

TREE PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Furnish all labor, materials, equipment, and services necessary for the installation of temporary fencing, barricades, and guards to protect trees and plants indicated to remain, as necessary and required to prevent damage above and below grade.
 - 1. Protection shall include trees which are located beyond the project boundaries but which have drip lines which extend into the project site.

1.2 DEFINITIONS

- A. Drip Line: Outer perimeter of branches of any tree or plant.
- B. DBH: Tree Diameter at Breast Height.
- C. Root Protection Zone (RPZ): a minimum of 1 foot radius per inch of tree diameter (DBH), or as shown on the Tree Inventory in the Drawings.
- D. Ground Cover: Includes, but is not limited to, shrubs, woody and herbaceous groundcovers, and grass.

1.3 SUBMITTALS

- A. Submit the following in accordance with Division 1 Section "Submittal Procedures".
- B. Proposal for tree and plant protection, describing methods of protection and stabilization.
- C. Drawings and supporting documentation as directed.

1.4 QUALITY ASSURANCE

- A. Contractor's Condition Inspection: Include written report and color photographic prints recording the condition of the site prior to commencing construction.

1.5 PROJECT CONDITIONS

- A. Performance Requirements: Prevent damage to trees and plants including soil, roots, bark, trunks, limbs, branches, and foliage due to construction activities including, but not limited to, the following:
 - 1. Soil contamination, erosion, and compaction.
 - 2. Excessive wetting, ponding of storm water, and construction run-off.
 - 3. Alteration of grade and stockpiling of soil, debris, and materials.
 - 4. Unauthorized cutting, breaking, skinning, and bruising of trees and plants.
- B. Project Conditions: Install protection during initial mobilization at the site and maintain until Substantial Completion.
 - 1. Driving and Parking: Not permitted within drip line of trees, plants and sensitive natural areas without Owner's Representative's written permission.
 - 2. Storage of Materials and Debris: Not permitted within drip line of trees and plants.
 - 3. Where Owner's Representative permits construction traffic, parking, or materials storage on prepared lawn and planting areas, provide planks, plywood and similar protection; prevent rutting, and compaction of soil.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 EXISTING TREES AND PLANTS

- A. Water existing trees and plants as necessary to maintain existing condition throughout the Contract period until Substantial Completion.
- B. Tree protection fencing:
 - 1. Protect all trees and plants indicated to remain, including bark and root zones. Install protection fencing as indicated on the Drawings. Protection fencing shall be placed before start of demolition or any other construction activities. Protection fencing shall not be moved, removed, or entered by equipment, and shall stay in place until after planning official authorizes their removal or a final certificate of occupancy is issued, whichever occurs first. Protection fencing shall be maintained in good repair throughout construction.

TREE PROTECTION

2. Tree protection fencing shall be chain link, minimum of 6' height, secured with 8' steel posts driven into the ground, installed at the edge of the RPZ or as indicated on the Drawings.
 3. Signage designating the protection zone and penalties for violations shall be secured in a prominent location periodically on each protection fence.
- C. Erosion control:
1. Any silt fencing required to be installed within the RPZ shall not be trenched in per manufacturer specifications to avoid root damage. Instead, roll the base of the silt fence around a straw wattle and stake the wattle securely into the ground.
- D. Work within Root Protection Zones:
1. No construction activity shall occur within the RPZ unless approved in advance by the project arborist or landscape architect. Prohibited activities include, but are not limited to the following:
 - a. Ground disturbance, including vehicle and equipment access, storage, or maneuvering.
 - b. Staging or storage of materials or equipment, including soil stockpiling.
 - c. Dumping or runoff of any waste material, debris, chemically injurious materials and liquids (e.g. paints, solvents, oils, concrete, etc.).
 - d. Grade change during or after construction.
 - e. Soil compaction or new impervious surfaces.
 - f. Utility or irrigation work, including trenching.
 2. Where construction activity must be done within Root Protection Zones, review conditions with Project Arborist or Landscape Architect prior to performing any work, including the pruning or cutting of roots, branches, or foliage. Work shall conform to the requirements in this specification. Proceed as directed by Project Arborist or Landscape Architect.
 3. Excavation and root pruning within Root Protection Zones:
 - a. Excavate under or around roots with an air spade, by hand digging, or by boring. Use of backhoes or similar mechanical excavators is prohibited.
 - b. Excavation shall be avoided within the RPZ if alternatives are available.
 - c. Roots smaller than 2-inches in diameter that interfere with the work may be pruned clean to sound wood using a sharp saw as digging progresses to avoid pulling and tearing roots. Excavation immediately adjacent to roots larger than 2-inches in diameter within the RPZ shall be by hand or other non-invasive techniques to ensure that roots are not damaged. The project arborist shall assess and document roots 2-inches and larger in diameter prior to impacts. Where feasible, roots 2-inches and larger shall be protected by tunneling or other means to avoid destruction or damage.
 - 1) Exceptions can be made if, in the opinion of the project arborist, unacceptable damage will not occur to the tree. Excavation activity adjacent to protected trees and root pruning regardless of root size shall be documented by the project manager.
 4. Do not allow exposed roots to be scarred nor to dry out; provide temporary earth cover, or pack with peat moss and wrap with burlap. Water and maintain in moist condition and temporarily support and protect from damage.
 5. All pruning and cutting shall be performed with sharp instruments intended for the purpose. Do not break or chop.
- E. For plant protection areas shown on the Drawings for which no protection fencing is indicated, protect all existing trees and plants. No construction activities are permitted within plant protection areas except with written permission by Owner's Representative.

3.2 REPAIR AND RESTORATION

- A. Repair trees and plants damaged by construction operations as directed by the Owner's Representative. Make repairs promptly after damage occurs to prevent progressive deterioration.
- B. Replace trees and plants damaged by construction operations where the Owner's Representative determines restoration to normal growth pattern is not possible. Plant and maintain as directed.
 1. Trees less than 12-inch caliper: Same size as damaged tree; species selected by Owner's Representative.
 2. Trees 12-inch caliper and larger: Compensate Owner as determined by an acceptable consulting arborist registered with the American Society of Consulting Arborists.
 3. Plants: Same size, quality, and quantity as damaged; species selected by Owner's Representative.

END OF SECTION

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary erosion and sediment control.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
 - 2. Section 012200 "Unit Prices" for description of unit prices requested on Bid Form.
 - 3. Section 015700 "Temporary Controls" for mobilization sequencing requirements.
 - 4. Section 312000 "Earth Moving" for aggregate materials and dewatering/disposal of ground water at Project site.
 - 5. Section 329200 "Seeded Lawns" for hydromulch requirements.

1.2 MEASUREMENT AND PAYMENT

- A. General: Base bid includes preparation of Erosion and Sediment Control Plan (ESCP), implementation, inspection services and maintenance of erosion and sediment control measures, and minor adjustments required thereto due to weather or other unexpected events.

1.3 DEFINITIONS

- A. Best Management Practices (BMP): Methods or techniques prescribed by authorities having jurisdiction to minimize erosion and release of sediments into air or water.
- B. Erosion, Sediment and Pollution Control Plan (ESPCP): City of Albany Public Works Department term that is synonymous with Erosion and Sediment Control Plan (ESCP).
- C. Stabilization/Stabilized: Completion of all soil disturbance activities at site and establishment of permanent vegetative cover, or equivalent permanent stabilization measures that will prevent erosion.
- D. Turbidity: An expression of optical effect produced by sediment suspended in liquid.

1.4 REFERENCE STANDARDS

- A. National Pollutant Discharge Elimination System (NPDES) 1200-CA Permit, Oregon DEQ File No. 113597. Copy available from Owner.
- B. City of Albany Erosion and Sediment Control Manual.

1.5 SUBMITTALS

- A. Product Data for each product required for the Work of this Section.
- B. Erosion and Sediment Control Plan and subsequent updates.
- C. Qualification Statements: Designated Erosion Control Inspector.
- D. Inspection log and reports.

1.6 CLOSEOUT SUBMITTALS

- A. Evidence of approved final erosion control inspection.

1.7 QUALITY REQUIREMENTS

- A. Qualifications:
 - 1. Designated Erosion and Sediment Control Inspector: training and minimum 3 years' experience in:
 - a. principles and practice of erosion and sediment control with skills to assess conditions at site that could impact stormwater quality
 - b. knowledgeable in correct installation of erosion and sediment controls
 - c. able to assess effectiveness of measures to control stormwater quality.
 - 2. Certified Erosion and Sediment Control Inspector: Qualifications for Designated Erosion Control Inspector plus certified in an erosion and sediment control program approved by Oregon DEQ.
 - 3. Inspector Requirements:
 - a. Projects that disturb 5 acres or more must provide a Certified Erosion Control Inspector.
 - b. Projects that disturb less than 5 acres may provide a Designated Erosion Control Inspector or a Certified Erosion Control Inspector.

TEMPORARY EROSION AND SEDIMENT CONTROL

1.8 PERFORMANCE CRITERIA

- A. Prevent significant amounts of sediment generated by the Work off this Contract from leaving Project site or entering surface waters. Prevent discharge of airborne dust to undisturbed areas and to adjacent properties and walkways.
- B. Significant amounts of sediment include but are not limited to:
 - 1. Earth slides or mud flows that leave the site and are likely to discharge to surface waters.
 - 2. Evidence of concentrated flows when such flows contain sediment and are likely to discharge to surface waters.
 - 3. Turbid flows that are likely to discharge to surface waters.
 - 4. Deposits of sediment in areas that drain to unprotected storm water inlets or catch basins that discharge to surface waters. Inlets with failing sediment controls will be considered unprotected.
 - 5. Deposits of sediment from site on public or private streets outside of permitted work zone that will drain to surface waters.
 - 6. Deposits of sediment from site onto any adjacent property outside of permitted work zone that are likely to drain to surface waters.
- C. Leaving the site includes but is not limited to sediment-laden flow to stormwater inlets or catch basins having no sediment control structures designed for the expected flows downstream of the inlets or catch basins that are under Contractor's control.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide materials required for this work.
- B. Sediment fences: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths. Provide standard or heavy-duty filter fabric with manufactured stitched loops to hold 2x2 fence support posts.
 - 1. Fabric: apparent opening size of 30 U.S. Std. sieve, maximum, when tested in accordance with ASTM D4751 (latest revision). Permittivity of 0.05 sec⁻¹, minimum, when tested in accordance with ASTM D4491 (latest revision); ultraviolet resistance retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355 (latest revision) and after 500 hours exposure. Grab tensile strength (supported) of 100 lb-f, minimum, in cross-machine direction; 120 lb-f, minimum, in machine direction, when tested in accordance with ASTM D4632 (latest revision). Grab tensile strength (unsupported) of 90 lb-f, minimum, in cross-machine direction; 100 lb-f, minimum, in machine direction, when tested in accordance with ASTM D4632 (latest revision).
 - a. Manufacturers:
 - 1) BP Amoco, Amoco Fabrics and Fibers; www.geotextile.com
 - 2) TC Mirafi; www.tcmirafi.com
 - 3) Synthetic Industries; www.fixsoil.com
 - 2. Posts: 2-inch x 2-inch wood or steel stakes, minimum 6 feet long.
- C. Aggregate: as specified in Section 312000 "Earth Moving".
- D. Erosion Control Accessories:
 - 1. Steel Reinforcing Stakes: ASTM A 615, Grade 40, 5/8-inch diameter.
 - 2. Steel Mesh: 3 by 3 mesh industrial hardware cloth, 21 gage galvanized wire, 36 inches wide, 100 feet long, 72 pounds per roll.
 - 3. Soil Stabilization Fabric: grab tensile strength 100 lb minimum per ASTM D4632 (latest revision) each direction; burst strength 300 psi per ASTM D3786 Mod. (OSHD TM814) (TF 25. Method 3); puncture strength 60 lb per ASTM D4833 (latest revision) or ASTM D3787 Mod. (OSHD TM 816); No. 30 sieve per ASTM D4751 (latest revision) or smaller opening; 0.1 sec water permittivity per ASTM D4491 (latest revision). Mirafi 100X or approved
 - 4. Staples: 6 inches long, U-shaped steel.
 - 5. Straw wattles, biobags, jute and coir soil stabilization fabric.
- E. Hydromulch: as specified in Section 329200 "Seeded Lawns".

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 3 - EXECUTION

3.1 GENERAL

- A. Control soil erosion and prevent eroded sediments and other construction-generated pollutants from leaving Project site via wind or surface waters.
- B. Implement structural and non-structural Best Management Practices (BMPs) and install, monitor and maintain erosion and sediment control measures.

3.2 EROSION AND SEDIMENT CONTROL PLAN (ESCP)

- A. Prepare Project ESCP and submit to Owner for review within 1 week of Preconstruction Conference.
 - 1. Employ Designated Erosion Control Inspector to prepare ESCP.
 - 2. Use initial, Owner-developed ESCP furnished in the Contract Documents as basis for Project ESCP.
 - 3. Adapt initial ESCP to updated Project information, construction schedule, and Contractor's intended means and methods of operation.
 - 4. Additional or revised BMPs not shown in Drawings or initial ESCP may be required.
- B. Project ESCP shall be site-specific and cover all sites utilized in the work of this Contract.
- C. Prepare Project ESCP in conformance with requirements of City of Albany Erosion and Sediment Control Manual: <https://www.cityofalbany.net/pw/engineering/erosion-prevention-and-sediment-control>. Minimum requirements for Project ESCP include but are not limited to:
 - 1. Narrative site description and site map to scale.
 - 2. Construction schedule and milestones related to erosion and sediment control:
 - a. Construction start and complete dates
 - b. Date when ESCP measures will be in place.
 - c. Date when ESCP measures will be removed.
 - 3. Required BMPs to manage erosion and sediment movement.
 - 4. Additional erosion control practices or facilities that may be implemented.
 - 5. Maintenance and monitoring requirements.
 - 6. Descriptions of:
 - a. Clearing and grading practices.
 - b. Vegetative erosion control practices.
 - c. Sediment control practices.
 - d. Stockpile management practices.
 - e. BMPs that will be used to prevent or minimize stormwater from being exposed to pollutants.
 - 7. Operations and maintenance plan for stormwater treatment system, if indicated.
 - 8. Name, title and mobile telephone number of Designated or Certified Erosion and Sediment Control Inspector.
- D. Owner or authorities having jurisdiction may request modifications to the ESCP at any time if implementation of ESCP is ineffective at preventing discharge of significant amounts of sediment and/or turbidity to surface waters.

