldment that gates require construction in a fabricating plant certified to AWS D1.2, manufacturer's fabricating plant shall provide proof of certification that:
1. All weld processes conform to documented Welding Procedure Specification and Procedure Qualification Record to insure conformance to the AWS D1.2 welding code.
2. All welders employed for welding under this specification have successfully completed the qualification requirements using the procedures of the AWS D1.2 Code. Individual Certificates of Welder Qualification shall be provided upon request.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacing indicated, in firm, undisturbed soil.

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
1. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

D. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment.

E. Line Posts: Space line posts uniformly at 10 feet O.C. or match existing spacing

F. Post Bracing and Intermediate Rails: Install according to ASTM F 567. Install braces at end and gate posts and at both sides of corner and pull posts.

G. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing.

H. Top Rail: Install according to ASTM F 567.

I. Bottom Rails: Install, spanning between posts.

J. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1/2 inch between finish grade or surface and bottom selvage, unless otherwise indicated.

K. Tie Wires: Attach wire per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

CHAIN LINK FENCING AND GATES

L. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.02 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

B. Adjust existing gates as required to match new grades.

3.03 COMPLETION

A. The area of installation shall be left free of debris caused by the installation of the fence.

END OF SECTION

IRRIGATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Work of this section includes all labor and materials necessary to construct and / or modify the irrigation system as shown on the drawings and specified herein.

B. The work includes, but is not limited to, the following:
1. Piping
2. Valves
3. Controller(s) and other control elements
4. Electrical Control Wiring and connectors
5. Sprinkler Heads
6. Distribution Tubing and Emission Devices
7. Connection of 120V AC power source for Automatic Irrigation Controller and other electrical control devices.
8. Central controls

C. Related Documents and Sections:
1. Section 329113 – Soil Preparation
2. Section 329300 – Plants
3. Section 329445 – Landscape Maintenance

1.3 DEFINITIONS

A. American Public Works Association (APWA).

B. American Standards for Testing and Materials (ASTM).
1. D 1785-99 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
2. D 2241-00 - Standard Specifications for Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
3. D 2466-91 (1996) - Standard Specifications for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
4. D 2564-96a - Standard Specifications for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
5. B3-01 - Specification for Soft or Annealed Copper Wire.
6. D2564-96a - Specification for Solvent Cements for PVC Plastic Pipe and Fittings.

C. American Water Works Association (AWWA)
1. C500 - Gate Valves for Water and Sewerage Systems.

1.4 SUBMITTALS

A. Product Submittals: Submit three copies of the proposed irrigation construction materials to the Owner's Representative for review and approval a minimum of 10 working days prior to commencement of work. The plan must follow the specifications and design criteria as outlined herein.
1. Each submittal shall include manufacturer's product information ('cut') sheets for all components and materials proposed for use in fabricating and installing the irrigation system.

B. Record Copy Drawings: During the course of installation, carefully show all field changes in red line on a print of the irrigation system as installed. This drawing shall be labeled "Record Copy", and shall be made available for inspection. The status of the 'Record Drawing' must correlate directly with the percentage of

work completed as described in the Contractor's Pay Request and may be used as a guide when approving payments.

C. As-Built Drawings: Upon completion of the work of this section and as a condition of its acceptance, the Contractor shall deliver to the Owner's Representative the following:
   1. Drawings: Submit three prints and one reproducible and/or electronic file of as-built drawings. As-built drawings shall clearly show all original components of the Record Copy and all changes documented in the Record Copy. Main lines, drain valves, valve boxes, and valve markers and other buried equipment shall be positively located by a minimum of two dimensions each from fixed reference points.
   2. Maintenance Manual: Submit three copies containing the following:
      a. Catalog cuts of all irrigation materials installed.
      b. Contractor's name, address and telephone number.
      c. The duration of the guarantee periods.
      d. The name and address of the local manufacturer's representative.
      e. List and description of routine maintenance procedures, including winterization, start-up, and recommended watering times for each zone.
      f. Troubleshooting guide.

1.5 QUALITY ASSURANCE

A. Proprietary items shown on the drawings and specified herein are shown to establish standards of quality, utility, design and function. Equivalent units by other manufacturers (substitutions) will be considered provided they are similar in characteristics. They shall be substituted only if approved by the Owner's Representative.

B. The Contractor shall store all PVC pipe and fittings out of direct sunlight and protect from physical damage.

C. The Contractor shall store and protect all specified components from adverse weather conditions until installation is complete.

D. The Contractor shall handle all components as directed by the manufacturer's handling and installation instructions. Damage from transport or other handling of materials shall be the responsibility of the Contractor.

E. All local, municipal and state laws and rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications and the Contractor shall carry out their provisions. Any specification herein contained, shall not be construed to conflict with the above rules, regulations or requirements.

1.6 PROJECT CONDITIONS

A. Inspection of the site: The contractor shall inspect the site prior to construction and verify the extent of the work required. Commencement of construction by the Contractor designates acceptance of the site conditions apparent at outset. The Contractor shall obtain approval to access system components for inspection prior to commencement of construction.

B. The Contractor shall verify the locations of all existing utilities, structures, and services before commencing work. The location of utilities, structures and services shown on these plans are approximate only. Any discrepancies between these plans and the actual field conditions shall be reported to the Owner‘s representative immediately.

C. Weather Limitations: Work shall be performed only when weather conditions do not detrimentally affect the quality of work as intended and shown on these plan sheets.

D. Project Limits: Areas, as specified within which work is to be performed.

E. If new mainline is required in areas not currently described on the construction documents, submit a shop drawing of location, hydraulics, and system layout for new extension to Owner's Representative for approval prior to commencement of construction.

F. The Contractor shall protect all areas of work defined on the drawings and any existing on-site vegetation, structures, utilities, etc. All damage which occurs as a result of work under this contract shall be repaired at no cost to the Owner. The Contractor shall be responsible for the provision of traffic control, barricades, safety guards, and any other structures or improvements necessary for the complete protection of the public. The Contractor shall verify water sources and install labeled components as required by state and federal laws.

G. The Contractor shall verify, locate and protect all existing utilities and features on and adjacent to the project site during construction and shall repair, at their own expense; all damage as a result of construction activities.

H. The Contractor shall, at all times, take adequate precautions to keep rock, dirt, gravel, debris, and all other foreign materials from entering piping, valves and other irrigation equipment.

1.7 COORDINATION

A. Coordinate with other trades affecting or affected by work of this section.

B. Verify that sleeving and other conduits, of sizes and types specified, are installed as required.

C. Prior to the start of work the Contractor shall verify that the performance and components of the existing site systems are in accord with current jurisdictional requirements and that all necessary components are located as shown on the drawings.

D. The Contractor shall protect the existing site systems and maintain their performance at all times during the work of this section unless otherwise approved by the Owner's Representative. The Contractor shall cap all lines that are cut by new construction and/or re-route to maintain existing system performance.

E. The Irrigation Contractor shall have a Supervisor on-site at all times while work is being performed. Supervisor must be available to communicate with other project personnel at all times.

1.8 GUARANTEE

A. The Contractor guarantees that all new irrigation components installed, as part of this work shall be free from defects in materials, design and workmanship for a period of one year from the Date of Substantial Completion.

B. Upon notice from the Owner's Representative of failure on any part of the installed equipment during the guarantee period, due to material fatigue, normal wear or faulty installation procedures, new replacement parts shall be promptly furnished and installed by the Contractor at no additional cost to the Owner. Damages to property or site improvements resulting from the failure of specified components shall be repaired promptly, at no additional cost to the Owner.

C. The contractor shall be responsible for grade settlement, and/or erosion of soil surfaces resulting from defects in irrigation installation throughout the specified warranty period.

1.9 DAMAGES

A. Any structures or facilities damaged due to work of this project shall be restored equal or better to their original condition at Contractor's expense and to the satisfaction of owner and Project Manager.

B. Contractor shall be responsible for all damage caused by leaks or breaks in pipe furnished or installed in this contract for one year after date of final acceptance.

1.10 EXISTING UTILITIES

A. 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.

B. Should uncharted piping or other utilities be encountered during excavation, consult the Project Representative and utility owner immediately for directions. Cooperate with the owner and public or 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 or known utilities shall be paid by the Contractor.

C. Do not interrupt existing utilities service facilities occupied and used by the owner or others, except when permitted in writing by the Project Manager and then only after acceptable temporary utility services have been provided

D. Point-of-connection to incoming water services for irrigation shall be made upstream of any other services.

PART 2 PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

A. Materials and equipment shall be new, delivered to site in original factory condition, and as specified in this section.

2.2 PLASTIC PIPE

A. All plastic pipe shall be polyvinyl chloride (PVC) continuously bearing the seal of the National Sanitation Foundation, with the exception of polyethylene pipe specified as follows.

B. Polyvinyl Chloride (PVC) pipe
1. Lateral Lines to valves: PVC Schedule 40, Type 1, white, NSF approved, solvent weld pipe meeting the requirements of ASTM D2241-00
2. Lateral Lines from valves: PVC Class 200, Type 1, white, NSF approved, solvent weld pipe meeting the requirements of ASTM D2241-00
2. Main Lines: PVC Schedule 40. Coordinate with drawing legend, Type 1, white, NSF approved, solvent weld pipe meeting the requirements of ASTM D2241-00
3. Sleeves:
   a. Sleeves installed beneath asphalt paving: Schedule 40 pipe meeting the requirements of ASTM D2241-00.
   b. Sleeves installed beneath walls and walkways: PVC Class 200 pipe meeting the requirements of ASTM D2241-00.
   c. Mainlines and lateral lines to be sized per the requirements of the irrigation system.

C. Risers and Nipples: PVC, Type 1, Schedule 80 - one piece gray, standard weight with molded threads, both ends, ASTM D1784-99a, D2464-99.

D. Electrical Conduit: PVC Schedule 40 – gray electrical conduit, standard weight; minimum 1 1/2-inch nominal diameter unless otherwise required.