3.3 INSTALLATION

- A. Examine Project site to determine any conflicts with tree and plant protection fencing. Coordinate with Owner to request minor modifications to Project ESCP measures prior to implementation.
- B. Install erosion and sediment controls as indicated and in compliance with Project ESCP after installation of Temporary Tree and Plant protection fencing. Refer to Section 015700 "Temporary Controls" for mobilization installation sequence.
- C. Request Preconstruction Erosion Control inspection. Do not initiate ground disturbing activities until Inspector approves installation.
 - 1. In addition to Inspector, required attendees at inspection include Owner, Contractor, and Designated/Certified Erosion Control Inspector.
 - 2. Inspector may require minor adjustments to erosion and sediment control measures. Make adjustments required by Inspector at no cost to Owner.
- D. Post and maintain signage required by authorities having jurisdiction.

3.4 MONITORING AND MAINTENANCE

- A. Employ a Designated Erosion Control Inspector to inspect and monitor erosion and sediment control measures as indicated.

TEMPORARY EROSION AND SEDIMENT CONTROL

- B. Obtain erosion control inspections from City of Albany Regulatory Inspector as indicated.
- C. Maintain erosion and sediment controls as indicated or as required by Owner or authorities having jurisdiction until final acceptance and until permanent erosion control mechanisms are established.
- D. Erosion and sedimentation control measures indicated are minimum requirements for anticipated site conditions. Adjust or install additional erosion or sediment management devices or take other actions required to ensure that sediment does not leave Project site during unexpected conditions or storm events, or if stormwater discharge adversely impacts water quality.
- E. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site until final acceptance.

3.5 REPORTING

- A. Designated Erosion Control Inspector shall complete erosion and sediment control inspections at indicated frequency and as required.
- B. Inspection Report: Include each erosion and sediment control measure required by Project ESCP in checklist form. Record observations and actions for each measure, including corrective measures taken and clean-up activities.
 - 1. Amend ESCP if inspections indicate erosion or sediment control measures are not effective.
 - 2. Submit amended ESCP for review but do not wait for review to be completed to adjust measures if significant erosion or sediment releases are occurring.
- C. Inspection Log: Record inspection findings in inspection log indicating:
 - a. Date and time of each inspection.
 - b. Weather conditions.
 - c. Rainfall amounts for previous 24 hours.
- D. Submit copies of inspection log and inspection reports at Substantial Completion.

END OF SECTION

SELECTIVE DEMOLIITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of above- and below-grade utilities and site improvements not affected by or related to demolition of a building or structure.
2. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 011100 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 015200 "Temporary Facilities" for temporary utilities by Contractor.
3. Section 015639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants.
4. Section 015700 "Temporary Controls" for temporary protection and controls.
5. Section 311000 "Site Clearing" for site clearing.
6. Section 312000 "Earth Moving" for backfilling requirements.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction or site and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction or site, in a manner to prevent damage, and store and then deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction or site, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 PREDEMOLITION MEETING

- A. Predemolition Conference: Conduct conference at Project site. Coordinate with preinstallation conference specified in Section 311000 "Site Clearing".
 1. Inspect and discuss condition of construction to be selectively demolished.
 2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 4. Review areas where existing construction is to remain and requires protection.

1.5 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, and for dust control. Indicate proposed locations and construction of barriers.
- B. Predemolition Photographs

1.6 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

SELECTIVE DEMOLIITION

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with the following:
 - 1. EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of Authorities Having Jurisdiction.
 - 2. ANSI A10.6 "Safety & Health Program Requirements for Demolition Operations."
 - 3. NFPA 241: "Safeguarding Construction, Alteration, and Demolition Operations."
 - 4. Applicable local codes for demolition work, safety of structure, and dust control.
- B. Record Drawings: Comply with Section 017000 "Execution and Closeout Requirements". Identify and accurately show locations of capped utilities and other subsurface structural, electrical and mechanical conditions.

1.8 FIELD CONDITIONS

- A. Notify Owner of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- B. Utility locates: Call the Oregon Utility Notification Center at 811 for underground utility locations 48 hours in advance of removing materials.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Owner. Hazardous materials will be removed by Owner under a separate contract.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Record Documents.
- C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
 - 1. Show existing conditions of adjoining construction or site, including finish surfaces and vegetation, that might be misconstrued as damage caused by demolition operations. Submit before Work begins.
 - a. Provide photographs or video date stamped and recorded at exposure and resolution sufficient to show details.
 - 2. Inventory and record the condition of items to be removed and salvaged. Show conditions that might be misconstrued as damage caused by salvage operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

3.3 PROTECTION

- A. Temporary Protection: Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection" and 015713 "Temporary Erosion and Sediment Control". Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent structures and park facilities to remain.
- B. Remove temporary barricades and protections where hazards no longer exist.

SELECTIVE DEMOLIITION

3.4 SELECTIVE DEMOLITION OF SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove subsurface slabs, stumps, and other obstacles as indicated and as necessary to facilitate new construction, to a minimum depth of 24 inches.
- C. Remove concrete slabs on grade, paving, curbs, gutters, and aggregate base as indicated.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn demolished materials.

3.6 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.
 - 1. Clean roadways of debris caused by debris transport.

END OF SECTION

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete footings and foundation walls.
- B. Related Sections:
 - 1. Section 014500: Quality Control, for special inspection and independent testing requirements.
 - 2. Section 312000: Earth Moving, for aggregate base course for footings.
 - 3. Section 116816: Play Structures, for play structure footings and related items embedded in concrete.
 - 4. Section 321313: Concrete Paving, for exterior paving.
 - 5. Manufacturer's Written Instructions: Structural Notes.

1.2 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
 - 1. Provide schedule of specific areas to receive each type of product specified for exterior slab-on-grade treatment, such as sealers and hardeners. Identify name of each product proposed for use.
- B. Design Mixes: For each concrete mix. Submit at least 10 days prior to concrete delivery to site.
- C. Test Reports: Submit copies of laboratory and field test reports for concrete work.
 - 1. Submit copies of inspection and independent testing reports required in Section 014500, "Quality Control."
- D. Material certificates signed by product manufacturers certifying that product complies with requirements.
- E. Batch Ticket: Provide a batch weight ticket with each truck for inspection agency.
 - 1. Comply with requirements of ASTM C 94 in Article 16 Batch Ticket Information.

1.3 QUALITY ASSURANCE

- A. Quality Assurance: Comply with ACI 301, "Specification for Structural Concrete," and ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- B. Reinforcing Steel Standards: CRSI "Manual of Standard Practice."
- C. Mix Design Qualifications: Employ testing laboratory or concrete supplier to perform materials evaluation, testing, and design of concrete mixes.
- D. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- E. Installer Qualifications: Use skilled workers trained and experienced in necessary crafts and familiar with requirements and methods needed for proper performance of Work of this Section.

1.4 SITE CONDITIONS

- A. Temperature and Weather Requirements:
 - 1. Do not place concrete when temperature or weather will affect performance or appearance of concrete.
 - a. Temperature Range for Ambient Air During Concrete Placement: 40 to 80 degrees F.
 - b. Temperature Range for Ambient Air During Epoxy Bonding Grouts: 40 to 85 degrees F.
 - 2. Maximum wind velocity for unprotected floor slabs, stairs, ramps, and walks: 15 mph.
 - 3. Minimum Ambient Air Temperature: 40 degrees F.
 - 4. No precipitation expected within 8 hours for unprotected concrete surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS / PRODUCTS

- A. Provide products by manufacturers indicated in this Section, or approved.
 - 1. Substitutions: Submit according to requirements of Division 01 Section for "Substitutions."

2.2 FORM MATERIALS

- A. Forms for Exposed Concrete: Plywood, metal, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces.
 - 1. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on Drawings.

CAST-IN-PLACE CONCRETE

- B. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. High-density overlay, Class 1 or better.
- C. Form Lumber: Douglas Fir, Construction Grade, No. 2 or better, dressed on at least two edges and one side (S1S2E) for tight fit.
- D. Forms for Cylindrical Columns: Round, type that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation, one of the following:
 - 1. Cylindrical Forms: Smooth faced, fiberglass reinforced polyester.
- E. Chamfer Strips: Wood, metal, PVC, or rubber strips.
 - 1. Shape: Beveled, 45 degrees, size as indicated on the Drawings.
 - 2. Shape: Radiused, size as indicated on the Drawings.
- F. 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.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than one inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in concrete surface.

2.3 REINFORCEMENT

- A. Reinforcing Bars: Intermediate grade steel conforming with "Specifications for Billet-Steel Concrete Reinforcing Bars," ASTM A 615, Grade 60, deformed, unless specifically noted as grade 40, and the following:
 - 1. Ties and Stirrups: ASTM A 615, Grade 40.
 - 2. Weldable Bars: ASTM A 706, Grade 60.
 - 3. Column Spiral Bars: ASTM A 616, Grade 50, plain.
- B. Weld Type Reinforcing Bars: ASTM A 706, Grade 60.
- C. Reinforcing Accessories:
 - 1. Chairs for Support of Rebar: "Concrete Brick," Precast concrete or fiber-reinforced concrete, of greater strength than concrete; do not use steel devices over vapor retarder. PVC protected steel, nylon or nylon coated.
 - 2. Reinforcing Tie Wire: ASTM A 82, 16 gauge, double annealed iron wire.
 - 3. Dowels: as indicated on in Drawings.
 - 4. Dowel Caps: Crimp or welded type, 5 inches minimum length, F46 by JEF, Inc
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets, 6" x 6" - W1.4/W1.4.

2.4 CONCRETE MATERIALS

- A. Concrete:
 - 1. Portland Cement: ASTM C 150, Type IA or IIA.
 - a. Fly Ash: ASTM C 618, Class F or Class C.
 - 2. Aggregate: ASTM C 33.
 - 3. Lightweight Aggregates: ASTM C 330.
 - 4. Water: ASTM C 94, clean, free of oils, acids, organic material.
 - 5. Air-Entraining Admixture: ASTM C 260.
 - 6. Water-Reducing Admixture: ASTM C 494, Type A.
 - 7. Chemical Admixture: ASTM C 494, Type A water reducing or Type D water reducing and retarding.
 - 8. Mineral Admixture: ASTM C 618, Class F or Class C.
- B. Accessory Materials:
 - 1. Joint-Filler Strips: Deck-o-foam expansion joint filler, by W.R. Meadows.
 - 2. Expansion Joint Filler Cap: 1/2 inch deep, 1/2 inch wide, 941 by JEF, Inc.

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3. Tongue and Groove Keyed Joint Fillers: Reinforced asphalt core between asphalt saturated felt liners, 1/4 inch thick with 1 inch deep and 2-1/2 inches at base of trapezoid, full depth of concrete slab, 10 feet long, with punched holes 24 inches on center for stakes and 30 inches on center for dowel bars.
 4. Construction Joints: 1 inch deep. 2-1/2 inch minimum at base of trapezoid, 24 gage galvanized steel or plastic keyway.
 5. Control Joint Forms: 1 inch deep, PVC, JEF Zip Joint by JEF Inc.
 6. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene; one of the following:
 - a. Euclid Chemical Company; Tammsweld.
 - b. Larsen; Weld-crete.
 - c. BASF Building Systems; Thorobond.
 7. Patching Compound: Two component cement base and acrylic polymer compound, 5,000 psi in 28 days minimum compressive strength; one of the following:
 - a. The Burke Company; Burke Acrylic Patch.
 - b. Sonneborn; Epolith Patcher or Sonopatch.
 8. Curing Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet, or synthetic fiber mat complying with AASHTO M-171, such as the following:
 - a. Synthetic Fiber Mat for Traffic Areas: Transguard, by Armorlon, a Division of Reef Industries, Inc.
- C. Exterior Curing Compound:
1. Chem-Masters; Polyseal.
 2. Dayton Superior; J-20 Acrylic Cure, Seal & Dustproofer 14.
 3. A.C. Horn; Acrylic Sealer.
 4. Preston Pacific; Preston C & S 600.
 5. Sonneborn; Kure-N-Seal.
 6. W.R. Meadows; Sealtight CS-309.
 7. Sika; Sikagard.
 8. Symons; Cure & Seal.
 9. Upco; Polyclear.
- D. Nonmetallic Nonshrink Grout.
- a. Industry Standard: ASTM C 1107.
 - b. Type: Shrink resistant, nonstaining, noncorrosive.
 - c. Minimum Compressive Strength: $f'c = 5,000$ psi in 28 days.
 - d. Acceptable Grouts:
 - e. Bostik Construction Products; Upcon.
 - f. The Burke Company; Nonmetallic Grout.
 - g. Euclid Chemical; Euco N-S Grout or Euco Dry Pack Grout.
 - h. Fosroc Preco; Conbextra S.
 - i. W.R. Meadows; Sealtight 588.
 - j. Master Builders; Masterflow 713.
 - k. Sika; SikaGrout 212.
 - l. Sonneborn; SonogROUT and SonogROUT G.P.
 - m. U.S. Grout; Five Star Grout.
- E. Epoxy Grout:
1. Industry Standard: ASTM C 881.
 2. Type: Premixed, packaged, two component, epoxy resin.
 3. Minimum Compressive Strength: $f'c = 6,000$ psi in 28 days.
 4. Acceptable Grouts to Bond Plastic Concrete to Existing Concrete:
 - a. Adhesive Engineering; Concessive 1001 LPL.
 - b. Bostik Construction Products; Upcon Epoxy Grout.
 - c. The Burke Company; Medium Viscosity 881 LPL Patch and Bond Epoxy.
 - d. Euclid Chemical; High Strength Grout.
 - e. ProKrete Industries; Probond 812 medium viscosity.
 - f. Sika; Sikadur 32 Hi-Mod.
 - g. Sonneborn; Sonobond.
 - h. U.S. Grout; Five Star Epoxy Grout.
 5. Acceptable Grouts to Bond Concrete to Reinforcing Steel:
 - a. Adhesive Engineering; Concessive 1441.

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- b. The Burke Company; 881 LPL Topping and Crack Grouting Epoxy.
- F. Anchoring Cement:
 - 1. Type: Premixed, packaged, shrink resistant.
 - 2. Minimum Compressive Strength: $f'c = 4,000$ psi in 28 days.
 - 3. Acceptable Anchoring Cements:
 - a. The Burke Company; Burke Stone.
 - b. Euclid Chemical; K-Ment.
 - c. Master Builders; Embeco 153.
 - d. Thoro System Product; Thorogrip.
- G. Reinforced Laminated Paper Moisture Retaining Membrane for Pedestrian Traffic Areas: ASTM C 171, Orange Label Sisalkraft by Fortifiber Corp.
- H. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - 1. Eucobar; Euclid Chemical.
 - 2. Sure Film; Dayton Superior Corporation.
 - 3. Sealtight Evapre; W.R. Meadows, Inc
- I. Surface Retarder: Water-based top-surface retarder designed to retard the setting (hydration) of the upper layer of cement paste, producing an exposed aggregate appearance of the concrete surface. Design intent is for product to work equally well on both horizontal and vertical surfaces.
 - 1. Dayton Superior "TopCast" Surface Retarder, or approved equal, of the following grade as required to achieve the intended aesthetic effect:
 - 2. Product code: 03. Package color: violet. Depth of aggregate exposure: acid-etch finish.

2.5 CONCRETE MIXES

- A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, with the following properties:
 - 1. Minimum Compressive Strength: $f'c = 3,500$ psi in 28 days.
 - a. Minimum Compressive Strength for Foundations: $f'c = 2,500$ psi in 28 days.
 - 2. Maximum Aggregate Size: 3/4 inch.
 - 3. Maximum Slump for Footings, Walks, Curbs, Exterior Slabs, and Floor Slabs: 4 inches + 1/2 to - 1 inch.
 - 4. Maximum Slump for Walls, Columns, and Beams: 3 inches + 1/2 to - 1 inch.
 - 5. Air Content: 4.5 to 7.0 percent.
 - 6. Water/Cement Ratio: 0.50.
- B. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
 - 1. Mix full load of concrete for 3 minutes at high speed upon arrival at site.
 - 2. Mix concrete for an additional 5 minutes after adding water

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork in accordance with ACI 301.
- B. Comply with ACI 318, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.
- C. Construct formwork so concrete structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- D. Chamfer exterior corners and edges of permanently exposed concrete, unless otherwise shown or indicated.
- E. Coat contact surfaces of forms with form-release agent, according to manufacturer's instructions before placing reinforcement.
- F. Leave formwork for structural elements in place until concrete has achieved 28-day design compressive strength.
- G. Anchor Bolts:
 - 1. Set anchor bolts for structural plates with anchor bolts double nutted to plywood or steel templates.

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2. Set anchor bolts for equipment with anchor bolts double nutted to templates furnished by equipment manufacturer.
- H. Installation of Anchor Bolts with Anchoring Cement:
1. Set anchor bolts for structural plates with anchor bolts double nutted to CDX plywood or oriented strand board templates.
 2. Set anchor bolts for equipment with anchor bolts double nutted to templates furnished by equipment manufacturer.
 3. Fill space around anchor bolts in drilled concrete and masonry with anchoring cement as recommended by anchoring cement manufacturer.
- I. Drilled in Grouted Anchors: When approved, in lieu of embedding anchor bolt, holes may be drilled in hardened concrete and anchor bolts and other items installed with special mortars, with procedure as follows:
1. Drill with diamond boring or coring bits.
 2. Use epoxy grout type bonding mortar;
 3. Blow holes clean and dry before installation of embedded items.
 4. Before insertion, coat both hole and the item to be embedded with bonding compound.
 5. Studs of equal size and length may be substituted for anchor bolts if nut fasteners are used.
 - a. Drilled in studs or anchors utilizing mechanical expansion locking in any process areas are not allowed.

3.2 INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- B. Steel Reinforcement: Comply with CRSI's "Manual of Standard Practice," MSP-1, for fabricating, placing, and supporting reinforcement.
1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
 2. Comply with UBC and ACI 318, Chapter 7 for minimum concrete cover over reinforcing steel.
 3. Stagger reinforcing bar splices 48 inches minimum at alternate bars.
 4. Lap continuous deformed bars 36 diameters and not less than 24 inches.
 5. Reinforce corners and intersections with 24 inch by 24 inch corner bars.
 6. Install two Number 5 bars around wall openings larger than 30 by 30 inches.
- C. Installation of Reinforcing Accessories:
1. Comply with CRSI Manual of Standard Practice for wire tie reinforcing.
 2. Install reinforcing couplers and splices in reinforcing.
 3. Locate and support reinforcing with metal chairs, bolsters, spacers, and hangers as required.
 4. Dolbys are not allowed.
 5. Install dowels and slab edges at size and spacing indicated in on Drawings.
- D. Joints: Locate and install construction, isolation, and contraction joints.
1. Install keyed joints between footings and retaining walls.
 2. Install construction joints at locations which will not impair concrete strength or appearance.
 3. Install expansion and control joints in slabs on grade at spacing indicated on Drawings.
 - a. Where spacing of expansion joints is not specified on the Drawings, install exterior expansion joints at not more than 30 feet on center.

3.3 CONCRETE PLACEMENT

- A. Deposit concrete continuously and avoid segregation. Deposit concrete in forms in horizontal layers no deeper than 24 inches, avoiding cold joints.
1. Consolidate concrete with mechanical vibrating equipment.
 2. Screed and initial-float concrete floors and slabs using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
 3. Comply with ACI 306.1 for cold-weather concrete placement.
 4. Place concrete according to recommendations in ACI 305R when hot-weather conditions exist.

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3.4 FINISHING VERTICAL CONCRETE

- A. Rough Form Finishing Concealed Vertical Concrete Surfaces:
 - 1. Comply with ACI 301, paragraph 10.2.1.; Remove fins and projections exceeding 1/4 inch in height and patch tie holes and surface defects.
- B. Smooth Form Finishing Exposed Vertical Concrete Surfaces:
 - 1. Comply with ACI 301, paragraph 10.2.2.; Remove fins and projections and patch tie holes and surface defects.

3.5 FINISHING HORIZONTAL AND INCLINED CONCRETE

- A. Floated Slab Finish:
 - 1. Provide floated finish for slab surfaces to receive washed, troweled, and broomed finish.
 - 2. Comply with ACI 301, paragraph 5.3.4.2.b.
 - 3. Begin floating when water sheen has disappeared and surface has stiffened sufficiently to permit float finishing.
 - 4. Check surface plane with a 10 foot straightedge at two or more angles during or after first floating.
 - 5. Level to flatness of 1/4 inch in 10 feet.
 - 6. Refloat immediately to a uniform sandy texture.
- B. Joint Finishing:
 - 1. Tool radius exterior slab, walk, ramp, and curb edges.
 - 2. Cut or form interior floor slab crack control joints.
 - 3. Cut or form exterior curb slab and ramp crack control joints.
- C. Horizontal Surface Finish Tolerances: Finish concrete horizontal surfaces as specified in ACI 302, paragraph 8.3.

3.6 GROUT PLACEMENT

- A. Surface Preparation:
 - 1. Remove loose aggregate and coating materials from substrate surfaces prior to placing grout and anchoring cement.
 - 2. Support bearing plates above cleaned bearing surfaces with double nutted anchor bolts and wedges.
 - 3. Position and plumb supporting steel members, then tighten double nutted anchor bolts.
 - 4. Cut off part of wedges and shims that protrude beyond the edge of base and bearing plates.
- B. Installation of Cementitious Grout Under Bases and Bearing Plates:
 - 1. Pack space below base and bearing plates supporting structural members and stationary equipment with nonmetallic nonshrink grout until no voids remain.
 - 2. Pack space below bearing plates supporting vibrating equipment with metallic nonshrink non-catalyzed grout until no voids remain.
 - 3. Trowel exposed grout surfaces to smooth finish.
 - 4. Cure grout to comply with manufacturer's printed instructions.
- C. Installation of Epoxy Grout:
 - 1. Coat existing concrete contact surfaces with epoxy grout at spalled concrete areas prior to filling with plastic cement.
 - 2. Fill space between existing drilled and dowel sleeved concrete and new reinforcing bars and dowels with epoxy grout.

3.7 FIELD QUALITY CONTROL

- A. Do not place concrete or reinforcement in footing forms until Owner or his representative has examined compacted soil and aggregate materials within forms.
- B. Do not place concrete until Owner's Representative has examined formwork, reinforcing steel, and condition of vapor retarder.
 - 1. Notify Owner's Representative 24 hours prior to concrete placement for inspection of reinforcing.
 - 2. Adjusting Reinforcing: Adjust location of reinforcing as required.
- C. Test Requirements:
 - 1. When special Inspection is required by State Building Code, Owner will employ an Independent Testing Laboratory to evaluate concrete delivered to and placed at site.
 - a. Notify Independent Testing Laboratory 24 hours prior to delivery and placement of concrete.
 - 2. Comply with Building Code, Section 1701 for evaluation and acceptance of concrete.

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- D. Ready Mixed Concrete Inspection and Testing:
1. Sample each truck load of ready mixed concrete, complying with ASTM C172.
 2. Perform one slump test for each truck load of ready mixed concrete, complying with ASTM C 143.
 3. Perform one air content test for each set of compressive strength specimens, complying with ASTM C 231.
 4. Make one set of 3 of compressive strength specimens for each day of structural concrete pouring or each 50 cubic yards or fraction thereof for each class of concrete, complying with ASTM C 31.
 5. Test one specimen in accordance with ASTM C 39 after curing 7 days, two specimens after curing 28 days, unless first specimen tested at 28 days does not meet specified compressive strength, in which case retain one specimen for testing after 35 days or as directed by Owner's Representative.
 6. Batch Ticket:
 - a. Receive a batch weight ticket from each truck; batch ticket to comply with requirements of ASTM C 94 in Article 16 for Batch Ticket Information.
 - b. Verify water/cement ratio.
 - 1) No water may be added if load is at specified ratio.
 - 2) Reject truck if ratio does not conform.
- E. Grout Testing:
1. When required by the Building Code, Section 306, Special Inspection Requirements, Owner will employ an independent testing laboratory to evaluate grout supporting structural members.
 2. Comply with procedures in Section 01 4000, Quality Requirements.
 3. Test nonmetallic nonshrink grout in accordance with ASTM C 109.
 4. Test epoxy grout in accordance with ASTM C 579, Method B.
 5. Manufacturer's Field Service: Grout and anchoring cement manufacturer's representative shall provide technical assistance and two project site visits to ensure that grout and anchoring cement work is performed in accordance with manufacturer's instructions.

3.8 REPAIRS AND PROTECTION

- A. Surface Repairs for Exposed Concrete:
1. Thoroughly clean, dampen with water and brush-coat area to be patched with Bonding Agent.
 2. Fill honeycomb voids and rock pockets with patching compound.
 3. Compact in place and screed as recommended by patching compound manufacturer.
 4. Finish to match adjoining work.
 5. Strike off excess mortar at surface.
 6. If defects in color and texture of surface cannot be repaired, remove and replace concrete.
- B. Replace damaged and defective grout and anchoring cement work.
- C. Protection:
1. Protect concrete from frost damage until protected by soil backfill or until cured for 28 days.
 2. Protect concrete from physical damage or reduced strength caused by air temperatures below 45 degrees F. and above 75 degrees F. during curing period, complying with recommendations in ACI 306R and 305R respectively.
 3. Protect concrete from shrinkage crack damage until protected by curing procedure.
 4. Cover fresh grout and anchoring cement with plywood or oriented strand board for 24 hours minimum, where exposed to public, pedestrian, and animal traffic.
- D. Physical Barrier Protection:
1. Barricade area containing fresh concrete slabs, stairs, ramps and walks for 24 hours minimum.
 2. Cover fresh concrete with plywood where exposed to public, pedestrian, and animal traffic.

END OF SECTION

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PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Brick veneer masonry
 - 2. Mortar, grout, reinforcing steel, and masonry accessories.
- B. Related Sections:
 - 1. Section 033000 – Cast-in-Place Concrete.
 - 2. Section 321373 – Paving Joint Sealants.

1.2 Reference Standards

- A. ANSI A118.4: Specifications for Latex-Portland Cement Mortar.
- B. ANSI A118.6: Specifications for Ceramic Tile Grouts.
- C. ASTM C33 Standard Specification for Concrete Aggregate
- D. ASTM C67-93a: Test Methods of Sampling and Testing Brick and Structural Clay Tile.
- E. ASTM C144: Standard Specification for Aggregate for Masonry Mortar
- F. ASTM C150: Standard Specification for Portland Cement
- G. ASTM C270-03 Specification for Mortar for Unit Masonry
- H. ASTM C216-92: Facing Brick.
- I. ASTM C270-03: Specification for Mortar for Unit Masonry
- J. ASTM C979: Specification for Pigments for Integrally Colored Concrete

1.3 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Minimum Masonry Wall Design Strength: $F'm = 1,500$ psi.

1.4 SUBMITTALS

- A. The Contractor shall make all submittals in accordance with Section 01 33 00.
- B. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and Owners, and other information specified.
- C. Product Submittals:
 - 1. Submit product data on masonry accessories.
 - 2. Submit product samples for each type of masonry unit.
 - 3. Submit color samples for grout and mortar mixes, subject to approval by Landscape Architect.
- D. Quality Assurance Submittals:
 - 1. Submit manufacturer's test reports for each type of masonry unit and for masonry grout, and mortar prism tests.
- E. Rain Mitigation Plan:
 - 1. Plan of activities demonstrating protection of installed brick masonry from wet weather conditions during installation period.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed brick masonry installation similar in material, design, and extent to that indicated for Project that has resulted in construction with a record of 5 years minimum successful in-service performance.
- B. Fabricator Qualifications: Engage a firm experienced in producing brick masonry similar to that indicated for this Project and with a record of 10 years minimum successful in-service performance, as well as sufficient production capacity to produce required units without delaying the Work.
- C. Source Limitations: Obtain each variety of brick, regardless of finish, from a single source.
- D. Field Mockup:
 - 1. Construct mockup for one 8 foot section and one end face of Masonry Seatwall as detailed in the drawings to verify selections made under sample submittals and to demonstrate aesthetic effects as

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well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of work, including same base construction and contiguous work as indicated. Acceptable mockups may be incorporated in the Work.

- a. Notify Landscape Architect 1 week in advance of date and time when mockup will be erected.
- b. Demonstrate proposed range of workmanship and visual attributes. Use materials, pattern, and joint treatment approved for final work.
- c. Obtain Landscape Architect's acceptance of visual attributes.