E. Polyethylene Pipe and fittings: flexible, thick walled designed to withstand 400 psi burst pressure test: Quality and wall thickness equivalent to ASTM Standards, or approved equal. Sized per manufacturer's specified velocity tolerances.

2.3 PLASTIC FITTINGS

A. For Polyethylene Pipe: As specified by manufacturer of polyethylene pipe.

B. For PVC Class 200 Pipe: meeting the requirements of ASTM D2466-01.

C. For PVC Schedule 40 Pipe: meeting the requirements of ASTM D2464-99 PVC.

D. Manufactured Swing Joints 3/4" or greater in size shall be as shown on the plans or approved equal.

2.4 PIPE JOINING COMPOUNDS

A. Cement and Primer for Solvent Weld Joints: As recommended by manufacturer of PVC pipe.

B. Teflon Tape for Threaded Joints (PVC or galvanized): DuPont or approved equal.

2.5 ELECTRIC CONTROL WIRE AND CONNECTORS

A. Wire: Single strand 14 gauge copper, UL approved for direct burial. Sized in accordance with manufacturer's specifications. Control (hot) wires shall be colored and common (ground) wire shall be white. Spare control wire shall be colored or numbered.

B. Wire Connectors and Sealant: UL approved for direct burial.

C. Irrigation control wire shall be buried at 12 inch minimum depth.

2.6 AUTOMATIC CONTROLLER AND REALTED COMPONENTS AND/OR SYSTEMS

A. Existing controller to remain.

2.7 VALVES, FILTERS, PRESSURE REGULATORS, PUMPS

A. Bronze Gate Valves: MSS SP-80, Class 125, Type 1, nonrising-stem, bronze body with solid wedge, threaded ends, and malleable-iron handwheel.

B. Manual Isolation Valves: Bronze Ball Valves: MSS SP-80, Class 125, Type 2, with bronze body and nonmetallic disc.

C. Remote Control Valve(s): as shown on plans, Rainbird or approved equal.
1. Remote Control Valve: Glass-filled nylon body with pressure compensation module, forward flow design and of a size and type to sufficiently operate system. Water volumes and velocity through valve shall not exceed manufacturer's recommended optimum performance criteria.

D. Manual Drain Valve: 3/4-inch size bronze angle valve with rising stem and cross-type handle. Hammond, Buckner or approved equal.

E. Quick Coupling Valve and Accessories: as shown on drawings with key, and Swivel hose ell of same manufacture, or approved equal.

F. Master Valve: Normally open, Bermad model #410-2", see valve schedule. Supply and install galvanized unions or flanges on both sides of valves.

G. Flow Sensor: Rainbird ESP-LXME with Maxicom compatible transmitter.

H. Inline Wye filters: As specified by manufacturer for low flow filtering. Utilize 150 or 200 mesh screens (0.5 GPH = 200 mesh min., (1.0 GPH + = 150 mesh) or as specified by manufacturer for appropriate emitter sizes required by site conditions.

I. Inline pressure regulators (if needed): As specified by manufacturer, for low flow (0.1 to 5 GPM / 6 to 300 GPH), or medium flow, (2 to 22 GPM / 120 to 1320 GPH), inlet pressure 10 to 80 psi, and outlet pressure of 30 psi.

2.8 VALVE BOXES

A. Plastic valve box with locking lid, sized to provide a minimum of 3 inches clear on all sides of the valve to facilitate access, maintenance, repair or removal. Ametek or approved equal.

2.09 DRAIN VALVE MARKER COVER

A. Cover as shown on drawings, or approved equal.

2.10 BACKFLOW PREVENTION DEVICE

A. Backflow prevention device as shown on drawings.

B. Size and type as approved by local authorities.

2.11 VAULT/BOX FOR BACKFLOW PREVENTION DEVICE

A. Size and type to conform to state and local codes and providing a minimum of 6 inches clear on all sides of the device.

2.12 SPRINKLERS

A. Sprinkler heads shall be as indicated on plans, Rainbird or approved equal.

B. Underground closed case rotary or spray heads, sufficient to apply specified precipitation rates, as manufactured by Hunter, or pre-approved equal. All spray heads shall be equipped with pressure compensating devices. All irrigation heads in low points must be equipped with integral check-valves to prevent ‘low-head seepage’.

C. Where necessary to control zone drainage, at the bottom of slope areas, install low head drainage bodies on lowest heads in zone.

D. Pop-up riser heights shall be as shown on drawings.

2.13 OTHER MATERIALS:

A. Gravel: 3/4-inch minus, washed, crushed rock

B. Valve Marker: Locking type, RainBird, Weathermatic, Buckner, or approved equal.

C. Manual Drain Valve Key: Minimum length 30 inches

D. Tracing Wire: Alarmatape or approved equal

E. Pipe backfill: Clean, dry, friable topsoil void of stones larger than 1" in diameter and other material deleterious to specified pipe. Soil shall be suitable for compaction to eliminate settlement conditions of specified finish grades.

F. All other materials, not specifically described, but required for a complete and proper irrigation system installation, shall be new and of first quality and must be approved by the Owner’s Representative prior to installation on site.

2.14 DRIP IRRIGATION COMPONENTS

A. Control Zone Kits
1. Low Flow Control Zone Kit for dripline irrigation zones shall include control valve, filtration, and pressure regulation components sized to meet the hydraulic demands and flow requirements of the zones that they service. See irrigation legend on irrigation plan for specific model.
2. Low Flow Valve (LFV) component specifications include:
a. Valve body and bonnet constructed of high impact, weather-resistant plastic, stainless steel and other chemical/UV resistant materials
b. Diaphragm with a double-knife seal, constructed of durable Buna-N rubber with a clog-resistant metering orifice
c. Energy-efficient, low-power encapsulated solenoid with captured plunger and 90 mesh (200 micron) solenoid filter
d. External bleed for manual system flushing during start-up, internal bleed for manual zone activation during maintenance operations
e. Inlet pressure rating: 20 to 120 PSI (1,4 to 8,3 bar)
f. Female threaded inlet and outlet connections
g. Anti-siphon valve configuration (AXCZ-075-PRF) includes listed features and incorporates atmospheric vacuum breaker with I.A.P.M.O and A.S.S.E. listing approval

3. Pressure Regulating Filter (PRF) combines filtration and pressure regulation in one integrated unit for protection of downstream components of drip irrigation system. PRF component specifications include:
a. Compact “Y” filter body and cap configuration constructed of glass-filled, UV-resistant polypropylene, with 120 PSI (8,3 bar) operating pressure rating.
b. Standard 200 mesh (75 micron) filter screen constructed of durable stainless steel attached to a polypropylene frame. Screen is serviceable for cleaning purposes by unscrewing cap from filter body and removing filter element.
c. Normally-open pressure regulating device with preset outlet pressure of approximately 30 PSI (2,1 bar). Pressure regulating device allows full flow with minimal pressure loss unless inlet pressure is greater than preset level. As inlet pressure increases above preset level, internal spring compresses to reduce downstream pressure.
d. Male threaded inlet and outlet connections.

B. Landscape Dripline
1. Dripline shall have factory installed, pressure-compensating, inline emitters welded to the inner circumference of the polyethylene tubing at spacing specified in irrigation legend.
2. Sub-Surface dripline emitters shall include an anti-root component which protects the emitter from root intrusion without the use of herbicides.
3. Drip line shall have a consistent flow rate from each installed inline emitter when emitter inlet pressure is supplied between manufacture’s recommended operating range.
4. Filtration for dripline tubing and emitters shall be 120 mesh (125 micron).

C. Air / Vacuum Relief Valve
1. Supply an air / vacuum relief valve as specified in irrigation legend. Locate valve at high point of the drip system. Install valve in exhaust header or a line that runs perpendicular to the lateral rows.

PART 3 EXECUTION

3.1 PREPARATION

A. A preconstruction meeting shall be held prior work on irrigation system. The meeting shall include appropriate representatives of the District, the Program Manager, the Design Team and Contractor. At that meeting, a procedure will be discussed for notification by the contractor to the other parties when activities in the vicinity of utilities or requiring interruption of utilities services are imminent.
1. A Utility Activity Coordination Form (UACF) will be provided that will have to be submitted a minimum of two (2) weeks in advance of any proposed activity falling into the categories described above.

2. The Contractor will ne required to prepare and submit the UACF's for approval;, attaching any sketches, drawings excerpts, or step-by-step sequences/schedules required to full-explain the proposed activities. The Contractor shall also be to contact the appropriate agencies for utility locates.

B. Prior to all work of this section, the Contractor shall carefully inspect all previously installed work and verify that all such work is complete to the point where specified installation may properly commence.

C. Verify that irrigation system may be installed in strict accordance with all pertinent codes and regulations, the accepted design, the referenced standards, and the manufacturer's specifications.

D. The Contractor shall integrate new components into the existing system and maintain existing performance as specified.

E. Make arrangements for water shutoff when necessary with Owner's Representative. Notify Owner 24 hours prior to water shutoff.

F. Layout: Location of pipe, sprinkler heads, valves, and other equipment shall be as shown on plans and shall be size and type indicated. No major changes shall be made without prior approval of by Project Manager. Minor changes may be necessary to conform to ground conditions.

3.2 PIPE INSTALLATION

A. Trench depths shall provide minimum covers of:
1. 18 inches (300 mm) for lateral lines;
2. 24 inches (450 mm) for main lines or sub-mains;
3. 18 inches (450 mm) for sleeving beneath walkways;
4. 24 inches (600 mm) for sleeving beneath vehicular traffic (or as directed by jurisdiction).]

B. Depth of trenching shall avoid interference with waterlines, drainage systems and other utilities (verify), and shall allow for a four-inch vertical clearance between pipes.

C. Trench bottoms shall have uniform slopes with one percent minimum slope towards drain valves. Trench bottom shall be free of rocks or sharp-edged objects. Stones larger than one-inch in diameter are not allowed in the backfill material. Compact to adjacent soil density. Keep trenches free of debris, during construction.