1.6 SITE CONDITIONS

- A. Weather Limitations for brick masonry installation: Comply with the following requirements:
 1. Cold-Weather Requirements: Protect brick masonry against freezing when atmospheric temperature is 40° F and falling. Heat materials to provide mortar and grout temperatures between 40° F and 120° F. Provide the following protection for completed portions of work for 24 hours after installation when the mean daily air temperature is as indicated: below 40° F, cover with weather-resistant membrane; below 25° F, cover with insulating blankets; below 20° F, provide enclosure and temporary heat to maintain temperature above 32° F.
 2. Hot-Weather Requirements: Protect brick masonry when temperature and humidity conditions produce excessive evaporation of setting beds and grout. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100°F and above.
 3. Comply with manufacturer's written recommendations for temperature and humidity requirements for mixing and installation of latex-modified mortars and grouts.
- B. Protection of installed stonework in wet weather conditions: comply with approved Rain Mitigation Plan.

1.7 SEQUENCING AND SCHEDULING

- A. Coordinate with installation of poured-in-place concrete and other structural components as they are constructed.
- B. Coordinate installation of brick masonry work with installation of brick and stone paving and other components.
- C. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of the Work.
- D. Coordinate brick masonry installation with all underground and overhead utilities and services. Comply with requirements of authorities having jurisdiction, franchised service companies, and controlling agencies.

1.8 WARRANTY AND CORRECTION OF WORK

- A. Warrant performance of brick masonry as required by the General Provisions.

PART 2 - PRODUCTS

2.1 MASONRY COMPONENTS

- A. Brick Masonry: Subject to compliance with requirements, provide the following products available from Mutual Materials (888) 688-8250:
 1. Top of Masonry Seatwall: Standard Modular Brick, Solid: 2-1/4-inch tall, 3-5/8-inch wide and 7-5/8-inch long.
 2. Faces of Masonry Seatwall: Standard Modular Brick, Stretcher: 2-1/4-inch tall, 3-5/8-inch wide and 7-5/8-inch long.
 3. Color and texture: "Vintage", mission finish.
- B. CMU block: Subject to compliance with requirements, provide the following products available from Mutual Materials (888) 688-8250:
 1. 8x8x16 Standard and 8x8x8 Standard Smooth Face CMU block.

2.2 MORTAR AND GROUT PERFORMANCE REQUIREMENTS

- A. Mortar Testing:
 1. Compressive Strength: ASTM C 91.
 2. Mortar Prism Tests: Prepare and test 3 grouted and 3 ungrouted prism samples for each 5,000 square feet of grouted masonry walls, complying with ASTM C 270 and ASTM C 91.
- B. Grout Testing:

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1. Sampling: ASTM C 172.
2. Slump Testing: One test for each truck, ASTM C 143.
3. Compressive Strength Testing: ASTM C 39, one set of 5 specimens for each 30 cubic yards.

2.3 MORTAR AND GROUT MIXES

- A. Portland Cement: ASTM C 150, Type I or II; natural color, white, or a blend to produce mortar color indicated, low alkali, non-staining cement.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of Portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
 1. For pigmented mortars, use colored Portland cement-lime mix of formulation required to produce color indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10% of Portland cement by weight for mineral oxides, or 2% for carbon black.
- D. Aggregate: ASTM C 144.
- E. Mortar and Grout Admix: Acrylic Mortar Admix by Custom Building Products, (800) 272-8786.
 1. Latex-Portland Cement Grout shall meet the requirements of ANSI A118.
- F. Latex-Portland Cement Grout: ANSI A118.6, composition as follows:
 1. Dry Grout Mixture: Factory-mixed, sanded grout complying with ANSI A118.6 and recommended by latex manufacturer, in natural color. Use latex additive without retarder with dry-set grout.
 - a. Color admixture: pure, concentrated mineral pigments especially processed for mixing into mortar and complying with ASTM C979.
 2. Latex additive (water emulsion), serving as replacement for gaging water, combined at Project site with dry grout mixture.
 3. Water: none permitted; use only latex additive.
- G. Setting and Pointing Mortar: ASTM C270, cement-lime mortar, Type N, proportion specification.
- H. Mixing:
 1. Combine and thoroughly mix cementitious materials, water or latex admix as applicable, and aggregates in a mechanical batch mixer.
 2. Mortar for stone masonry (pointing) shall be composed of one part Portland cement, 2 parts fine aggregate, and admixtures as specified to which sufficient hydrated lime may be added to make as stiff a mixture as can be properly worked into the joints.
 3. Comply with applicable ASTM or ANSI standards and manufacturer's instructions for mixing time, content of water and latex admixture, as applicable, and materials, color and installation methods.

2.4 OTHER MASONRY SEATWALL COMPONENTS

- A. Concrete footing and steel reinforcement: conforming with requirements in Section 033000 – Cast-in-place Concrete.

PART 3 - EXECUTION

3.1 GENERAL

- A. Examine related work and surfaces with Installer present before starting work in this Section. Note conditions that require correction. Verify that corrections have been made before starting stone work. Do not proceed with work when ambient temperature is below 45° F. Ensure that materials such as curing compounds, which would prevent proper adhesion of the setting bed to the concrete, are removed. Verify that irrigation sleeves have been installed prior to beginning work.
- B. Install all items in locations indicated according to manufacturer's recommendations and as detailed.
- C. Install concrete footing conforming with requirements in Section 033000 – Cast-in-place Concrete and as shown on the Drawings.
 1. Allow concrete slab to cure for a minimum of 28 days before beginning work in this Section.
- D. Install steel reinforcement conforming with requirements in Section 033000 – Cast-in-place Concrete and as shown on the Drawings.
- E. Install CMU block conforming with requirements listed in Paragraph 3.2 – Performance and as detailed.
- F. Mix and place only that amount of mortar that can be laid with brick prior to initial set. Cut back, bevel edge, remove, and discard mortar material that has reached initial set prior to placing brick.

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3.2 PERFORMANCE

A. Installation of Masonry Units:

1. Install units in patterns and locations as indicated on Drawings.
2. Install units with 3/8-inch thick, tooled concave mortar joints except tool joints flush at concealed surfaces.
3. Remove mortar from masonry unit cavities where solid grout is indicated.
4. Tool exposed joints concave and strike for concealed joints flush.

B. Masonry Unit Installation Tolerances:

1. Variation from Plumb: 1/4-inch maximum in 10 feet, 3/8-inch maximum in 20 feet, 1/2-inch maximum in more than 20 feet.
2. Variation from Horizontal Lines: 1/2-inch maximum in 20 feet, 3/4-inch maximum in more than 40 feet.
3. Variation in Thickness for Walls and Columns: Minus 1/4-inch to plus 1/2-inch from indicated thickness.

C. Curing:

1. Comply with masonry unit manufacturer's recommendations.
2. Cure grout by maintaining in a damp condition for 7 days except as otherwise recommended by latex additive manufacturer.
3. Cure assembly for 28 days prior to application of structural loads.

3.3 COMPLETION

A. Adjusting and Cleaning:

1. Remove and replace defective and damaged masonry assemblies.
2. Remove excess mortar and grout from the site.
3. Clean exposed walls with power wash unit using high pressure hot water and proprietary cleaner, complying with Brick Institute of America technical bulletin for masonry cleaning (11490 Commerce Park Drive, Reston, VA 22091).

END OF SECTION

PLAY STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Manufactured and shop fabricated play structures and equipment.
- B. Related Sections:
 - 1. Section 033000: Cast-In-Place Concrete, for formwork, reinforcing, and concrete for play structure footings.
 - 2. Section 312000: Earth Moving, for boring play structure footings.
 - 3. Section 321817: Playground Protective Surfacing.

1.2 DEFINITIONS

- A. IPEMA: International Playground Equipment Manufacturer's Association.
- B. CPSC: US Consumer Product Safety Commission, Guidelines for Public Playground Safety.
- C. Fall Height: In accordance with ASTM F 1487, "the vertical distance between a designated play surface and the protective surfacing beneath it,".
- D. Use Zone: In accordance with ASTM F 1487, the "area beneath and immediately adjacent to a play structure or equipment that is designated for unrestricted circulation around the equipment and on whose surface it is predicted that a user would land when falling from or exiting the equipment.

1.3 SYSTEM DESCRIPTION

- A. Design Performance Requirements:
 - 1. Design play structures to conform to U.S. Consumer Product Safety Commission, Handbook for Public Playground Safety.
 - 2. Design play structures so that corners, edges, and ends of play structures have no exposed pinching and/or crushing points that may result through the unplanned movement of any piece of the structure.
 - 3. Design play structures for children in the tot's and kid's age range of 2 years and older.

1.4 SUBMITTALS

- A. Product Data: Manufacturer's specifications, data, and installation instructions.
- B. Shop Drawings showing layout, dimensions and installation details for each play structure and custom fabrication.
 - 1. Shop drawings shall include paving, curbs, and other structures located within or at the perimeter of the play surfacing.
 - 2. Shop drawings shall include safety zones.
 - 3. Shop drawings for play structures on slopes shall include grading information and longitudinal sections cut through each piece of equipment showing the relationship of the play equipment to the play surfacing.
 - 4. Shop drawings for custom fabrications shall show all dimensions, cross sections, fabrication tolerances, finishes, welds, penetrations and supports, and integration with other work.
- C. Samples:
 - 1. Submit two 12 inch long samples of polyester powder coat finish on aluminum and steel framing components.
 - 2. Submit two 12 inch long samples of PVC coated materials.
 - 3. Submit two color chips for each finish specified.
- D. Quality Assurance Submittals:
 - 1. Design data for play structures bearing the seal and signature of a structural engineer registered in the State of Oregon.
 - 2. Test reports for powder coated surfaces including adhesion tests in accordance with ASTM D 3359 and knife scratch tests in accordance with ASTM D 2197.
- E. Maintenance Instructions: Manufacturer's complete instructions for maintenance.
- F. Certification and Warranty Submittals:
 - 1. International Playground Equipment Manufacturer's Association (IPEMA) certification.
 - 2. Play structure manufacturer's standard 15 year warranty against structural failure due to corrosion, deterioration of components, and defective labor for aluminum posts and collars.

PLAY STRUCTURES

1.5 QUALITY ASSURANCE

- A. Comply with governing codes and regulations for installation of play structures for public use.
- B. Design play structures to comply with the following standards:
 - 1. ASTM F 1487, "Standard Consumer Safety Performance Specification for Playground Equipment for Public Use."
 - 2. US Consumer Product Safety Commission (CPSC), Guidelines for Public Playground Safety.
- C. Certification: Provide certification by the International Playground Equipment Manufacturer's Association (IPEMA) that products comply with specified ASTM standards.
- D. Use skilled workers who are trained and experienced in crafts and familiar with requirements and methods needed for proper performance of Work of this Section.
- E. Manufacturer's Qualifications: Minimum 5 years experience in the manufacture of play structures.

1.6 SITE CONDITIONS

- A. Existing Conditions:
 - 1. Locate existing site improvements, underground utility systems, and other below grade site improvements in area of surface and footing excavations.
 - 2. Call the Oregon Utility Notification Center at 811 for underground utility locations 48 hours in advance of removing soil materials and boring post holes.
 - 3. If necessary, modify with Owner's approval play structure layout to avoid conflicts with existing underground utilities and site improvements.

1.7 DELIVERY, STORAGE, PROTECTION AND HANDLING

- A. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Store metal materials not less than 4 inches above grade.
- C. Protect prefinished metal from abrasion and corrosion during storage and assembly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers and Products for Shop Fabricated Play Structures:
 - 1. Landscape Structures, Inc., or approved equal.
 - 2. Contact: Len Fransen at Ross Recreation 503.407.4890.
- B. Substitutions: Submit according to requirement of Division 01 Section for "Substitutions."

2.2 MATERIALS

- A. Round Extruded Aluminum Structural Tube Posts:
 - 1. Industry Standard: ASTM B 429, 6061 alloy and T6 temper.
 - 2. Minimum Yield Strength: 35,000 psi.
 - 3. Minimum Tensile Strength: 38,000 psi.
 - 4. Minimum Outside Diameter: 4.5 inches.
 - 5. Minimum Wall Thickness: 0.125 inches.
 - 6. Minimum Weight: 2.02 pounds per lineal foot.
 - 7. Shop Finish: Polyester powder coat.
- B. Aluminum Tube Post Collars:
 - 1. Industry Standard: ASTM B 429, 6061 alloy and T6 temper.
 - 2. Minimum Yield Strength: 35,000 psi.
 - 3. Minimum Tensile Strength: 38,000 psi.
 - 4. Minimum Outside Diameter: 4.5 inches.
 - 5. Minimum Wall Thickness: 0.125 inches.
 - 6. Minimum Weight: 2.02 pounds per lineal foot.
 - 7. Shop Finish: Polyester powder coat.
- C. Aluminum Tube Post Caps:
 - 1. Aluminum Tube Post Caps.

PLAY STRUCTURES

- D. Aluminum Seamless Pipe:
 - 1. Industry Standard: ASTM B 209, extruded aluminum 6063-T6, 6063-T52, or 6063-T832 alloy and temper, Schedule 5, 10, or 40.
 - 2. Maximum Length: 20 feet.
 - 3. Nominal Inside Diameter Pipe Size: 3/4, 1, 1-1/4, 1-1/2, 2, 2-1/2, 3, 3-1/2, 4, 5, 6, and 8 inch.
- E. Round Steel Pipe Beams:
 - 1. Industry Standard: ASTM A 53, Grade B, Seamless, Schedule 40.
 - 2. Minimum Size: 4 inch NPS, 4.5 inch outside diameter.
 - 3. Minimum Wall Thickness: 0.237 inch.
 - 4. Minimum Weight: 10.79 pounds per lineal foot.
 - 5. Shop Finish: Hot dip galvanized and powder coated.
- F. Round Steel Pipe Framing for Rails, Climbing Rungs, and Connectors:
 - 1. Industry Standard: ASTM F 1083, Type I, Schedule 40.
 - 2. Minimum Size for Rails and Climbing Rungs: 2 inches NPS, 2.375 inches outside diameter.
 - 3. Minimum Weight for Rails and Climbing Rungs: 3.65 pounds per foot.
 - 4. Minimum Size for Pipe Connectors: 1 inch NPS, minimum 1.315 inch outside diameter.
 - 5. Minimum Weight for Connectors: 1.68 pounds per foot.
 - 6. Shop Finish: 0.9 ounces of zinc per square foot of surface and prime coated with manufacturer's standard prime coat that allows adhesion for shop applied powder coat
- G. Chains and Chain Connectors:
 - 1. Material: Hardened steel chain, do not use proof coil chain.
 - 2. Size: 4/0.
 - 3. Minimum Tensile Strength: Not less than 1,000 pounds.
 - 4. Shop Finish: Hot dip galvanized steel.
- H. Slip Resistant Surface Texture:
 - 1. Manufacturers standard slip resistant surface for flat steps, ladders, footholds, handrails, and grab rails.
- I. Play Structure Accessories:
 - Exposed Accessible Fasteners: Designed to require the use of specialized tools not generally available to the public.
 - Steel Pipe Framing End Caps: Round weatherproof metal cap welded to steel pipe on exposed ends.
 - 1. Equipment Fasteners and Hardware: Equipment manufacturer's standard vandal resistant, flush and not protruding, fasteners, fittings, collars, sleeves, spacers, caps, hooks, and hangers shop finished to match adjacent surfaces.

2.3 CONCRETE FOOTING MATERIALS

- A. Provide forms, reinforcing, and materials for concrete post footings in accordance with requirements of Section 033000, "Cast-In-Place Concrete," and additional requirements of this Section.
- B. Forms for Post Footings:
 - 1. Type: Cylindrical fiber forms.
 - 2. Size: As shown on the Drawings, minimum 12 inch diameter, not less than 24 inches long.
 - 3. Acceptable Cylindrical Fiber Forms, one of the following:
 - a. Sleek Tube by Alton.
 - b. Vulco by Vulcan.
 - c. Sonotube by Sonoco.
 - d. Burke Tube by Burke.
- C. Concrete for Footings: Minimum Compressive Strength: $f_c = 3,000$ psi in 28 days.

2.4 MANUFACTURED PLAYGROUND EQUIPMENT

- A. Custom Play Booster Play Structure: Landscape Structures, or approved equal.
 - 1. Play structure includes the following components:
 - a. PlayBooster Bridges & Ramps
 - 1) (1) 120325A Ramp Berm Exit Plate
 - 2) (1) 156232A Ramp w/Guardrails w/Curbs
 - b. Climbers W/Permalene Handholds
 - 1) (1) 143199B Conical Climber 40" Dk DB

PLAY STRUCTURES

- 2) (1) 152907A Deck Link w/Barriers Steel end panels 1 Step
 - 3) (1) 152907B Deck Link w/Barriers Steel end panels 2 Steps
 - 4) (1) 122914A Loop Arch 48" Dk DB
 - c. Decks
 - 1) (1) 178710A Hexagon Tenderdeck
 - 2) (2) 121948A Kick Plate 8" Rise
 - 3) (2) 111228A Square Tenderdeck
 - 4) (2) 111231A Triangular Tenderdeck
 - d. Enclosures
 - 1) (2) 191031A Accessible Panel Curb
 - 2) (1) 177712A Color Splash Panel Above Deck
 - 3) (2) 127953A Handhold Panel Set
 - 4) (1) 129043A Image Reach Panel Above Deck
 - 5) (1) 173567B Marble Panel Ground Level
 - 6) (1) 135729A Periscope Reach Panel Above Deck
 - 7) (1) 173565A Xylofun Panel Above Deck
 - e. Motion and More Fun
 - 1) (1) 120901A Grab Bar
 - f. Posts
 - 1) (2) 11404G 100" Alum Post DB
 - 2) (2) 111404E 116" Alum Post DB
 - 3) (1) 111404D 124" Alum Post DB
 - 4) (6) 111403H 126" Alum Post For Roof DB
 - 5) (2) 111404C 132" Alum Post DB
 - 6) (3) 111404B 140" Alum Post DB
 - 7) (2) 111404J 76" Alum Post DB
 - g. Roofs
 - 1) (1) 130567A Hex Shingle Roof
 - h. Slides
 - 1) (1) 123331B Double Slide 40" Dk DB
 - 2) (1) 124863E SlideWinder2 64" Dk DB 1 Straight 1 Right 1 Left
 - i. Climbers
 - 1) (2) 120710A Pod Climber 8" DB
 2. Swing Set includes the following components:
 - a. (1) 221292A 5" Arch Swing Frame 8' Beam Height Only
 - b. (1) 221293A 5" Arch Swing Frame Additional Bay 8' Beam Height Only
 - c. (2) 174018A Belt Seat ProGuard Chains for 8' Beam Height
 - d. (1) 176038A Full Bucket Seat ProGuard Chains for 8' Beam Height
 - e. (1) 218671C Molded Bucket Seat (2-5 yrs) w/Harness ProGuard Chains for 8' Beam Height
 3. Free-standing equipment includes the following components:
 - a. (1) Double Bobble Rider DB, Color palette: Limon/Acorn
 - b. (1) Digirider Horse DB
 - c. (1) LSI welcome sign.
- B. Color palette: Landscape Structures Palette AI (modified):
1. Permalene: Leaf and Acorn.
 2. Proshield Finishes: Leaf (posts and beams) and Limon (collars and bars).
 3. Polycarbonate Panels: Limon.
 4. Polyethylene: Acorn.
 5. Steel decks: Brown.
 6. Cables: Black.
 7. Tender-tuff Coating: Brown.

2.5 FABRICATION

- A. Fabrication of Play Structure Exposed Corners, Edges, and Ends:
 1. Hem, roll, curl, ease, or cap exposed corners, edges, and ends of structure members.
- B. Shop Powder Coat Finish for Aluminum and Steel Components:
 1. Powder coat metal components after fabricating, preparing, and cleaning metal substrates to a minimum thickness of 4 mils, and oven cure at 400 degrees F.

PLAY STRUCTURES

2. Do not powder coat expanded stainless steel and metal chains.
3. Place permanent horizontal line marking at designed level of playground fiber surface.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify areas to receive products of this Section are free of impediments likely to interfere with installation and are ready to receive Work of this section.
 1. Examine play structures and verify that components are undamaged and ready for field assembly.
 - a. Remove and replace damaged and non-conforming products.
 2. Identify location of underground utility lines on surface.
 3. Correct unsatisfactory conditions prior to installation.

3.2 INSTALLATION - POSTS AND FOOTINGS

- A. Lay out play structures and play surface areas.
- B. Post Footings:
 1. Bore 18 inch minimum diameter holes with power auger to not less than 24 inches below substrate below aggregate base course and to not less than 3 inches below bottom of support posts.
 2. Install cylindrical fiber or steel forms in the top 12 inches of soil with the top edge 4 inches above adjacent subgrade surfaces and flush with adjacent aggregate base course surface.
 3. Install 24 inch long fiber forms where adjacent soil is not self supporting.
- C. Installation of Posts:
 1. Set post to depth with concrete cover as recommended by manufacturer of play structure equipment.
 2. Firmly secure brace posts during concrete placement.
 3. Place anchor rods in pipes prior to placement of concrete.
 4. Fasten anchors securely to prevent dislodgement during concrete placement.
- D. Installation of Reinforcing Steel:
 1. Comply with CRSI Manual of Standard Practice, MSP-1.
- E. Concrete Placement:
 1. Wet forms and holes thoroughly with water prior to depositing concrete.
 2. Do not allow water to puddle in footing excavation.
 3. Place concrete in hole in continuous operation, rod and tamp concrete to consolidate concrete.
 4. Trowel concrete to form a convex surface with 1/2 inch minimum slope to direct water away from posts.
- F. Form Removal and Backfilling:
 1. Remove forms 24 hours after concrete pour and backfill around concrete footings.
 2. Compact backfill to 95 percent of maximum density at optimum moisture content according to requirements of Section 312000, "Earth Moving."
 3. Maintain post footing in moist condition and cover footing for 7 days after concrete placement.

3.3 INSTALLATION – PLAY STRUCTURES

- A. Install play structures in accordance with manufacturer's written instructions and approved Shop Drawings.
- B. Install play structures plumb and level.
- C. Where required or indicated, anchor playground equipment to prepared concrete footings or slabs, or other solid substrates capable of supporting equipment.
- D. Installation of Shop Fabricated Play Structures:
 1. Install play structure framing 7 days after concrete pour.
 2. Assemble steel framing members as recommended by manufacturer.
 3. Cover bolt ends with washers and caps.
 4. Anchor play structures to concrete footings with anchor bolts.
 5. Install fixed playground equipment level and anchor components to beams, posts, and other framing members.
 6. Install components without exposed sharp surface protrusions, corners, edges, and ends.
 7. Tighten anchors as securely as possible without damaging the shop finish.
 8. Do not install decks and accessories until playground surface material is in place.

PLAY STRUCTURES

9. Attach decks and accessories in accordance with manufacturer's instructions.
10. Deck heights indicated in Drawings are measured either from top of playground surface material to deck surface or as spot elevations developed from existing datum.

3.4 PROTECTION

- A. Protect adjacent facilities, plants, trees, ground covers, grass, paved and playground protective surfaces, and other site improvements from damage during assembly and installation of post footings and play structures.

3.5 ADJUSTING AND CLEANING

- A. Replace damaged and defective play structure components.
- B. Hose wash and towel dry all exposed surfaces at time of Substantial Completion.
- C. Remove excess material, including footing concrete, and other construction debris from the site daily.

END OF SECTION

SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included in this Section:
 - 1. Site furnishings: furnish all labor, material and equipment necessary to complete the installation of all site furnishings shown on the drawings and as specified herein.
- B. Related Sections:
 - 1. Division 03 – Concrete.
 - 2. Section 321313 – Concrete Paving.

1.2 SUBMITTALS

- A. Submit the following in accordance with Division 01 Section “Submittal Procedures”.
 - 1. Product information indicating quantity, factory finish, and size of products.
 - 2. Samples as indicated.
 - 3. Prior to fabrication, submit shop drawings for all concrete, metal and wood fabrications and as indicated. Show all dimensions, cross sections, fabrication tolerances, finishes, welds, penetrations and supports, and integration with other work.
 - 4. Qualifications as specified herein.

1.3 QUALITY ASSURANCE

- A. General:
 - 1. Concrete fabrications, foundations, and footings in this section shall meet the requirements of Division 03 – Concrete.

PART 2 - PRODUCTS

2.1 TRASH RECEPTACLES

- A. Dumor 102-22SH trash receptacle with BT lid, surface mount.
 - 1. Color: Forest Green.
- B. Available from Northwest Playground Equipment 800.726.0031.

2.2 BENCHES

- A. Dumor 58-60 6' Bench with back and arms, surface mount.
 - 1. Color: Forest Green.
- B. Available from Northwest Playground Equipment 800.726.0031.

2.3 PICNIC TABLES

- A. Dumor 298-60-2HS 6' ADA-accessible picnic table and benches, surface mount.
 - 1. Color: Forest Green.
- B. Available from Northwest Playground Equipment 800.726.0031.

2.4 SPLIT RAIL FENCE

- A. Split rail fence shall be Owner-Furnished, Owner-Installed.

2.5 PARK SIGN

- A. Park sign shall be Owner-furnished, Contractor-installed.
- B. Sign: custom design by Custom Wood Signs, 503.233.1539.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install site furnishings in accordance with manufacturer’s printed instructions and as indicated on Drawings.
- B. Provide attachment devices for attaching furnishings to concrete or other surfaces as required.
- C. Provide concrete footings as required and as shown on the Drawings.
- D. Install all site furnishings to be level, plumb, and true.
- E. Coordinate installation work with other trades.

SITE FURNISHINGS

3.2 COMPLETION

- A. Protect finished surfaces and elements from damage during installation.
- B. Clean exposed surfaces after installation of site furnishings. Use cleaning materials suitable for each material to be cleaned; do not stain or mar surfaces during cleaning.

END OF SECTION

SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Removing existing vegetation.
 - 2. Clearing and grubbing.
 - 3. Stripping, stockpiling and disposal of topsoil.
 - 4. Stripping and stockpiling and disposal of rock.
 - 5. Contaminated or hazardous material.
 - 6. Disposal of surplus or waste material.
- B. Related Requirements:
 - 1. Section 015639 "Temporary Tree and Plant Protection" for tree protection fencing and requirements for clearing and grubbing within Root Protection Zones.
 - 2. Section 015700 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.
 - 3. Section 024119 "Selective Demolition" for partial disconnecting, capping or sealing, and removing site utilities and removing above- and below-grade site improvements.
 - 4. Section 312000 "Earth Moving" for procedure to determine if soil is unsatisfactory or unsuitable for reuse as fill.

1.2 MEASUREMENT AND PAYMENT

- A. Lump sum price includes all Work described in this Section including incidental work necessary to achieve a clear dirt surface on the site, and all handling, recycling, hauling and disposal.
- B. Removal of existing stumps not resulting from tree removal operations, having trunk remainders larger than 12 inches will be paid for according to unit prices established in Section 012200 "Unit Prices".

1.3 DEFINITIONS

- A. Boulder: As defined in Section 312000 "Earth Moving".
- B. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- C. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.
- E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETING

- A. Preinstallation Conference: Conduct conference at Project site to review clearing limits, tree and plant protection requirements, and stockpiling and removal requirements.

1.5 MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property.
 - 1. Remove from Project site and dispose of.
- B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

1.6 SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed digital photographs or video recordings.
 - a. Date stamped.

SITE CLEARING

- b. Recorded at a resolution sufficient to show details.
- 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.
- B. Approved Application for Pesticide Use on Albany Parks Property.
- C. Topsoil stripping and stockpiling program.
- D. Rock stockpiling program.

1.7 QUALITY ASSURANCE

- A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.
- B. Rock Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.8 FIELD CONDITIONS

- A. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Owner.
- B. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- C. Utility locates: Call the Oregon Utility Notification Center at 811 for underground utility locations 48 hours in advance of removing soil materials.
- D. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Herbicide: As approved by Integrated Pest Management coordinator. Refer to Section 015700 "Temporary Controls".

PART 3 - EXECUTION

3.1 PREPARATION

- A. Stake boundaries of horizontal clearing limits indicated prior to pre-installation meeting.
 - 1. Do not permit disturbance beyond staked clearing area.
- B. Protect and maintain benchmarks and survey control points from disturbance during construction.
- C. Verify that protection measures are in place, including:
 - 1. Perimeter fencing.
 - 2. Erosion control measures.
 - 3. Tree and plant protection fencing.
 - 4. Protect existing site improvements to remain from damage caused by settlement, lateral movement, undermining, washout or any other change caused by operations of this Section.