D. Pipe connections: Do not use solvent cement on threaded joints. Wrap threads with minimum of three wraps of Teflon tape in accordance with manufacturer's recommendations. Tighten fittings only to manufacturer's specifications. Follow manufacturer's instructions for solvent welding of PVC pipe and fittings to achieve tight and inseparable joints.

E. Tracing wire shall be installed adjacent to all irrigation main and sub-main piping.

F. Pipes shall be sleeved under all paved surfaces. Sleeves shall be a minimum 4 inch OD or 1 inch OD larger than pipe being sleeved. Location of sleeves shall be marked with stainless steel pin in paved surface.

G. Thrust blocks shall be installed at changes in direction of main line.

3.3 PIPE PULLING

A. Installation of pipe and wires by means of vibratory plow may be used as an alternate to standard trenching methods if approved by the Owner's Representative.

B. Vibratory pipe pulling shall only be allowed on 3/4 inch and 1 inch diameter piping.

C. Solvent weld joints shall be thoroughly cured prior to pipe pulling.

D. The Contractor shall ensure, by means of an open pit or trench at the beginning, middle, and the end of pull, that pipe and wire is installed at the specified burial depths throughout the entire length of the pull. Burial depths shall be the same as specified for trenching.

E. Pulling grip/bullet shall be a minimum of two-inch in diameter greater than the combined diameters of pipe joints and wire to be pulled.

F. Wire pulling shall only occur with proper wire blade feed attachment.

3.4 PIPE CONNECTIONS

A. Solvent weld PVC pipes only during non-freezing weather. Solvent weld PVC pipes only under cover in rainy weather. Do not allow flooding of welded piping until specified cure time has elapsed.

B. Air temperature of PVC mating surfaces for plastic pipe and fittings shall be between 40 degrees F and 100 degrees

C. Do not use solvent cement on threaded joints. Wrap threads with minimum of three wraps of Teflon tape in accordance with manufacturer's specifications.

D. Follow manufacturer’s instructions for solvent welding of PVC pipe and fittings to achieve tight and inseparable joints.

E. Cementing plastic pipe:
1. Cut all ends squarely with approved pipe cutting tool. Bevel ends with a deburring tool.
2. Clean all pipe ends prior to assembly.
3. Clear all pipe lengths of dirt and debris. Protect from contamination.
4. Do not use excess primer and solvent when joining pipe ends.
5. Insert pipe ends to full depth of fitting, hold tightly as necessary to insure full depth bonding.
6. Allow 15 minutes curing time following joint assembly prior to moving or handling jointed pipe.
7. Install slip and/or barbed fittings for drip system components per manufacturer's specifications.

3.5 BACKFILLING

A. The Contractor shall completely fill trench with native material free of stones and other debris greater than 1 inch in diameter. In all turf areas, shrub beds and other planting areas, backfill material shall conform to the specified soil mix to the depths indicated in Division 2 requirements for soil preparation. The Contractor must fill all voids and tamp thoroughly in compacted layers of 6 inches at a time. The Contractor shall place and compact soil to eliminate settling of final trench grades. The Contractor shall backfill trenches only after main and lateral line inspection and testing and after receiving written approval from Owner’s Representative. The Contractor shall notify the Owner’s Representative a minimum of 24 hours in advance when requesting inspection.

3.6 DRAIN VALVE INSTALLATION

A. Install one manual drain valve at low points on the discharge side of each remote control valve and at all low points in main line pipe to allow for complete drainage of all main lines.

B. Install drain valves as shown on drawings.

3.7 VALVE INSTALLATION

A. Install as shown on drawings.

B. Valve depth shall be 16 inch minimum and 24 inch maximum depth.

C. Install specified quick coupling valve, in specified box, at point of connection, and as shown and noted on plans.

D. Valve and valve box locations shall be located in a manner so as not to interrupt plant massing or groups, hedge lines, or otherwise alter the character of the proposed plantings.
   1. Place valves and valve boxes in low growing ground cover areas offset from adjacent paving by a minimum of 2 times the specified ground cover spacing.
   2. In public areas where valves or valve boxes may be readily visible to the public, verify their location with Owner's Representative prior to installation.
   3. Valve boxes shall contain a single control valve.

3.8 BACKFLOW PREVENTION DEVICE INSTALLATION

A. Comply with state and local codes. Conceal in planting beds where possible.

3.9 CONTROLLER INSTALLATION

A. Install controller in accordance with manufacturer's specifications, and respective State and Local codes. Install at location as shown on drawings. Notify Owner's Representative prior to installation, of conflicts or complications with specified controller locations.

3.10 ELECTRICAL WIRING INSTALLATION

A. Lay in trench under mainline or lateral lines when practical. Minimum depth 18 inches. Place in sleeves when passing underneath pavement.

B. Make all splices moisture proof using specified electrical connectors. Splices shall only be in 8" diagonally measure valve boxes. Bundle wires together and wrap with electrical tape at 5 foot intervals. Provide 24 inches of coiled slack at connection to control valves. Provide one foot of slack between all splices in a series of "S" curves in trenches.

C. Clearly mark ends of all wiring according to valve number with a permanent number tag. Locate one tag at each control valve inside the valve box and one tag per wire in the controller.

D. Provide four spare wire(s) to farthest zone(s) in each direction and clearly mark as "spare." Loop spare wires through all control valve boxes.

E. Provide any additional control wires as noted on drawings and label to correspond with controller station numbers.

F. Install separate common wires for each controller if system contains more than one controller.

G. Sharp bends or kinks in the wiring shall not be permitted. Wires shall be unreeled in place alongside or in trench and shall be carefully placed along bottom of trench. Wire shall not be unreeled and pulled into trench from one end.

H. For computer control wire, follow above specifications. Connect to satellite controllers if applicable. Coil adequate slack for any future connections. Place field ends in 12" valve boxes with extensions as needed to meet 1/2" above finish grade. Place other end inside controller with adequate slack for future connection. If more than one controller, also install wire from controller to controller.

3.11 SPRINKLER INSTALLATION

A. Install in accordance with manufacturer's specifications.

B. Install all sprinklers on flexible risers, using flexible polyethylene pipe or PVC swing joints.

C. Sprinklers located on slopes which are less than three percent shall be installed plumb. Those that are located on slopes greater than three percent shall be installed at an angle midway between plumb and perpendicular to the slope.

D. Sprinkler heads shall be located 6 inches from edges of sidewalks and curbs.

3.12 SYSTEM FLUSHING

A. After piping, risers, and valves are installed, but prior to installing sprinkler heads, thoroughly flush piping system under full water head.

B. Maintain flushing for five minutes or until water flows clearly.

C. Cap risers immediately after flushing.

3.13 PRESSURE TESTING

A. Conduct test in presence of Owner's Representative.

B. Test shall be conducted with pump station, backflow prevention, quick couplers, control valves and manual drains in place and prior to backfilling. Laterals may be visually inspected for proper solvent welds and leaks prior to backfilling but no pressure test will be required.

C. Piping must not lose more than 4 psi after 60 minutes at 125 psi

D. Correct defects and retest until Owner's Representative approves.

E. Notify Owner's Representative a minimum of 24 hours in advance when requesting inspection of pressure test.

3.14 SYSTEM PROGRAMMING

A. Calculate three irrigation programs: Spring / Early Summer, Summer, Late Summer/ Fall. System operation requirements shall be based on annual precipitation rates, plant material maturation requirements, solar exposure, and topography and soil conditions.

B. Submit seasonal controller operation program with as-built record drawings and include laminated copy of program at controller location in controller cabinet. Include total application quantities in inches per week for all zones, for establishment period and normal system operation.

3.15 DRIPLINE INSTALATION

A. Control Zone Kit Assembly:
   1. Flush mainline pipe before installing Control Zone Kit assembly.
   2. Locate where shown on drawings. Connect control wires to remote control valve wires using specified wire connectors and waterproof sealant. Provide connectors and sealant per manufacturer's recommendations.
   3. Install a maximum of four (4) Low Flow or Medium Flow Control Zone Kits per standard rectangular valve box. Install a maximum of one (1) Medium Flow Commercial Control Zone Kits per standard rectangular valve box. Install a maximum of one High Flow Commercial Control Zone Kits per jumbo rectangular valve box.
      a. Locate valve boxes at least 12" from, and align with, nearby walls or edges of paved areas.
      b. Group Control Zone Kit assemblies together where practical. Align grouped valve boxes in uniform patterns. Allow at least 12" between valve boxes.
      c. Brand controller letter and station numbers on valve box lid in 2" high letters.

B. Lateral Piping for Drip and Dripline Tubing
   1. Install lateral piping and dripline tubing at locations and in grid patterns as indicated on drawings and installation details, and in strict accordance with manufacturer recommendations.

2. Thoroughly flush PVC lateral piping, supply headers, and dripline tubing immediately upon installation.

C. Air Relief Valve Kit Assembly: Install at all high points in dripline tubing grid as shown and directed on drawings and installation details.

D. Flush Point Assembly: Install in flush header or at ends of each dripline zone segment as shown and directed on drawings and installation details. Install at least 12-inches from and align with adjacent walls or edges of paved areas.

3.15 FINAL INSPECTION

A. Thoroughly clean, adjust and balance the installed irrigation system. Adjust spray pattern of nozzles to reduce throw of water onto buildings, structures, vehicles, and paved surfaces. Monitor and re-adjust system operation until components operate continually as specified.

B. The Contractor shall operate the system in the presence of the Owner's Representative to demonstrate satisfactory performance and coverage. The Contractor shall give the Owner's Representative a minimum of 48 hours advance notice when requesting final inspection.

C. The Contractor shall demonstrate complete operation of the system, including controller-operating program, start-up and winterizing procedures, and deliver all supplemental equipment to the Owner's designated operating personnel.

3.16 MAINTENANCE

A. The Contractor shall provide a minimum one-year maintenance period unless otherwise specified in the contract documents. The maintenance period shall start on the day following the date of written acceptance of system installation by the Owner's Representative.