3.2 CLEARING AND GRUBBING

- A. Remove trees, shrubs, and other living or dead vegetation, boulders, incidental refuse and obstructions to permit installation of new construction. Clearing includes removing or salvaging downed timber and removal of fences, gates, sign posts and other incidental improvements.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - a. Prune minor roots and branches of trees and shrubs indicated to remain that will conflict with new construction according to requirements of Section 015639 "Temporary Tree and Plant Protection."
 - 2. Stumps: Grind down stumps, whether existing or resulting from tree removal operations, and whether indicated on Drawings or not.
 - a. Remove roots larger than 2 inches in diameter.
 - 3. Use only hand methods or air spade for grubbing within protection zones.
 - 4. Remove sod to a depth of 2 inches.

SITE CLEARING

5. Chip removed tree branches and dispose of off-site.
6. Obstructions, refuse and debris, including boulders: remove to a depth of 18 inches below exposed subgrade.

3.3 TOPSOIL STRIPPING

- A. Remove herbaceous materials, including grasses and weeds, before stripping topsoil.
 1. Mow all sod or grassy areas to be cleared.
- B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.
 1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots larger than 1/2 inch, root mats, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
 1. Limit height of topsoil stockpiles to 48 inches.
 2. Shape stockpiles to drain water.
 3. Prevent stockpiles from emitting wind-blown dust.
 4. Do not stockpile topsoil within root protection zones.
 5. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.4 STOCKPILING ROCK

- A. Remove boulders and stockpile without intermixing with other materials. Do not include smaller sizes of excavated or crushed rock in boulder stockpile.
 1. Dispose of surplus rock. Surplus rock is that which exceeds quantity indicated to be stockpiled or reused.

3.5 CONTAMINATED OR HAZARDOUS MATERIAL

- A. Should any asbestos-containing material, underground storage tank, toxic or contaminated soil or questionable material that is not already indicated in the contract documents be encountered during the Work, perform the following in addition to the provisions of the General Conditions of the Contract:
 1. Immediately notify Owner, Oregon Department of Environmental Quality and all other Authorities Having Jurisdiction.
 2. Do not proceed with Work in the affected area before allowing Owner sufficient time to determine extent of condition.
- B. If corrective measures are required, authorized additional work will be paid for according to Contract provisions for changes in the Work.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil and rock material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION

EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Excavating and filling for rough grading the Site.
 - 2. Preparing subgrades for slabs-on-grade, walks, pavements, play surfacing, turf and grasses, and planting areas.
 - 3. Drainage course for concrete slabs-on-grade.
 - 4. Subbase and base course for concrete walks and pavements.
 - 5. Subsurface drainage backfill for walls and trenches.
 - 6. Excavating and backfilling for utility trenches.
 - 7. Excavating and backfilling for electrical and irrigation trenches.
- B. Related Requirements:
 - 1. Section 015639 "Temporary Tree and Plant Protection" for excavation around and within the Root Protection Zones (RPZs) of trees and planting areas to remain.
 - 2. Section 015713 "Erosion Control".
 - 3. Section 024119 "Selective Demolition" for removal of selected above- and below-grade utilities and site improvements.
 - 4. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil.
 - 5. Section 329200 "Seeded Lawns" for finish grading in lawn and grass areas, including preparing and placing planting soil for lawn areas.
 - 6. Section 329113 "Soil Preparation" for requirements for topsoil suitable for amending into planting soil.
 - 7. Section 329300 "Trees, Plants and Ground Covers" for finish grading in planting areas and tree and shrub pit excavation and planting.
 - 8. Section 334100 "Storm Drainage System" for requirements for drain rock related to storm drainage systems.
 - 9. Section 334600 "Subdrainage Systems" for requirements related to subsurface drainage.

1.2 PAYMENT PROCEDURES

- A. Lump sum price includes all Work described in this Section, including incidental work necessary to achieve subgrades indicated, and handling, recycling, hauling and disposal.

1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Backslope: In soft surface trail installation, the cutbank uphill of the trail tread.
- C. Base Course: Structural layer immediately beneath a paving installation, footing or other structure.
- D. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- E. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- F. Boulder: A single fragment of rock with a nominal size greater than 2 feet in diameter.
- G. Drainage Course: Compacted aggregate layer supporting concrete slab-on-grade that also minimizes upward capillary flow of pore water.
- H. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Owner.
 - 2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Owner. Unauthorized excavation, as well as remedial work directed by Owner, shall be without additional compensation.
- I. Fill: Soil materials used to raise existing grades.
- J. Full Bench: In soft surface trail installation, used to describe a trail in which the full width of the tread and base course are constructed on native subsoil.

EARTH MOVING

- K. Match Point: In trail or path installation, the point at which graded surfaces meet undisturbed surfaces.
- L. Rock: Natural deposit of solid material composed of one or more minerals occurring in large masses or fragments.
- M. Sideslope: In soft surface trail installation, the undisturbed slope of a hillside.
- N. Subbase Course: Course placed between subgrade and base course.
- O. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill on which subbase, drainage course, bedding, base, tread or topsoil materials are to be placed. Subgrade soils refers to soils originating from layer below topsoil.

1.4 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M 43, Sizes of Coarse Aggregate.
 - 2. AASHTO M 288, Standard Specification for Transportation Materials and Methods of Sampling and Testing.
- B. American Society of Testing and Materials (ASTM):
 - 1. ASTM D 698, Maximum Dry Density and Percent of Maximum Dry Density at Optimum Moisture Content for Cohesive Soils: Determined by Standard Proctor Test.
 - 2. ASTM D 1557, Maximum Dry Density and Percent of Maximum Dry Density at Optimum Moisture Content for Cohesive Soils: Determined by Modified Proctor Test.
 - 3. ASTM D 2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - 4. ASTM D 3740, Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
 - 5. ASTM D 4253, Standard Test Methods for Maximum Dry Density and Unit Weight of Soils Using a Vibratory Table.
 - 6. ASTM D 4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
 - 7. ASTM D 4355....(about geotextile UV stability.....)
 - 8. ASTM D 4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - 9. ASTM D 4533, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 - 10. ASTM D 4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 - 11. ASTM D 4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 - 12. ASTM D 4833, Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.
 - 13. ASTM E 96-A, Standard Test Methods for Water Vapor Transmission of Materials.
 - 14. ASTM E 329, Standard Specification for Agencies Engaged in Construction Inspection, Testing or Special Inspection.
- C. Oregon Occupational Safety & Health Administration (OR-OSHA).

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct pre-excavation conference at Project site.
 - 1. Review methods and procedures related to earthmoving, including, but not limited to, the following:
 - a. Personnel and equipment needed to make progress and avoid delays.
 - b. Review of erosion control requirements.
 - c. Coordination of Work with utility locator service.
 - d. Coordination of Work with electrical, irrigation and utility subcontractors.
 - e. Coordination of sequencing, locations and elevations for sleeves and conduits.
 - f. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
 - g. Extent of trenching by hand or with air spade.
 - h. Field quality control.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type manufactured product required, including but not limited to:
 - 1. Geotextiles.
 - 2. Controlled low-strength material, including design mixture.
 - 3. Warning tapes.

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4. Tracer wire.
- B. Samples for Verification, in sizes indicated below:
 1. Geotextile: 12 by 12 inches.
 2. Warning Tape: 12 inches long; of each color.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
 1. Classification according to ASTM D 2487.
 2. Laboratory compaction curve according to ASTM D 698.
 3. Submit with each soil and aggregate test report a written statement indicating the source and character of each sample tested.
- C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.8 QUALITY ASSURANCE

- A. Contractor shall employ testing agency for all inspections and testing.
 1. Geotechnical Testing Agency Qualifications: Qualified according to ASTM D 3740 for testing indicated.
- B. Comply with requirements of the geotechnical report.
 1. Testing agency shall inspect and test subgrades and each fill or backfill layer. Proceed with subsequent activities only after test results for previously completed work comply with requirements.

1.9 FIELD CONDITIONS

- A. Temperature Requirements:
 1. Do not excavate, fill, backfill, compact soils, or place or grade base courses, unless ambient air temperature is above 35 degrees F.
- B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
- C. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 1. Do not proceed with work on adjoining property until directed by Owner.
- D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 015700 "Temporary Controls" and Section 015639 "Temporary Tree and Plant Protection" are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations. Owner makes no guarantee or representation by implication or otherwise that any material available on the site is satisfactory for incorporation into any portion of the Project.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487.
 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
 2. Unless otherwise approved by Owner in writing, all contaminated soils are unsatisfactory soils.
 3. No material will be considered unsatisfactory solely because special or additional processing or handling is required to make it suitable for incorporation into the Project.

2.2 AGGREGATES

- A. Aggregates are granular soil materials.

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- B. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- C. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M 0; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- D. Medium Aggregate: Washed angular crushed rock, 100 percent passing a 3/4" sieve, and not more than 12 percent passing a 200 sieve (washed analysis).
- E. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- F. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- G. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.
 - 1. Refer to Section 33 4100 "Storm Drainage System" for aggregates related to storm drainage systems and drywells.
- H. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.
- I. Sand: ASTM C 33/C 33M; fine aggregate.
- J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.3 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Survivability: Class 2; AASHTO M 288.
 - 2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
 - 3. Permittivity: 0.2 per second, minimum; ASTM D 4491.
 - 4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Survivability: Class 2; AASHTO M 288.
 - 2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
 - 3. Permittivity: 0.02 per second, minimum; ASTM D 4491.
 - 4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.4 ACCESSORIES

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

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that erosion and sedimentation, tree and plant protection and other temporary controls specified are in place and approved before beginning work.
- B. Review locate marks.
- C. Examine subsoil and existing site conditions for compliance with requirements and for conditions affecting performance of Work of this Section. Do not proceed with work until unsatisfactory conditions have been corrected.
- D. Examine subsoil for moisture content, density, contamination and existing site drainage conditions.

3.2 PREPARATION

- A. Conduct Preinstallation conference.
- B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
 - 1. Protect existing surfaces from wheel and track damage by covering with heavy timber dunnage and temporary soil materials.
- C. Protect and maintain erosion and sedimentation, tree protection and other temporary controls during earth-moving operations.
- D. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.3 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. Do not pump or reroute water into storm or sanitary sewer drains, streets or natural drainageways without written permission from City of Albany.

3.4 WATERING

- A. Furnish and apply water when required to apply water in order to achieve optimal moisture content and for alleviation of dust nuisance.

3.5 EXCAVATION, GENERAL

- A. Excavation is Classified as earth and rock. Additional Contract Sum and, if applicable, Contract Time will be authorized for excavation of rock or obstructions.
 - 1. Excavate to subgrade elevations. Do not excavate rock until it has been classified and measured by Owner.
 - 2. Earth excavation includes excavating soil, rock fragments up to 2 feet in diameter and other materials not classified as rock or unauthorized excavation.
 - a. Intermittent drilling; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
 - 3. Rock excavation includes removal and disposal of rock and boulders. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 24 inches outside of concrete forms other than at footings.
 - b. 12 inches outside of concrete forms at footings.
 - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. 6 inches beneath bottom of concrete slabs-on-grade.
 - f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

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3.6 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand or using excavating equipment with electronic grade control systems to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - a. Remove all surface silt soils from footing and foundation excavations.
 - 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
 - 3. Tree- and Plant-Protection Zones:
 - a. Refer to requirements of Section 015639 "Temporary Tree and Plant Protection".
 - b. Do not break, tear, or chop exposed roots.
 - c. Do not use mechanical equipment that rips, tears, or pulls roots.

3.7 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.8 UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
 - 2. Provide trench walls and bottoms free from rocks, debris or protruding objects.
- B. Excavate trenches to uniform widths to provide the following clearances on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 - 1. Clearance: As indicated on the Drawings.
- C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
 - 1. In rock or other unyielding bearing material, excavate trenches 6 inches deeper than elevation required to allow for bedding course.
- D. Trenches in Tree- and Plant-Protection Zones:
 - 1. Refer to requirements of Section 015639 "Temporary Tree and Plant Protection".
 - 2. Do not use mechanical equipment that may break, tear, or chop exposed roots.

3.9 EXCAVATION FOR IRRIGATION AND ELECTRICAL TRENCHES

- A. Prior to trenching or installation, field stake proposed irrigation lines wherever they pass under existing tree canopies. Stake proposed new tree planting and sign locations as well prior to any trenching or installation. Call for inspection a minimum of 48 hours prior to anticipated trenching.
- B. Trench Depths: Provide minimum cover as indicated in the Drawings or as directed by Owner.
- C. Trench Widths: Provide minimum clearances as indicated in the Drawings.
- D. Trench Bottoms:
 - 1. Provide smooth, level trench bottoms free of rocks or sharp-edged objects.
 - 2. Keep trenches free of debris during construction.

3.10 SUBGRADE INSPECTION

- A. Notify Owner when excavations have reached required subgrade.
- B. If Owner determines that unsatisfactory soil is present in the subgrade, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
 - 1. Do not proof-roll wet or saturated subgrades.
 - 2. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.

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3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Owner, and replace with compacted backfill or fill as directed.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner, without additional compensation.

3.11 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Owner.
 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Owner.
- B. If trenches are over excavated or experience sloughing or overbreak, restore to indicated dimensions as directed by Owner.

3.12 STORAGE OF SOIL MATERIALS

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

3.13 BACKFILL, GENERAL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 2. Recording locations of underground utilities for record documents.
 3. Testing and inspecting underground utilities.
 4. Removing concrete formwork.
 5. Removing trash and debris.
 6. Removing temporary shoring, bracing, and sheeting.
 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.14 UTILITY TRENCH BACKFILL

- A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- B. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete".
- C. Backfill voids with satisfactory soil while removing shoring and bracing.
- D. Initial Backfill:
 1. Soil Backfill: Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
 - a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
 2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.
- E. Final Backfill:
 1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
- F. Warning Tape: Install detectable warning tape directly above utilities, as indicated below finished grade, except 6 inches below subgrade under pavements and slabs.

3.15 IRRIGATION AND ELECTRICAL TRENCH BACKFILL

- A. Backfill trenches only after required inspection and testing, and after receiving written approval from Owner. Notify Owner a minimum of 48 hours in advance when requesting inspection.
- B. Electrical trench backfill:
 1. Interior trenches: Sand or pea gravel.