B. After two weeks of operation, flush lines and remove particulates from system. Adjust and clean all filters and/or screens bi-monthly.

C. Review site conditions and plant vitality on a monthly basis and adjust watering schedule and components as necessary to maintain plant health.

D. Run through controller and verify time settings, upon each inspection.

E. Perform seasonal winterization and system start-up. Demonstrate start-up and winterizing procedures to operating personnel.

F. Repair and adjust system throughout warranty period, and prior to turning maintenance schedule over to Owner's operating personnel.

END OF SECTION

SOIL PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
1. The work covered in this section consists of furnishing all labor, materials and equipment for testing, preparation, and placement of topsoil, water quality media and compost as indicated by the drawings and as specified.
2. Coordinate placement of topsoil or water quality media and required soil amendments with the establishment of rough grades.
3. Coordinate depths of soil amendments and topsoil with grading specifications for rough and finish grades.
4. All rough grading operations shall be completed as required by these specifications. Topsoil placement or backfilling in areas to be landscaped shall not occur until the Owner's Representative has issued written approval of the rough grade and topsoil.

B. Related Sections include the following:
1. Section 015639; Temporary Plant Protection.
2. Section 312200; Grading.
3. Section 328000; Irrigation.
4. Section 329219; Seeding.
5. Section 329300; Plants.

1.3 DEFINITIONS

A. Soil classifications standards used herein for existing and imported soils include but are not limited to the following.
1. ASTM Soil Quality Standards.
2. Classification: ASTM D 2487-00.
3. Gradation of Soils: ASTM D 422-63 (1998).
4. Liquid Limit and Plasticity Index: ASTM D 4318-94(2001)e1.
5. Moisture-Density Relations: ASTM D 1557-00.
6. Permeability of Soils: ASTM D 2434-68(2000).

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

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

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

E. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

F. Subgrade Soil: Friable soil, free from contaminants and materials deleterious to plant growth to depth as specified.
a. Water Quality Media: A highly permeable soil mix to facilitate infiltration and pollutant attenuation in water quality facilities. Sleeves installed beneath asphalt paving: Schedule 40 pipe meeting the requirements of ASTM D2241-00.

SOIL PREPARATION

1.4 SUBMITTALS

A. At least 7 working days prior to use on site or the start of work, the Contractor shall submit the following information to the Owner's Representative. All product samples must include sufficient volume for the Owner's Representative to make a reasonable analysis.
   1. Certified Analysis:
      a. All compost mixture components required by these specifications or as required by testing laboratories to bring soil into compliance with these specifications. All samples must be tested within six months of anticipated use.
      b. All fertilizer mixes required by the specifications or as required by testing laboratories to bring soil into compliance with these specifications.
      c. All on-site or imported topsoil or water quality soil media required by these specifications. All samples must be tested within six months of anticipated use.
   2. Where any tests show results failing to conform to the required standards the Contractor shall include with the testing report a recommended treatment plan to bring the material into conformance.
   3. Available Testing Laboratories:
      a. Soil and Plant Laboratory, Inc. – 503-557-4959.
      b. Western Agricultural Laboratories – 503-968-9225.
   4. Product Samples:
      a. Backfill Soil Mixture.
      b. Water Quality Media.

1.5 QUALITY ASSURANCE

A. Soil Preparation - All soil preparation work shall be done under the supervision of a Contractor having experience in landscape construction. All work shall be done in accordance with proper horticultural practices.

B. Herbicide Application - Applications of herbicide for weed control, as required, shall be made only by an applicator currently licensed under State and Federal law.

C. The Contractor shall store fertilizer and other required materials in a dry place and free from the intrusion of moisture.

D. All topsoil and compost must be tested by an independent testing laboratory and certified that it is in conformance with the requirements of these specifications.

E. Soil/Compost 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.

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

G. Compost Analysis: Furnish compost analysis by a qualified testing laboratory stating the volumes, quantities, and ratios of component parts specified.
   1. Compost Analysis Report must include analysis of suitability of compost for plant growth. State volumes and quantities of recommended amendments necessary to produce satisfactory compost.

SOIL PREPARATION

1.6 PROJECT CONDITIONS

A. Prior to the work of this section all rough graded surfaces shall be free of:
1. Concrete, asphalt, and other construction debris;
2. Limbs, twigs, cones, seed-pods and other woody material; and
3. Rock, gravel or other material not suitable for plant growth.

B. In all plant bed areas the sub-grade shall be free of unsuitable material such as stumps, roots, rocks, concrete, asphalt, or metals, for a minimum depth of 24 inches and in all lawn or seeded areas the sub-grade shall be free of unsuitable material for a minimum depth of 12 inches.

C. The Contractor shall provide protective covers and barriers as necessary to prevent damage and staining to all site improvements.

D. The Contractor shall prepare topsoil only when weather and soil conditions allow. Do not attempt soil preparation work when weather or soil conditions would contribute to poor or improper mixing, voids, or other adverse conditions/

E. The Contractor shall take all reasonable precautions to prevent runoff of topsoil and fertilizers from leaving site or entering storm systems, or any waterway.

1.7 SEQUENCING AND SCHEDULE

A. Coordinate soil preparation work with installation of other site improvements and planting of trees, shrubs, ground covers and lawns.

PART 2 - PRODUCTS

2.1 PLANTING SOILS

A. Planting Soil:
1. ASTM D 5268.
2. Acidity range (pH) of 5.5 to 7.
3. A minimum of 4 percent, and a maximum of 20 percent organic material content by volume.
4. A maximum of 25 percent decaying content by volume.
5. Free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.
6. Textural Class Requirements: Topsoil textural analysis shall fall within the following gradations.

Textural Class	% of Total Weight	Average %
Sand (0.05-2.Omm dia.)	45 – 75	60%
Silt (0.002-0.05mm dia.)	15 – 35	25%
Clay (less than 0.002mm dia.)	05 – 20	15%

B. Subgrade Soil: Friable soil, free from contaminants and materials deleterious to plant growth to depth as specified in Part 1 – General, Project Conditions.

2.2 STORMWATER FACILITY GROWING MEDIUM

A. Furnish imported growing medium for vegetated stormwater facilities conforming to the following:
1. General Composition: The medium should be a blend of loamy soil, sand, and compost that is 30 to 40 percent compost (by volume) and meets the criteria in this specification.
2. Analysis Requirements for the Blended Material:
a. Particle Gradation: A particle gradation of the blended material, including compost, should be in conformance with ASTM C1 17/C136 (AASHTO T11/T27).

b. Organic Matter Content: The soil organic matter content should be in conformance with ASTM D2974 (loss on ignition test). The soil organic matter content should be a minimum of 10 percent.

c. Ph: The blended material should have a pH of 5.5 to 7.

3. General Requirements for the Blended Material:

a. The material should be loose and friable.

b. It should be well mixed and homogenous.

c. It should be free of wood pieces, plastic, screened and free of stones 1 inch (25 mm) or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; and free of weeds and invasive plants including but not limited to:

Cirsium arvense (Canadian Thistle)
Convolvulus spp. (Morning Glory)
Cytisus scoparus (Scotch Broom)
Dipsacus sylvestris (Common Teasel)
Festuca arundinaceae (Tall Fescue)
Hedera helix (English Ivy)
Holcus canatus (Velvet Grass)
Lolium spp. (Rye Grasses)
Lotus corniculatus (Bird's Foot Trefoil)
Lythrium salicaria (Purple Loose Strife)
Melilotus spp. (Sweet Clover)
Myriophyllum spicatum (Eurasian Milfoil)
Phalaris arundinaceae (Reed Canary Grass)
Rubus discolor (Himalayan Blackberry)
Solanum spp. (Nightshade)
Trifolium spp. (Clovers),

d. Not infested with nematodes, grubs, other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration, continuous, air-filled, pore-space content on a volume/volume basis should be at least 15 percent when moisture is present at field capacity; and soil should have a field capacity of at least 15 percent on a dry weight basis.

e. It should have no visible free water.

f. It should be obtained from naturally well drained construction or mining sites where topsoil occurs at least 4 inches deep; and it should not be obtained from bogs, wetlands, or marshes.

2.3 INORGANIC SOIL CONDITIONERS

A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

B. Class: Class T, with a minimum 99 percent passing through No. 8 sieve and a minimum 75 percent passing through No. 60 sieve.

C. Class: Class O, with a minimum 95 percent passing through No. 8 sieve and a minimum 55 percent passing through No. 60 sieve.

D. Provide lime in form of dolomitic limestone.

E. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 sieve and a maximum 10 percent passing through No. 40 sieve.

F. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

G. Aluminum Sulfate: Commercial grade, unadulterated.

H. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.

I. Sand: Clean, washed, natural or manufactured, free of toxic materials.

J. Diatomaceous Earth: Calcined, diatomaceous earth, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

K. Calcined Clay: An inorganic soil amendment formed by expanding clay at high temperatures (calcining), and used to alter soil strength by affecting its ability to retain moisture.

L. EarthLite Fiter Media, as manufactured by Sunmark Seeds; 1.888.214.7333; Contact – Robin Cook.

M. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

N. For bidding assume assume placement and incorporation of 35 lbs. of dolomitic lime per 1,000 square feet.

2.4 SOIL AMENDMENTS

A. Compost: The compost should be derived from plant material and provided by a member of the U.S. Composting Council Seal of Testing Assurance. (STA) program. See www.compostingcouncil.org for a list of providers in the Portland area. The compost should be the result of the biological degradation and transformation of plant-derived materials under conditions designed to promote aerobic decomposition. The material should be well composted, free of viable weed seeds, and stable with regard to oxygen consumption and carbon dioxide generation. The compost should have no visible free water and produce no dust when handled. It should meet the following criteria, as reported by the U.S. Composting Council STA Compost Technical Data Sheet provided by the vendor.
   1. 100 percent of the material must pass through a 1/2-inch screen.
   2. The pH of the material should be between 6 and 8.
   3. Manufactured inert material (plastic, concrete, ceramics, metal, etc.) should be less than 1.0 percent by weight.
   4. The organic matter content should be between 35 and 65 percent.
   5. The soluble salt content should be less than 6.0 mmhos/cm.
   6. Germination (an indicator of maturity) should be greater than 80 percent.
   7. The stability should be between classes 5-7.
   8. The carbon/nitrogen ratio should be less than 25:1.
   9. The trace metals test result = “pass.”

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, with a pH range of 3.4 to 4.8.

C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.

D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
   1. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with at least 0.15 lb of ammonium nitrate or 0.25 lb of ammonium sulfate per cubic foot of loose sawdust or ground bark.

E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

F. For bidding assume planting and seeding beds and areas be amended with 2" of compost tilled into the top 6" of finished grade.

2.5 FERTILIZERS

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

E. For bidding assume 10 percent nitrogen, 6 percent phosphorus, and 4 percent potash by weight. At least 50 percent of total nitrogen shall contain no less than 3 percent water-insoluable nitrogen. At least 60 percent of nitrogen content shall be derived from super-phosphate containing not less than 18 percent phosphoric acid or bone meal containing 25 percent – 30 percent phosphoric acid and 2 – 3 percent nitrogen. Potash shall be derived from muriate of potash containing 55 – 60 percent potash.

2.6 PRE-EMERGENT HERBICIDE

A. Pre-emergent herbicide shall be as directed for condition by currently licensed herbicide applicator.

2.7 POST-EMERGENT HERBICIDE

A. Post-emergent herbicide shall be as directed for condition by currently licensed herbicide applicator.

2.8 WATER

A. Water shall be suitable for irrigation, free from oil, acid, alkali, salt or other substances harmful to plant life.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The Contractor shall examine the entire site for conditions that will adversely affect execution, permanence and quality of work, and survival of plant materials. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Rough Grading Inspection - Contractor shall notify Owner's Representative a minimum of 72 hours in advance for inspection of rough grades.

C. The Contractor shall verify that rough grades and slopes of areas to be planted areas are set at sufficient depth to allow for placement of specified materials. If the site is not suitable for landscaping operations, the Contractor shall perform necessary corrective work.

3.2 GENERAL PREPARATION OF GROUND SURFACES – ALL PLANTING OR SEEDING AREAS

A. The Contractor shall eliminate uneven areas and low spots, remove lumber, stones, sticks, mortar, concrete, rubbish, debris, contaminated soil and any other material harmful to plant life, in shrub and ground cover beds.

B. The Contractor shall verify that invasive species and weeds have been eliminated prior to the placement of topsoil. The Contractor must not place topsoil until all living weed matter has been eliminated.

C. Weed eradication shall include herbicide and non-herbicide methods. Eradication shall include and is not limited to elimination of the following invasive species and weeds:

Cirsium arvense (Canadian Thistle).

Convolvulus spp. (Morning Glory).

Cytisus scoparus (Scotch Broom).

Dipsacus sylvestris (Common Teasel).

Equisetum spp. (Horsetail).

Festuca arundinaceae (Tall Fescue).

Hedera helix (English Ivy).

Holcus canatus (Velvet Grass).

Lolium spp. (Rye Grasses).

Lotus corniculatus (Bird's Foot Trefoil).

Lythrium salicaria (Purple Loose Strife).

Melilotus spp. (Sweet Clover).

Myriophyllum spicatum (Eurasian Milfoil).

Phalaris arundinaceae (Reed Canary Grass).

Rubus discolor (Himalayan Blackberry).

Solanum spp. (Nightshade).

Trifolium spp. (Clovers).

1. Herbicide application shall be by manual 'spot spraying', wicking, or backpack methods per manufacturer's specifications.
2. Herbicide application shall be as directed by a currently licensed applicator and shall be strictly applied by manufacturer's specifications, and applicable codes and regulations.
3. Remove invasive plant material after herbicide application has effectively stopped plant growth. Dispose legally off-site.
4. After initial spraying and removal of weeds, and prior to placing topsoil, the contractor shall water the subgrade sufficiently to germinate dormant weed seeds.
   a. Prior to this weed crop producing seeds, the contractor shall spray these weeds with herbicide and remove them from the site.

b. Before continuing with topsoil placement the contractor shall verify with the Owner's Representative whether or not to repeat this treatment.

5. Selective hand removal by non-herbicide methods shall be utilized if herbicide application threatens existing plantings.
6. Existing or new plantings damaged or killed by herbicide application shall be replaced immediately at no additional cost to the Owner.

3.3 PLACING PLANTING SOILS

A. Verify that planting soil is stockpiled in sufficient quantities to be placed at depths specified. The Contractor shall notify the Owner's Representative immediately if supplies are inadequate or do not meet specifications for topsoil. The Contractor shall provided imported topsoil meeting the requirements of this section if the supply of existing on-site topsoil is insufficient.

B. Planting soil shall be placed at specified grades between any existing or constructed points on the site, such as curbs, walls, walks and paving.

3.4 SOIL PREPARATION IN PLANTING BEDS

A. Prepare subgrade to depth as specified in Part 1 – General, Project Conditions.

B. Loosen subgrade of planting beds to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
1. Apply 16-16-16 fertilizer at a rate of 6 lbs. per 1000 s.f. directly to subgrade before loosening.
2. Thoroughly blend planting soil mix off-site before spreading.
   a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
   b. Mix lime with dry soil before mixing fertilizer.
3. Spread planting soil mix to a depth of 12 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
   a. Spread approximately 4 inches of planting soil mix over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil in 4 inch lifts.
   b. Allow sufficient depth of topsoil placement to allow for finish grade to be one 1" below any paved surface after placement of bark mulch.

C. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

D. Restore planting beds if eroded or otherwise disturbed after finish grading and before planting.

3.5 SOIL PREPARATION IN SOD AND SEEDED AREAS

A. Limit lawn subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
1. Apply 16-16-16 fertilizer at a rate of 6 lbs. per 1000 s.f. directly to subgrade before loosening.
2. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.
   a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
   b. Mix lime with dry soil before mixing fertilizer.

3. Spread planting soil mix to a depth of 6 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
   a. Spread approximately 4 inches of planting soil mix over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil in 4 inch lifts,
   b. Reduce elevation of planting soil to allow for soil thickness of sod.

C. Unchanged Subgrades: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare surface soil as follows:
1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
2. Loosen surface soil to a depth of at least of 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.
   a. Apply 16-16-16 fertilizer at a rate of 6 lbs. per 1000 s.f. directly to subgrade before loosening.
3. Remove stones larger than 1 inch in any dimension and sticks, roots, trash, and other extraneous matter.
4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

D. Seeded Field grass:
1. Rototill surface of seedbed to a minimum depth of 6 inches.
2. Regrade and float to final finish grade, adding topsoil where required, with final grade to match existing or revised slopes, banks, etc. Grade to eliminate washing and puddling. Slope to drain water away from all buildings or structures.

E. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.

F. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

G. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.6 STORMWATER FACILITY GROWING MEDIUM INSTALLATION

A. Protection of the Growing Medium: The growing medium should be protected from all sources of contamination, including weed seeds, while at the supplier, in conveyance, and at the project site.

B. Placement of the Growing Medium: The medium should be placed in loose lifts, not to exceed 8 inches each and each lift should be compacted with a water-filled landscape roller. The material should not otherwise be mechanically compacted.

C. Timing of Plant Installation: Weather permitting, plants should be installed as soon as possible after placing and grading the growing medium in order to minimize erosion and further compaction.

D. Erosion Control: Temporary erosion control measures may be required until permanent stabilization measures are functional, including protection of overflow structures.

E. Protection of the Facility: In all cases, the facility must be protected from foot or equipment traffic that is unrelated to the construction of the facility. Temporary fencing or walkways should be installed as needed to keep workers, pedestrians, and equipment out of the facility. Under no circumstances should materials and equipment be stored in the facility.

F. Sediment protection: Stormwater facilities should be kept clean and should not be used as erosion and sediment control structures during construction.

G. Wet and Winter Conditions: Placement of the growing medium is not recommended when the ground is frozen or saturated or when the weather is determined to be too wet.

H. Watering, Fertilizing, and Mulching
   1. Water all plants during establishment to maintain all plantings in a healthy thriving condition.
   2. Fertilizers should generally be avoided in stormwater facilities. Fertilize all plants during establishment as needed with slow release, organic (low yield) material.
   3. Mulch for Vegetated Stormwater Facilities:
      a. The use of mulch in frequently inundated areas should be limited to avoid any possible water quality impacts, including the leaching of tannins and nutrients and the migration of mulch into waterways.
      b. Mulches to be used are a stable and inert (non-leaching)matter of sufficient mass and density that it will not float in standard flows. Mulch cover should be maintained throughout the life of the stormwater facility with minimum thickness of 2 inches in depth.

3.7 CLEANUP

A. Keep project site free from accumulation of debris, topsoil, and other material.

B. At completion of each area of work, completely remove debris, equipment and surplus materials.

C. Any paved area or surfaces stained or soiled from landscaping materials shall be cleaned with a power sweeper using water under pressure. Building surfaces shall be washed with proper equipment and materials as approved by the Owner's Representative. .

END OF SECTION

SEEDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Work consists of providing all labor, material and equipment for installing and establishing seeded Field Grass, Lawn and other special seed mixes as indicated below.
   1. Plant and establish seed mixture(s) in areas shown on drawings.

B. Related Section include the following:
   1. Section 015639; Temporary Plant Protection
   2. Section 328000; Irrigation
   3. Section 329113; Soil Preparation
   4. Section 329300; Plants
   5. Section 329445; Landscape Maintenance

1.3 DEFINITIONS

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

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

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

D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

1.4 SUBMITTALS

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

B. Product Certifications: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
   1. Certification of each seed mixture for turfgrass sod, identifying source, including name and telephone number of supplier.