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2. Exterior trenches: 3 inches Sand, then excavated material with final 8 inches of clean soil.
- C. Stones larger than 1 inch in diameter are not allowed in backfill material.
 1. Place and compact bedding course on trench bottoms as indicated to provide continuous support for pipe, cable, sleeve or conduit.
- D. Irrigation Backfill: Completely fill trench with backfill material.
 1. Fill all voids and tamp thoroughly in compacted layers of 6 inches at a time. Place and compact soil to prevent settling of final trench grades.
 2. Compact to 85 percent of maximum density at optimum moisture.
- E. Location Devices:
 1. Tracer Wire: Install tracer wire directly above pressurized piping and specified nonmetallic pipes as indicated below finished grade, except 6 inches below subgrade under pavements and slabs.
 2. Electrical Trenches: Install detectable warning tape above high voltage cable or conduit runs 12 inches below finished grade.

3.16 SOIL FILL

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

3.17 SOIL MOISTURE CONTROL

- A. Mass earthwork is prohibited during periods of wet weather, except as recommended in the field by the geotechnical engineer.
- B. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 1. Wet and mix as directed material that does not contain sufficient moisture to obtain proper compaction. Dry by manipulation, aeration, drainage or other means material containing an excess of moisture for proper compaction.
 2. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 3. Perform aeration work in dry weather.
 4. Scarify and aerate or remove and replace otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified density.

3.18 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry density according to ASTM D 698:
 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
 4. For utility, electrical and irrigation trenches, compact each layer of initial and final backfill soil material 85 percent.

3.19 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 1. Provide a smooth transition between adjacent existing grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

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- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
 - 1. Soft surface trail, lawn or unpaved areas: Plus or minus 1 inch.
 - 2. Concrete slabs, curbs, footings, walks and pavements: Plus 1/4 inch above or minus 1/2 inch below.
 - 3. Asphalt Concrete Pavements: Plus or minus 1/2 inch.

3.20 SUBSURFACE DRAINAGE

- A. Subsurface Drain: install per the requirements of Section 334600 "Subdrainage Systems".
 - 1. Compact each filter material layer to 95 percent of maximum dry density according to ASTM D 698.
- B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
 - 1. Compact each filter material layer to 85 percent of maximum dry density according to ASTM D 698.

3.21 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase and base courses on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course, if indicated, and base course under pavements and walks as follows:
 - 1. Place base course material over subbase course.
 - 2. Shape subbase and base courses to required crown elevations and cross-slope grades.
 - 3. Subbase and base courses 6 inches or less in compacted thickness: Place in a single layer.
 - 4. Subbase and base courses that exceed 6 inches in compacted thickness: Place in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 5. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry density according to ASTM D 698.
 - a. Finish grade top of base courses below concrete slabs, curbs, footings and walks to plus 1/4 inch above or minus 1/2 inch below elevations indicated.
 - b. Finish grade top of aggregate base courses below asphalt concrete paving to plus or minus 1/2 inch elevation indicated.
- C. Pavement Shoulders:
 - 1. Place shoulders along edges of subbase and base course to prevent lateral movement.
 - 2. Construct shoulders, at least 6 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry density according to ASTM D 698.

3.22 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 - 1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 - 2. Drainage course 6 inches or less in compacted thickness: Place in a single layer.
 - 3. Drainage course that exceeds 6 inches in compacted thickness: Place in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry density according to ASTM D 698.

3.23 FIELD QUALITY CONTROL

- A. Special Inspections: Contractor shall engage a qualified inspector to perform the following special inspections:
 - 1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
 - 2. Determine that fill material classification and maximum lift thickness comply with requirements.
 - 3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.
- B. Testing Agency: Contractor will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

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- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Owner.
- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area but in no case fewer than three tests.
 - 2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.24 PROTECTION

- A. Do not allow trucks with water seeping or draining from truck beds to leave site.
- B. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- C. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Owner; reshape and recompact.
- D. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.25 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

END OF SECTION

PEDESTRIAN CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes exterior portland cement concrete pavement for pedestrian areas.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 015639 – Tree Protection
 - 2. Section 033000 – Cast-in-Place Concrete.
 - 3. Section 042113 – Brick Masonry.
 - 4. Section 129300 – Site Furnishings.
 - 5. Section 321373 – Concrete Joint Sealants.

1.2 REFERENCES

- A. American Association of State Highway Transportation Officials (AASHTO) specifications.
- B. American Concrete Institute (ACI): ACI 301 – Specifications for structural concrete for buildings.
- C. American Society for Testing and Materials (ASTM): ASTM a185 – Welded Steel wire fabric for concrete reinforcement.
- D. ASTM D1751 – Performed expansion joint fillers for concrete paving and structural construction.
- E. ASTM A615 – Deformed and plain billet-steel for concrete reinforcement.
- F. ACI 318 – Building Code Requirements for Reinforced Concrete
- G. Concrete Reinforcing Steel Institute (CRSI) “Manual of Standard Practice.”
- H. ASTM C2600 – Air entraining admixtures for concrete.
- I. ASTM C309 – Liquid membrane forming compounds for curing concrete.
- J. ASTM C979 – Pigments for Integrally Colored Concrete.

1.3 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete pavement mix. Included alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Samples:
 - 1. Expansion Joint Material: Submit one 12-inch length.
- D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials.
- E. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements.
 - 1. Cementitious materials and aggregates.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Admixtures.
 - 4. Curing compounds.
 - 5. Joint fillers.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent of that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer must be certified according to the National Ready Mix Concrete Association’s Plant Certifications Program.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

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- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.
- E. ACI Publications: Comply with ACE 301, "Specifications for Structural Concrete," unless modified by the requirements of the Contract Documents.
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.

1.5 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pedestrian Concrete Paving: typical pedestrian concrete paving. Finish: light broom finish, except as noted.

2.2 FORMS

- A. Form Materials: Plywood, metal-framed plywood, or other acceptable panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves of a 100-foot or less radius.
- B. Form Release Agent: Provide commercial formulation form-release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 REINFORCING MATERIALS

- A. Reinforcing Bars and Tie Bars: ASTM 615, Grade 60, deformed.
- B. Epoxy-Coated Reinforcing Bars: ASTM A 775 with ASTM A 615, grade 60 deformed steel bars.
- C. Plain, Cold-Drawn Steel Wire: ASTM A 82.
 - 1. Furnish in flat sheets, not rolls, unless otherwise acceptable to Architect.
- D. Deformed-Steel Welded Wire Fabric: ASTM A 497.
- E. Fabricated Bar Mats: Welded or clip-assembled steel bar mats, ASTM A 184. Use ASTM A 615, grade 60 steel bars, unless otherwise indicated.
- F. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.
- G. Epoxy-Coated Joint Dowel Bars: ASTM A 775 with ASTM A 615, Grade 60 plain steel bars.
- H. Hook Bolts: ASTM A 307, grade A bolts, internally and externally threaded. Design hook bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- I. Supports for Reinforcement: Chairs, spacers, dowel bar supports and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels. In place. Use wire bar-type supports complying with CRSI specifications.
 - 1. Use supports withstand plates or horizontal runners where base material will not support chair legs.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
 - 1. Use one brand of cement throughout project unless otherwise acceptable to Landscape Architect.
- B. Fly Ash: ASTM C 618, Type F.
- C. Normal-Weight Aggregates: ASTM C 33, Class 4, and as follows. Provide aggregates from a single source.
 - 1. Maximum Aggregate Size: 1-1/2-inches.
 - 2. Do not use fine or coarse aggregates that contain substances that cause spalling.
 - 3. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Landscape Architect.
- D. Water: potable.

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2.5 ADMIXTURES

- A. Provide concrete admixtures that contain no more than 0.1 percent chloride ions.
- B. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- C. Water-Reducing Admixture: ASTM C 494 Type A.
- D. High-Range Water-Reducing Admixture: ASTM C 494 Type F or Type G.
- E. Water-Reducing and accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and retarding Admixture: ASTM C 494 Type D.

2.6 CURING MATERIALS

- A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 ounces per square yard., complying with AASHTO M 182, Class 2.
- B. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
 - 1. Waterproof paper.
 - 2. Polyethylene film.
 - 3. White burlap-polyethylene sheet.
- C. Clear Solvent-Borne Liquid Membrane-Forming Curing Compound: ASTM C 309, Type I, class A or B, wax free.
- D. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type I Class B.
 - 1. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.
- E. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.

2.7 RELATED MATERIALS

- A. Expansion Joint Material: ASTM D 1751, 1/2-inch thick.
- B. Irrigation Sleeves and related materials: as specified in Section 32 8400 – Design-build Irrigation. Coordinate location and installation of sleeves with Design-build irrigation contractor.

2.8 CONCRETE MIX

- A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.
 - 1. Do not use Owner's field quality-control testing agency as the independent testing agency.
- C. Proportion mixes to provide concrete with the following properties:
 - 1. Compressive Strength (28 Days): 3500 psi.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45
 - 3. Slump Limit: 3 inches.
- D. Cementitious Materials: Limit percentage by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete deicing chemicals.
- E. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 2.5 to 4.5 percent.

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.
 - 1. When air temperature is between 85 degrees F and 90 degrees F, reduce mixing and delivery time for 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that aggregate base has been correctly placed as specified in Division 31 - Earthwork.

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3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.
 - 1. Top of Forms: Not more than 1/8-inch in 10 feet.
 - 2. Vertical Face on Longitudinal Axis: Not more than 1/4-inch in 10 feet.

3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for 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 fabric 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 to adjacent mats.

3.4 JOINTS

- A. General: Construct contraction, construction, and expansion joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.
 - 1. Provide pre-formed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless indicated otherwise. Embed keys at least 1-1/2 inches into concrete.
 - 2. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.
 - 3. Provide tie bars at sides of paving strips where indicated.
 - 4. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 5. Use epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Expansion Joints: Form expansion joints of pre-formed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 - 1. Locate expansion joints as detailed.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Terminate joint filler not less than 1/2-inch or more than 1-inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is indicated.
 - 4. Furnish joint fillers in one-piece. Where more than one length is required, lace or clip joint-filler sections together.
 - 5. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary pre-formed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Control Joints: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least 1/4 of the concrete thickness, as follows:
 - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

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2. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 - a. Radius: 1/4-inch.
- E. Install dowel bars and support assemblies at joints where indicated. Lubricate one half of dowel length to prevent concrete bonding to one side of joint.
- F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces. Radius: 1/4-inch.

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcing before placing concrete. Do not place concrete on surfaces that are frozen.
- C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery, at Project site, or during placement.
- F. 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.
- G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.
 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.
- H. Screed paved surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations or spreading dry-shake surface treatments.
- I. Formed Concrete Curbs: Produce curbs to required cross section, lines, grades, finish, and jointing as indicated on Drawings.
- J. Cold-Weather Placement: Comply with provisions of ACI 306R 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 F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 80 degrees F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- K. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist.
 1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 degrees F. Mixing water may be chilled 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 reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

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

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- 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 within a tolerance of 1/4-inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.
 - 1. Light-Textured Broom Finish: Draw a soft bristle broom across float finished concrete surface perpendicular to line of traffic to provide a uniform fine line texture finish, unless indicated otherwise on Drawings
- C. Final Tooling: Tool edges of paving, gutters and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.
 - 1. Radius: 1/4-inch, or as indicated on the drawings.
 - 2. After final floating, apply a hand-trowel finish to the concrete followed by a light broom finish, or other finish as indicated on the drawings. Cure concrete with curing compound recommended by dry-shake material manufacturer. Apply curing compound immediately after final finishing.

3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.
- B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

3.8 CURING

- A. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 PATCHING

- A. Projections: Remove projecting fins, bolts, wire, nails, etc., not necessary for the Work, or cut them back 1-inch from the surface and patch in an inconspicuous manner.
- B. Voids:
 - 1. Fill holes with an accepted patching material the same color as the adjoining concrete.
 - 2. Mix and place patching material and finish flush with the adjacent surface.
- C. Corrective Patching:
 - 1. Correct defects in concrete Work.
 - 2. Chip voids to a depth of at least 1-inch with the edges perpendicular to the surface and parallel to form markings.

3.10 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
 - 1. Elevation: 1/4-inch.
 - 2. Thickness: Plus 3/8-inch, minus 1/4-inch.

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3. Surface: Gap below 10-foot long, unlevelled 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: 1/2-inch.
9. Control Joint Depth: Plus 1/4-inch, no minus.
10. Joint Width: Plus 1/8-inch, no minus.

3.11 FIELD QUALITY CONTROL TESTING

- A. Testing Agency: Engage a qualified independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article:
- B. Testing Agency: The Owner will engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article:
- C. Testing Services: Testing shall be performed according to the following requirements:
 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
 2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test but no less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
 3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test but no less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
 4. Concrete Temperature: ASTM C1064; one test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above, and one test for each set of compressive-strength specimens.
 5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless directed otherwise. Cylinders shall be molded and stored for laboratory cured test specimens unless field-cured test specimens are required.
 6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cubic yards but less than 25 cubic yards, plus one set for each additional 50 cubic yards. Test one specimen at 7 days, test two specimens at 28 days, and retain one specimen in reserve for later testing if required.
 7. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
 8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 9. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
- D. Test results will be reported in writing to Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in paving, design compressive strength at 28 days, concrete mix 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 but shall not be used as the sole basis for acceptance or rejection.
- F. Additional Tests: The testing agency will make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

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3.12 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section.
- B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Cleaning:
 - 1. Efflorescence: Remove efflorescence as soon as practical after it appears and as part of final cleaning.
 - 2. Use least aggressive cleaning techniques possible
 - 3. If proprietary cleaning agents are used, pre-wet surface, test cleaning agent on small, inconspicuous area, and check effects prior to proceeding. Thoroughly rinse surface afterwards with clean water. Follow cleaner manufacturer's instructions.
 - 4. Do not use muriatic or hydrochloric acid on integrally colored concrete.
- E. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.

END OF SECTION

CONCRETE JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included in this Section: Furnish labor, material and equipment required to install concrete paving joint sealants as shown on the Drawings and as specified herein.
- B. Related Sections:
 - 1. Section 042113 – Brick Masonry,
 - 2. Section 321313 – Concrete Paving.

1.2 SUBMITTALS

- A. Submit product data in accordance with Division 1 – Submittal Procedures with materials list and color cards, before ordering materials.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver sealant to job in manufacturer's original, unopened dated containers.