C. Product Certificates: For soil amendments and soil conditioners, signed by product manufacturer.

1.5 QUALITY ASSURANCE

A. Work performed as described in this section shall be done under the supervision of a contractor having experience in landscape construction.

B. Work and material supplied shall comply with applicable requirements of the United States Department of Agriculture (USDA).

C. Delivery, Storage, and Handling

1. Deliver grass seed in original containers showing analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging and location of packaging. Damaged packages are not acceptable.
2. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.6 PROJECT CONDITIONS

A. Season: Seed between March 15 to October 15.

B. Weather conditions: Seeding is not permitted during the following conditions:
1. Cold weather: When air or surface temperature is less than 32 degrees F.
2. Hot weather: When air temperature is greater than 80 degrees F.
3. Soil Temperature: When soil temperature is less than 55 degrees F.
4. Wet weather: When ground becomes saturated.
5. Windy weather: When wind velocity is greater than 10 mph.

1.7 SUBSTANTIAL COMPLETION

A. Substantial completion is achieved after the Contractor has installed all plants, seeding and associated materials, and provides Owner's Representative with a written request to inspect said work. Plant and seed areas will be considered substantially complete when in compliance with the following conditions as directed by the Owner's representative and documented by written acknowledgement of Owner's Representative.
1. Plant Conditions: Healthy, free of pests and disease, and in vigorous condition.
2. Turf: Healthy, free of pests and disease, and with 90 percent cover and no bare areas greater than six square inches
3. Roots: Seeding roots thoroughly knitted to the soil.

1.8 WARRANTY

A. The warranty of plant materials furnished and planted under this contract shall be for one full year from the date of Substantial Completion and written acceptance as specified herein.

B. At the end of the warranty period, all seeded areas not meeting requirements of these specifications shall be reseeded with the same species and size as originally specified. Such replacement shall be made in the same manner as specified for the original plantings, and at no extra cost to the Owner. The warranty on reseeded areas shall be extended for one full seasons cycle after reseeding has been completed.

PART 2 - PRODUCTS

2.1 SEED MIXTURES

A. General
1. Seed shall meet or exceed Blue Tag quality according to current Oregon Certified Seed Standards published by Oregon State University.
2. Seeds shall be labeled in accordance with USDA Rules and Regulations under the Federal Seed Act.
3. Seeds shall be furnished in sealed, standard containers unless written exception is granted.
4. Noxious weed seed not to exceed 1% by weight.
5. Seed that is wet or moldy or has been damaged in transit will not be accepted.

B. Permanent seed mixture as indicated on planting plan.

C. Erosion Control Seed mix shall be as specified in Section 02270, Erosion Control.

D. The Contractor shall furnish suppliers certificate guaranteeing that the seed conforms to the above requirements and USDA certification. Seed shall be delivered to the contract site in unopened containers bearing the USDA and suppliers certificates.

2.2 WATER

A. Water shall be free from oil, acid, alkali, salt and other substances harmful to growth of grass, and shall be from a source approved prior to use.

2.3 MULCH

A. Straw Mulch: For use where manually or hydraulically applied seed is subject to wind or water erosion. Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Sphagnum Peat Mulch: Partially decomposed sphagnum peat moss, finely divided or of granular texture, and with a pH range of 3.4 to 4.8.

C. Muck Peat Mulch: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.

D. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
   1. Organic Matter Content: 50 to 60 percent of dry weight.
   2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

E. Wood-Cellulose Fiber Mulch: For use with the hydraulic application of grass seed and fertilizer.

   3. Biodegradable, dyed-wood, cellulose-fiber mulch.
   4. Dyed an appropriate color to facilitate visual metering of application materials.
   5. Nontoxic and free of plant-growth or germination inhibitors.
   6. Maximum moisture content of 15 percent air-dry weight basis.
   7. pH range of 4.5 to 6.5.

F. Nonasphaltic Soil Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors. Tackifier shall be capable of penetrating soil surface and binding soil particles; shall provide an adhesive to hold seed and wood-cellulose fibers together and bond them to the soil; and shall be made from naturally occurring and biodegradable materials. Specified tackifier shall be J-Tac or approved equal, per manufacturer's specification for applicable condition, as manufactured by Reclamare Company, 20727 7th Avenue South, Seattle, Washington (206-824-2385)

E. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.4 SPECIAL SEEDING AND MULCHING EQUIPMENT

A. Hydraulic equipment used for the application of fertilizer, seed and slurry of prepared wood-cellulose fiber shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend and homogeneously mix the slurry specified. The slurry distribution lines shall be large enough to prevent stoppage. The discharge line shall be equipped with a set of spray nozzles that will provide even distribution of the slurry on the various slopes.

PART 3 - EXECUTION

3.1 GENERAL PREPARATION

A. Verify that grading and soil preparation has been completed correctly.
   1. Notify Owner's Representative of any discrepancies; do not proceed with work until discrepancies have been resolved.

B. Notify Owner's Representative at least 24 hours prior to planting or seeding operations. Owner's Representative will inspect soil preparation, plant materials and plant orientation.

3.2 LAWN PREPARATION

A. Limit lawn subgrade preparation to areas to be planted. Prepare Lawn and Seeded areas as directed in Division 2, Soil Preparation.

3.3 SEEDING (all seeded areas)

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
   1. Do not use wet seed or seed that is moldy or otherwise damaged.

B. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.

C. Protect seeded areas with slopes exceeding 1:6 with erosion-control fiber mulch and 1:4 with erosion-control blankets or mats installed and stapled according to manufacturer's written instructions.

D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.
   1. Anchor straw mulch by crimping into topsoil with suitable mechanical equipment.
   2. Bond straw mulch by spraying with asphalt emulsion at the rate of 10 to 13 gal./1000 sq. ft.. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.

B. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak and scatter uniformly to a depth of 3/16 inch and roll to a smooth surface.

3.4 HYDROSEEDING

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
   1. Mix slurry with nonasphaltic tackifier.
   2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply mulch at a minimum rate of 1500-lb/acre dry weight but not less than the rate required to obtain specified seed-sowing rate.
   3. Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry application at a minimum rate of 500-lb/acre dry weight but not less than the rate required to obtain specified seed-sowing rate. Apply slurry cover coat of fiber mulch at a rate of 1000 lb/acre.

3.5 FIRST MOWING

A. Mow turf and other 'manicured' seed areas when seed has germinated to a thick stand 4" in height, to 1-1/2" from ground level with a sharp, sterile, power mower. Remove clippings and dispose legally offsite or

cut turf with 'mulching' mower of sufficient power to thoroughly cut and distribute clippings at soil level of lawn.

B. Mow Field Grass, Fleur de Lawn and other native mixes at 6" in height, when seed has germinated to a thick stand leaving no bare spots larger that 4" in diameter. Remove clippings and dispose legally offsite.

C. Do not mow Water Quality Facility Seeded Areas.

3.6 ACCEPTANCE OF SEEDED AREAS

A. Satisfactory Seeded Areas: Unless otherwise specified all seeded areas shall at the time of substantial completion, exhibit a healthy, uniform, close stand of the specified seed mix, free of weeds and surface irregularities, with coverage of mix in specified proportions, exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.

B. Satisfactory Seeded Turf: At the time of substantial completion, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.

C. Reestablish turf that does not comply with requirements and continue maintenance until lawns are satisfactory.

3.7 CLEANUP, PROTECTION AND ACCEPTANCE

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

C. Remove non-degradable erosion-control measures after grass establishment period.

D. Obtain written Conditional Acceptance from the Owner's Representative after all turf areas have been mowed at least twice.

END OF SECTION

PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
1. Furnishing all labor, materials and equipment for installation of landscape planting as shown on the drawings and as specified.

B. Related Sections include the following:
1. Section 015639; Temporary Plant Protection
2. Section 311070, Erosion Control
3. Section 328410, Design / Build Irrigation
4. Section 329113, Soil Preparation
5. Section 329219, Seeding
6. Section 329445, Landscape Maintenance

1.3 DEFINITIONS

A. The following publications, referred to thereafter by basic designation only, form a part of this specification to the extent indicated by references:
1. AMERICAN STANDARD FOR NURSERY STOCK, 2004 (ANSI Z60.1-2004), published by American Nursery & Landscape Association (ANLA)
2. STANDARDIZED PLANT NAMES, 1942 Edition, published by J. Horace McFarland Company.
3. FLORA OF THE PACIFIC NORTHWEST; by Hitchcock and Cronquist, latest edition,
4. Federal Standard for Fertilizers - Mixed, Commercial: FS0-F-241D

B. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than sizes indicated; wrapped, tied, rigidly supported, and drum-laced as recommended by ANSI Z60.1-2004.

C. Balled and Potted Stock: Exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than sizes indicated.

D. Bare-Root Stock: Exterior plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1-2004 for kind and size of exterior plant required.

E. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1-2004 for kind, type, and size of exterior plant required.

F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted exterior plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1-2004 for type and size of exterior plant.

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

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

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

1.4 SUBMITTALS

A. Substitutions Requests: Submit certifications, or samples of material requested for substitution.

B. Nursery Invoices: A minimum of 1 week prior to purchase, the Contractor shall submit to the Owner's Representative, copies of all invoices for plant materials to be used on site. The copies must indicate source of supply by name, address and phone number, order invoice number, and size and quantity for each species or variety ordered.

C. Inspection certificates:
1. All plant material shall meet requirements of State and Federal laws with respect to inspection for plant diseases and infestation.
2. Inspection certificates required by law shall accompany each shipment of plant materials and be submitted to the Owner's Representative

1.5 QUALITY ASSURANCE

A. Work and material supplied shall comply with applicable requirements of the United States Department of Agriculture (USDA).

B. The Contractor shall protect all materials, at all times during handling, shipping and storage, from extreme weather conditions, wind, drying of roots or root ball injury.

C. Plant materials showing damage from handling, shipping or during planting shall be rejected by the Owner's Representative and shall be replaced by the Contractor at their expense.

D. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1-2004, "American Standard for Nursery Stock."
1. Selection of exterior plants purchased under allowances will be made by Owner's Representative., who will tag plants at their place of growth before they are prepared for transplanting.

E. Tree and Shrub Measurements: Measure according to ANSI Z60.1-2004 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6-inches above ground for trees up to 4-inch caliper size, and 12-inches above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

F. Construction Observation: Owner's Representative may observe trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Owner's Representative retains right to observe trees and shrubs further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

G. Store fertilizers in a dry place and protect from intrusion of moisture.

H. Planting
1. All landscaping work shall be done under the supervision of a Contractor currently licensed in landscape construction, under respective jurisdictions, and having a minimum of two years

experience in landscape construction. All work shall be done in accordance with proper horticultural practices and hereinafter described.

2. Installer's Personnel Certifications: Certified Landscape Technician, CLT-Exterior; Certified Ornamental Landscape Professional, COLP.

I. Herbicide Application

1. Application of herbicides for weed control as may be required shall be made only by an applicator currently licensed under state law.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver exterior plants freshly dug.

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

B. Do not prune trees and shrubs before delivery, except as approved by Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.

C. Handle planting stock by root ball.

D. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots in water for two hours if dried out.
2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.7 PROJECT CONDITIONS AND COORDINATION

A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

B. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns, unless otherwise acceptable to Architect.

1. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

C. The Contractor shall coordinate planting work with soil preparation.

1.8 PLANT MATERIALS SUBSTITUTION

A. Plants, not specifically named in the plant list, will not be accepted unless specifically accepted in writing by the Owner’s Representative.

B. Substitutes proposed for approval, in each case shall possess the same essential characteristics as the kind of plant actually specified in regard to appearance, ultimate height, shape, and habit of growth, general soil, and other requirements.

1.9 SUBSTANTIAL COMPLETION

A. Substantial completion is achieved after the Contractor has installed all plants, seeding and associated materials, and provides Owner's Representative with a written request to inspect said work. Plant and seed areas will be considered substantially complete when in compliance with the following conditions as directed by the Owner's representative and documented by written acknowledgement of Owner's Representative.
   1. Plant Conditions: Healthy, free of pests and disease, and in vigorous condition.
   2. Branches: Free of dead and dying branches and branch tips.
   3. Foliage: Plants shall bear foliage of normal density, size, and color.
   4. Turf: Healthy, free of pests and disease, and with 90 percent cover and no bare areas greater than six square inches
   5. Roots: Seedling roots thoroughly knitted to the soil.

1.10 WARRANTY

A. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.

B. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.

C. At the end of the warranty period, the Owner's Representative will make an inspection to determine the condition of plants. All plants not in a healthy growing condition, as determined by the Owner's Representative, will be marked and noted for replacement. As soon as seasonal conditions permit, contractor shall removed the indicated plants from the site and replaced them with plants of the same species and size as originally specified. Such replacement shall be made in the same manner as specified for the original plantings, and at no extra cost to the Owner. The guarantee on plants shall be limited to one full replacement cycle.

PART 2 - PRODUCTS

2.1 TREES, SHRUBS AND GROUNDCOVER

A. Species, variety, quantity, size and condition of plant will be provided as indicated on the drawings. Plant material shall be supplied, but not limited to form and conditions defined as follows:

Rhizome:	Rhiz:	Section of root or stolon
Propagules:	Prop:	Section of stem
Bulb:	Bulb:	Single bulb mass
Plug:	Plug:	Rooted Cutting
Aquatic container:	AqCont;	Water filled container for floating plants
Seedling:	Sdlg:	Rooted tree or shrub
Tubeling:	Tblg:	Rooted tree or shrub in single tube
Bare Root:	BR;	Shrub or tree with soil removed from root mass
Cutting:	Ctng;	Stem cut from parent stock
Ball and Burlap:	B&B;	Tree or shrub with excavated root ball wrapped and tied per ANSI Z60.1-2004 standard.

Container:	Cont.;	Standard pot or bag, per ANSI Z60.1-2004 standard sizing.

B. Nomenclature shall conform to "Standardized Plant Names."

C. Quality definitions, grading tolerances, and caliper to height ratios no less than minimum specified in ANSI Z60.1-2004.

D. Plant material shall be healthy nursery stock, well branched, full foliated when in leaf, free from disease, injury, insects, all weeds and weed roots.

E. Cold storage plants shall not be permitted.

F. Plant materials shall be nursery-grown unless otherwise specified. Nursery-grown plants shall have been growing continuously in licensed nurseries for the following minimum number of growing seasons:

Plant Materials	Time in Nursery
Evergreens and conifers	Two growing seasons
Deciduous	One growing season
Groundcover and Vines	One growing season

G. Balled and burlapped (B&B) stock shall be furnished with natural ball.

H. Potted and container stock shall be well rooted, vigorous enough to ensure survival and exhibit healthy growth.

I. Container stock shall have been growing in its container for a minimum of six (6) months and a maximum of two (2) years, with roots filling the containers but not showing evidence of being or having been root bound.

J. Trees: Provide untapped, straight, single-leader trees. The Owner's Representative may reject any split-leader trees at any time prior to end of warranty period. Contractor shall replace any rejected, split-leader trees at their own expense.

K. Plant materials shall be free from disease, insects, disfiguring knots, sun scale, injuries, bark abrasion, evidence of improper pruning and other objectionable disfigurements.

L. Trees and shrubs shall have all developed branching system; shrubs shall have full foliage and shall not be leggy.

M. Thin, weak, leggy, or misshapen plants will be rejected by the Owner's Representative.

N. Labels: The correct horticultural name, size and caliper and/or other data, as specified in the Plant Material List, written on durable labels in weather-resistant ink, shall be securely attached to all individually shipped plants and to each box, bundle, bale and container of plant materials. Labels shall remain on representative plant materials until final acceptance of planting. Labels shall be affixed in such a manner that will not girdle the plant materials.

O. The species (botanical and common names), size, manner in which the plants are furnished, and spacing of the required plant materials, are noted on the planting plan.

P. The quantities of plant materials shall be as determined by the Contractor in accordance with the specified spacing, or location on plan. Material quantities shown on plan are for Contractor convenience only and

shall be verified by the Contractor prior to installation. Surplus or shortages of plant quantities shall be the responsibility of the Contractor.

2.2 TREE STAKING AND TYING MATERIALS

A. Wood tree stakes: Stakes for tree support shall be straight, sound, roughhewn, Douglas fir, construction grade not less than 2-inches square or 2-inches in diameter if round, and 8 feet long. Stakes shall be stained dark brown, for their entirety.

2.3 WATER

A. Water shall be suitable for irrigation, free from oil, acid, alkali, salt or other substances harmful to plant life.

2.4 FERTILIZER

A. Commercial fertilizer shall be any standard brand, uniform in composition, dry and delivered to the site in unopened original moisture proof containers. Each container shall be fully labeled, conforming to the applicable State fertilizer laws, bearing the manufacturer's trade name or trademark, warranty of the producer and the guaranteed analysis. Duplicate copies of invoices shall be furnished to the Owner's Representative Fertilizers shall be supplied in the following forms:
1. Granular-form fertilizer: Top-dressing fertilizers shall be:
a. Slow-release, 16-20-10 formula.
b. Ammonium nitrate.

B. Base percentages of nitrogen, phosphorus, and potash on laboratory test recommendations as approved by Owner. For bidding assume 10 percent nitrogen, 6 percent phosphorus, and 4 percent potash by weight. At least 50 percent of total nitrogen shall contain no less than 3 percent water insoluble nitrogen. At least 60 percent of nitrogen content shall be derived from super-phosphate containing not less than 18 percent phosphoric acid or bone meal containing 25 - 30 percent phosphoric acid and 2 - 3 percent nitrogen. Potash shall be derived from muriate of potash containing 55 - 60 percent potash.

2.5 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Fir and/or hemlock bark, 1-inch minus size with less than 30% bark finer than 1/4-inch size. Sawdust and wood shavings will not be acceptable.

C. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-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 as follows:
1. Organic Matter Content: 50 to 60 percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

D. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color:
1. Type: Rounded riverbed gravel or smooth-faced stone.
2. Size Range: 1-1/2-inches maximum, 3/4-inch minimum.

3. Color: Readily available natural gravel color range.

2.6 ANTIDESICCANT

A. Antidesiccant shall be a transparent concentrate in liquid form capable of application by spraying and/or dipping to relieve transplanting shock, wilt and loss from drying winds. The antidesiccant shall be a clear film that will retard moisture loss without respiration and be provided for use on edible crops in the United States. The concentrate shall not crack, peel off the foliage, be damaged by freezing nor possess any ingredient that will cause solidification or be harmful to wildlife.

2.7 PLANT STARTER

A. Plant starter solution shall, when mixed according to the manufacturer's specifications, be a high-nutrition plant food which contains water soluble hormone-like materials that are easily and readily absorbed into the roots and which stimulate early and rapid root development and reduce transplant shock when applied to the plant root zone. The solution shall include chelated iron, manganese and zinc-trace mineral supplements available in a formulation that will match the needs of a wide range of plant types with minimum risk of damage to plants and shall be approved for use on edible crops in the United States. Solution shall not be damaged by freezing, reduced in nutrients due to leaching or runoff, posses any ingredient that will cause solidification, be affected by soil pH or bacterial action, nor be harmful to wildlife. Plant starter solution will not be applied to plant foliage as a fertilizer or plant food.

PART 3 - EXECUTION

3.1 INITIAL INSPECTION OF PLANT MATERIAL

A. All plant materials must be inspected by the Owner’s Representative before planting. All plant material shall be free from insects, diseases, and injuries and sizing shall be equal to or exceeding measurements specified. Transport and handle all materials in strict accordance with proper horticultural standards. The Contractor shall provide plants with habit and growth that is normal, sound, healthy and vigorous.

B. All plant materials not meeting specification requirements shall be rejected.

C. All native plants shall be nursery stock except hardwood cuttings. Nursery stock shall be grown from propagules or seed collected from western Oregon or western Washington sources only. Plants from off-site collection sources shall not be allowed, unless otherwise approved by the Owner’s Representative.

3.2 PLANT BED PREPARATION

A. Prepare plant beds as directed in Division 32, Soil Preparation.

3.3 PLANT LAYOUT AND INSPECTION

A. Layout of major planting areas as indicated on the plans are approximate only, and the locations and identity of all trees, shrubs and ground covers shall be outlined in the field by the Contractor, subject to review and approval.

B. Inspection: The Contractor shall notify the Owner’s Representative forty-eight (48) hours prior to beginning any planting. The Owner’s Representative may adjust plant material location to meet field conditions. Planting shall not occur until the Owner’s Representative has approved the location and layout of all plant beds.

3.4 TREES, SHRUBS AND GROUNDCOVER PLANTING

A. Plant trees and shrubs upright and adjust to set best appearance or relationship to adjacent plants and structures. Shrubs and groundcovers shall be planted one half the distance from curbs, sidewalks, buildings and other objects, as specified in the spacing requirements

B. Native Plant material shall be planted with regard to condition specified on plan, per, but not limited to the following:

Rhizome:	Cut into soil surface within 2-inches of surface
Propagule:	Cut into soil surface within 2-inches of surface
Bulb:	Set into soil 4-inches – 6-inches deep. point up
Plug:	Placed into soil at size of root mass
Aquatic container:	Dispersed into open water surface
Seedling:	Cut into soil as deep as root mass, compacted
Tubeling:	Cut into soil as deep as root mass, compacted
Bare Root:	Placed into plant pit sufficient for root mass, compacted
Cutting:	Dibble into soil per cutting installation detail on plan
Ball and Burlap:	Placed into plant pit twice the size of root ball, compacted
Container:	Placed into plant pit twice the size of container

C. Planting dates:
1. Critical dates for planting operations include the following; subject to revision by Owner's Representative:
   a. Collection of hardwood cuttings: Nov. 15-Jan. 15
   b. Planting of cuttings, or bare root material: Jan. 15 - Feb .15 (weather dependent)
   c. Planting of container stock: Feb.15 - June 15, Aug. 30-Oct.30.

D. Excavation for planting
1. Stockpile all excavated topsoil for planting operations.
2. In digging pits for trees, the contractor shall separate sod, topsoil suitable for backfill, and subsoil, and shall dispose of the sod, rocks and unsuitable material off-site.
3. Diameter or minimum width of planting pit or trenches shall be as shown on the drawings.
4. If standing water is encountered during excavation of the planting pits, the Contractor shall notify the Owner's Representative who will determine the corrective drainage measures required.
5. If underground obstructions or rocks are encountered in excavation of planting areas making it impossible to plant materials as shown on the contract documents, an alternate location for the planting shall be selected by the Owner's Representative.
6. Excess excavated topsoil shall be used to form saucers around plants as detailed. Soil not required or suitable for the above usage shall be properly disposed of off the project site.

E. Cutting: Cut off cleanly all broken or frayed roots, smaller than 1/2-inch caliper.

F. Prior to completing backfilling, the upper two-thirds of the plant pit shall be flooded with the plant starter solution. Allow solution to soak away. Finish filling holes to finish grade and lightly compact soil around root ball.

G. Placement and compaction: Place and compact backfill soil mixture carefully to avoid injury to roots; fill all voids.

3.5 SHRUBS AND GROUNDCOVER PLANTING BED GRADES

A. Establish finish grades and slopes in accordance with finish grades as specified.

3.6 MULCHING

A. Mulch all shrubs and ground cover planting beds with a 2-inch layer of mulch material within two (2) days after planting. Cover entire bed areas; apply evenly. A 2-inch layer of mulch material shall be applied to saucer areas of trees and shrubs located outside of planting beds, or as indicated on drawings.

3.7 STAKING TREES

A. Stake and tie trees immediately after planting as indicated on the detail drawings.

B. Drive stakes vertically into the ground as shown on the drawings. Do not injure root or ball.

3.8 ANTIDESICCANT

A. The application of the antidesiccant shall be prior to transplanting as a spray or during planting as a dip. The antidesiccant shall not be applied if rain is anticipated in one hour or less. If not previously applied, the Contractor shall, within 24 hours of completing backfilling, spray all evergreen and leafed-out deciduous plants with the antidesiccant thoroughly covering all leaves. The solution shall be mixed according to manufacturer's specifications.

3.9 PRUNING

A. Pruning shall be done at or after the time of planting in accordance with proper horticultural practice.

B. Pruning shall be limited to the minimum necessary to remove injured twigs and branches and to compensate for the loss of roots during transplanting, but shall never exceed one-half of the branching structure.
   1. Crossed or rubbing branches shall be removed providing the natural shape of the tree is preserved.
   2. All cuts shall be made flush with the parent stem leaving no stubs. Pruning cuts shall be made in a manner to favor the earliest possible covering of the wound by callus growth. Cuts that produce large wounds and weaken the tree will not be acceptable. Evergreens shall not be pruned except to remove injured branches and/or double leaders. The use of pole shears and/or hedge shears for pruning deciduous and evergreen trees will not be permitted. All trimmings and other debris left over from the planting operations shall be collected and disposed of legally off the site.

C. With the permission of the Owner’s Representative, pruning may be done before delivery of plants, but not before plants have been inspected and accepted.

3.10 CLEANUP

A. Keep premises free from accumulation of debris.

B. At completion of each area of work, remove all debris, equipment and surplus materials

END OF SECTION

LANDSCAPE MAINTENANCE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE OF WORK

A. This Section includes the following:
1. Furnish labor, material, and equipment required to maintain landscaped areas for 1 years after date of Substantial Completion. Term of maintenance shall commence only after date of final written approval.
2. Supply landscape maintenance quote as separate line item in construction proposal.
3. Maintenance items listed Part 3 – Execution are a part of the scope.

1.3 SUMMARY

A. Related Sections include the following:
1. Section 015639; Temporary Plant Protection
2. Section 328000; Irrigation.
3. Section 329219; Seeding.
4. Section 329300; Plants.

1.4 SUBMITTALS

A. Maintenance Schedule: Upon beginning of maintenance contract, submit a proposed schedule of visit dates and services as outlined herein.

PART 2 PRODUCTS

2.1 GENERAL

A. Fertilizer shall be Webfoot Organic Deluxe 10-10-5 or Webfoot 5-15-10 cottonseed meal based fertilizer.

B. Staking and Guying Materials: Provide staking and guying materials in accordance with project specifications, details and drawings.

C. Mulch; Provide mulch to match planting beds and individual plant locations in accordance with project specifications, details and drawings.

PART 3 EXECUTION

3.1 PLANTING BED MAINTENANCE

A. Replace all damaged, dead, or dying plants covered by warranty within 30 days of initial identification of condition.

B. Fertilizing at planting beds: Apply 20 lb. per 1,000 square feet of specified organic base commercial fertilizer two times per growing season. First application on March 15 and the final application on June 15. All fertilizer shall be washed off foliage and watered in thoroughly if not watered by normal rainfall. Use cottonseed meal base Rhododendron fertilizer such as Webfoot 5-15-10 for all acid-loving (ericaceous) plants instead of 10-10-5 organic base fertilizers.

C. Weeding: Maintain clean planting beds by pulling and removing all weeds. Check weekly during the growing season and at least bi-weekly at other times.

D. Pruning: Prune to shape plantings as needed or directed to conform to the natural growth patterns. Remove all dead or diseased wood from the plantings.

E. Mulching: Keep a two-inch mulch of medium coarse bark mulch on the planting beds at all times. Rake mulch in early spring before applying new cover to break "crust" of old mulch.

F. Spraying: Spraying shall occur only by a currently licensed applicator. The contractor shall follow North Clackamas School District's integrated pest management program (IPM)

G. Watering: Shall be by specified irrigation program, excepting new plantings or replacement plantings that shall be watered in as planted. Verify balance of watering on new or replacement planting with Owner. One-inch per week is sufficient during growing season on established plantings. Increase watering to one-and-a-half inches per week during warm season. Adjust watering schedule or frequency, if evidence of excess puddling or runoff is encountered.

H. Remove all debris from site after each visit, and dispose legally offsite.

3.2 LAWN MAINTENANCE

A. Start water application as soon as season requires. Apply water in sufficient quantities and at sufficient intervals to maintain lawn in good color and health. Do not allow surface run-off. Cease watering operations when seasonal rains provide ample water to maintain lawn.

B. Mow at least once per week during the normal growing season (March 15 – October 15). Normal height of cut is 1 1/2 inches. Utilize clean, sharp equipment that is cleaned of bacteria, chemicals, fungus etc., prior to use on project site. Remove grass clippings from mowing operations and dispose legally offsite.

C. Edge beds and lawn perimeters every two weeks, after establishment.

D. Feed with Webfoot Turf Treat 15-5-10 or approved equal, applying equivalent of four pounds of actual nitrogen per season in a minimum of four applications annually.

E. Apply herbicide weed control by licensed applicator sufficient to control invasive broadleaf weeds and grasses.

F. Lawn areas shall be watered with a irrigation system during the warranty period.

3.3 IRRIGATION SYSTEM INSPECTION AND MAINTENANCE

A. The Contractor shall irrigate to maintain all plantings in a healthy, thriving condition.

B. Start irrigation when plants require supplemental water due to dry weather, depleting available soil moisture.

C. Flush and winterize system by November 1, or earlier if weather exhibits threat of freezing. Verify that system is free of water in all components subject to freeze damage.

D. Provide yearly backflow prevention inspections and certificates to Owner's representative, as required by code.

E. Adjust nozzles, heads, valves, and controller operation to provide a consistent water application avoiding over-saturation or under watering throughout native planting areas.

LANDSCAPE MAINTENANCE

F. Notify Owner's representative of system inadequacies that cannot be addressed by adjustment.

END OF SECTION