1.4 PROJECT CONDITIONS

- A. The installer must examine the joint surfaces, backing, and the conditions under which the sealant work is to be performed, and notify the Contractor of conditions detrimental to the proper and timely completion of the work and performance of the sealants.
- B. Do not proceed with the sealant work until unsatisfactory conditions have been corrected.
- C. Weather Conditions:
 - 1. Do not proceed with installation of sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.
 - 2. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength.
 - 3. Wherever joint width is affected by ambient temperature variations, install elastomeric sealants only when temperatures are in the lower third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Colors: For exposed materials, provide color as indicated or if not indicated, as selected by Architect from manufacturer's standard colors.
- B. Hardness: As recommended by manufacturer for application shown, unless otherwise indicated.
- C. Modulus of Elasticity: Provide the lowest available modulus of elasticity which is consistent with exposure to weathering, indentation, vandalism, abrasion, support of loading, and other requirements.
- D. Compatibility: Before purchase of each required material, confirm its compatibility with each other material it will be exposed to in the joint system.
- E. Size and Shape: As shown or, if not shown, as recommended by the manufacturer for the type and condition of joint, and for the indicated joint performance of movement.
- F. Grade of Sealant: For each application, provide the grade of sealant (non-sag, self-leveling, no-track, knife-grade, preformed, etc.) as recommended by the manufacturer for the particular condition of the installation (locations, joint shape, ambient temperature, and similar conditions), to achieve the best possible overall performance. Grades specified herein are for normal conditions for installation.

2.2 PAVEMENT JOINTS

- A. Provide traffic-bearing surface joints at locations where vehicular or pedestrian traffic is anticipated on concrete pavement and at all locations shown on Drawings.
- B. Provide polyurethane-based, 2-part elastomeric sealant, complying with FS TT-S-00227E, Class A, Type 1 (self-leveling) unless Type 2 (non-sag) is recommended by the manufacturer for applications shown.

CONCRETE JOINT SEALANTS

- C. Acceptable Product and Manufacturer: Subject to compliance with the requirements, provide one of the following products, or approved equal.
 - 1. Sonolastic SL-2, as manufactured by Sonneborn.
 - 2. Dynatred, as manufactured by Pecora Corporation.

2.3 MISCELLANEOUS MATERIALS

- A. Joint Cleaner: Provide the type of joint cleaning compound as recommended by the sealant manufacturer for the joint surfaces to be cleaned.
- B. Joint Primer/Sealer: Provide the type of joint primer/sealer recommended by the sealant manufacturer, for the joint surfaces to be primed or sealed.
- C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by the sealant manufacturer, to be applied to sealant-contact surfaces where bond to the substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape wherever applicable.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean joint surfaces as recommended by sealant manufacturer. Provide bond breaker between sealant and joint filler, wherever recommended by manufacturer and wherever sealant is not compatible with joint filler.
- B. Prime or seal the joint surfaces wherever shown or recommended by the sealant manufacturer. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.

3.2 INSTALLATION

- A. Do not use sealants after compounds have "set" or when discharge is not continuous.
- B. Employ only proven installation techniques, which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of the joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces.
- C. Install sealants to depths shown, or if not shown, as recommended by the sealant manufacturer.
- D. Remove excess and spillage of compounds promptly as work progresses. Clean the adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.
- E. Repair or replace sealants which fail to perform as air-tight and water-tight joints; or fail in joint adhesion, cohesion or abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability; or appear to deteriorate in another manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated.

END OF SECTION

PLAYGROUND PROTECTIVE SURFACING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wood fiber loose-fill surfacing.
 - 2. Engineered Bark Mulch.
- B. Related Sections:
 - 1. Section 116816: Play Structures, for play structures installed in area of protective surfacing.
 - 2. Section 312000: Earth Moving, for excavation, grading, filling, and geotextile drainage fabric.

1.2 DEFINITIONS

- A. Critical Height: Standard measure of shock attenuation.
 - 1. Defined by CPSC No. 325 as: "the fall height below which a life-threatening head injury would not be expected to occur."
- B. Fall Height:
 - 1. Defined by ASTM F 1487 as "the vertical distance between a designated play surface and the protective surfacing beneath it."
- C. Use Zone:
 - 1. Defined by ASTM F 1487 as the "area beneath and immediately adjacent to a play structure or equipment that is designated for unrestricted circulation around the equipment and on whose surface it is predicted that a user would land when falling from or exiting the equipment."

1.3 SUBMITTALS

- A. Product Data, for each type of product indicated.
- B. Shop Drawings: For each playground surface system, include materials, plans, cross sections, drainage, installation, and edge.
- C. Coordination Drawings: Scaled Drawings showing types and locations of playground equipment and play structures, coordinated with each type of protective surfacing specified, and the following:
 - 1. Extent of surface systems and Use Zones for equipment.
 - 2. Critical Heights for playground surfaces.
 - 3. Fall Heights for equipment.
- D. Samples:
 - 1. Submit one cubic foot sample of engineered bark mulch.
- E. Qualification Data, for installers of each type of protective surfacing specified.
- F. Material Test Reports: Based on evaluation of comprehensive tests performed by an independent testing agency, for each loose-fill playground surface system.
 - 1. Engineered Bark Mulch: Submit independent testing laboratory test report for impact attenuation of new and 5-year-old materials in accordance with ASTM F 1292, Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by an independent testing agency, for each unitary synthetic playground surface system.
- H. Manufacturer's Material Certificates: For each type of loose-fill playground surface system.
- I. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Company using workers who are trained and experienced in necessary crafts and familiar with requirements and methods needed for proper performance of Work of this section.
- B. Standards and Guidelines: Comply with CPSC No. 325, "Handbook for Public Playground Safety;" ASTM F 1292; and ASTM F 1487.

1.5 SITE CONDITIONS

- A. Existing Conditions:
 - 1. Locate existing site improvements, underground utility systems, and other below grade site improvements in area of surface excavations.

PLAYGROUND PROTECTIVE SURFACING

2. Call the Oregon Utility Notification Center at 811 for underground utility locations 48 hours in advance of removing soil materials and boring post holes.
- B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit playground surface system installation to be performed according to manufacturers' written instructions and warranty requirements.

PART 2 - PRODUCTS

2.1 WOOD FIBER SURFACING

- A. Engineered wood fibers consisting of the following:
 1. Random-sized wood fibers, for depths of 2, 6 and 10 inches, in manufacturer's standard fiber size, approximately 10 times longer than wide; containing no bark, leaves, twigs, or foreign or toxic materials according to ASTM F 2075; graded according to manufacturer's standard specification for material consistency for playground surfaces and for accessibility according to ASTM F 1951.
- B. Products: Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following.
 1. The Fiber Group LLC; Fibar.
 2. Game Time, a PlayCore, Inc. company; GT Impax Fiber.
 3. New England Bark Mulch & Playground Surfacing, Division of Supreme Forest Products, Inc.; Playground Safety Fiber.
 4. SofSolutions Inc.; SofFall.
 5. Zeager Bros., Inc.; Wood Carpet.

2.2 ENGINEERED BARK MULCH SAFETY SURFACING

- A. Engineered Bark Mulch: Product tested and passed for shock attenuation under ASTM F 1292-99 G-Max and HIC (Head Injury Criteria) for fall heights indicated for play equipment and structures installed according to Sections 11 6813 and 11 6816.
 1. Material: Barkless coniferous wood.
 2. Dimensions: Manufacturer's standard.
 3. Additives: Preservatives or added chemicals are prohibited.
 4. Acceptable Product: Fibar, or approved.

2.3 INORGANIC LOOSE-FILL SURFACE- PLAYGROUND SAND

- A. Inorganice Aggregate Materials: Clean, washed, and free of silica, loam, clay, organic matter, debris, and other foreign substances.
 1. Product: Oregon Dune Sand complying with ASTM C 136; supplied by Oregon Decorative Rock, or approved.

2.4 ACCESSORIES

- A. Geosynthetic:
 1. Geotextile Fabric: Drainage Fabric specified in Section 31 2000, "Earth Moving."
- B. Play Surfacing Edge:
 1. Anchored-in-place, weather-resistant containment barrier designed to minimize sharp edges, protractions, tripping hazards, hold surfacing in the play equipment use zone.
- C. Drain Lines: Minimum flow rate of 10 gpm/ft.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for maximum moisture content, subgrade and substrate conditions, drainage, and other conditions affecting performance of the Work.
- B. Hard-Surface Substrates: Verify that substrates are satisfactory for unitary playground surface system installation and that substrate surfaces are dry, cured, and uniformly sloped to drain within recommended tolerances according to playground surface system manufacturer's written requirements for cross-section profile.
 1. Concrete Substrates:

PLAYGROUND PROTECTIVE SURFACING

- a. Verify that substrates are dry, free from surface defects, and free of laitance, glaze, efflorescence, curing compounds, form-release agents, hardeners, dust, dirt, loose particles, grease, oil, and other contaminants incompatible with playground surface system or that may interfere with adhesive bond. Determine adhesion, dryness, and acidity characteristics by performing procedures recommended in writing by playground surface system manufacturer.
2. Drain Rock Substrates:
 - a. Verify that substrates are dry, free from surface defects, and free of laitance, glaze, efflorescence, curing compounds, form-release agents, hardeners, dust, dirt, loose particles, grease, oil, and other contaminants incompatible with playground surface system.
3. Aggregate Base Substrates:
 - a. Verify that substrates are dry, free from surface defects, and free of laitance, glaze, efflorescence, curing compounds, form-release agents, hardeners, dust, dirt, loose particles, grease, oil, and other contaminants incompatible with playground surface system
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Prepare substrates to receive surfacing products according to playground surface system manufacturer's written instructions. Verify that substrates are sound and without high spots, ridges, holes, and depressions.
- B. Concrete Substrates: Provide sound surface free of laitance, efflorescence, curing compounds, and other contaminants incompatible with playground surface system.
 1. Repair unsatisfactory surfaces and fill holes and depressions.
 2. Saw cut concrete for terminal edges of playground surface systems as indicated .
 3. Treat control joints and other nonmoving substrate cracks to prevent telegraphing through playground surface system.
- C. Drain Rock Substrates: Provide sound surface free of laitance, efflorescence, curing compounds, and other contaminants incompatible with playground surface system.
 1. Repair unsatisfactory surfaces and fill holes and depressions.
 2. Lightly compact drain rock substrate to ensure uniform installation and solid placement.
 3. Place and secure geotextile fabric.
- D. Aggregate Base Substrates: Provide sound surface free of laitance, efflorescence, curing compounds, and other contaminants incompatible with playground surface system.
 1. Repair unsatisfactory surfaces and fill holes and depressions.
 2. Compact aggregate base according to requirements of Section 312000 "Earth Moving."
 3. Place and secure geotextile fabric.

3.3 INSTALLATION - GENERAL

- A. Grade and compact subsoils according to requirements in Section 312000, "Earth Moving."
- B. Comply with playground surface system manufacturer's written installation instructions. Install playground surface system over area and in thickness indicated.
 1. Apply moisture to dry substrate soil prior to placing geotextile.

3.4 INSTALLATION - GEOSYNTHETIC

- A. General: Install geotextile according to playground surface system manufacturer's and geosynthetic manufacturer's written instructions.
 1. Completely cover subgrade indicated, overlapping sides and edges a minimum of 8 inches with adhesively bonded seams.
 2. Adhere edges on all sides to top of perimeter curb, edging, or footing.

3.5 INSTALLATION – LOOSE-FILL WOOD FIBER SURFACING

- A. Loose-Fill Edgings: Place as indicated, and permanently secure in place and attach to each other according to edging manufacturer's written instructions.
- B. Wood Fiber Surfacing Loose-Fill: Place wood fiber loose-fill to specified depth that includes excess material to account for natural compaction over time.
- C. Grading: Uniformly grade loose-fill according to manufacturer's written instructions to an even surface free from irregular surface changes.
- D. Finish Grading: Hand rake to a smooth finished surface to required elevations.

PLAYGROUND PROTECTIVE SURFACING

3.6 INSTALLATION – ENGINEERED BARK MULCH SURFACING

- A. Excavate play area to subgrade and construct soaking trench outside play area as detailed in the Drawings.
- B. Install geotextile filter fabric over soaking subgrade and trench.
- C. Install rubber safety mats (impact pads) under swings and slides. Lay mats directly on subgrade below engineered bark mulch. Do not anchor.
- D. Install engineered bark mulch over geotextile a minimum of 12 inches compacted depth in fall zone, and a minimum of 8 inches deep outside fall zones.
 - 1. Stockpiled play chips from the existing playground on site can be used.
 - 2. Do no use bark mulch loose-fill in the 6 and 12 inch wood fiber surfacing zones.
- E. Grading: Uniformly grade loose-fill according to manufacturer's written instructions to an even surface free from irregular surface changes.
- F. Finish Grading: Hand rake to a smooth finished surface to required elevations.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage an independent testing agency to perform tests and inspections.
 - 1. Agency will test and inspect completed applications of playground surface system according to ASTM F 1292.
- B. Remove and replace playground surface system where test results indicate noncompliance with requirements.
 - 1. Perform additional testing and inspecting of replaced surface system at no expense to the Owner.

END OF SECTION

SOIL PREPARATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Furnish labor, material and equipment required for soil preparation of areas to receive shrubs and trees, and groundcovers.
- B. Coordinate Work with installation of other site work including but not limited to installation of site elements including curbs, edgers, and other site features, irrigation, seeding and planting.
- C. Related Sections:
 - 1. Section 015639 – Tree Protection
 - 2. Section 312000 – Earth Moving.
 - 3. Section 321313 – Concrete Paving.
 - 4. Section 329200 – Seeded Lawns.
 - 5. Section 329300 – Trees, Shrubs and Groundcovers.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM).
- B. Definitions:
 - 1. Topsoil is defined as ASTM 5268, fertile, friable, natural fine sandy loam, very fine sandy loam, loam or silt loam surface soil with pH range of 5.5 to 7, 4 percent organic material minimum. Topsoil shall be free of subsoil, stones or hard earth 1-inch or larger, noxious weeds (including quack grass and horsetail), roots, sticks or other extraneous material.
 - 2. RPZ: Root Protection Zone, as specified in Section 015639 – Tree Protection.

1.3 SUBMITTALS

- A. The Contractor shall make all submittals in accordance with Section 013300 – Submittal Procedures.
- B. Contractor shall perform and submit a complete soil test for existing on-site topsoil, subject to the following conditions:
 - 1. Analysis and Testing shall be performed by an Independent Testing Laboratory (ITL): The Soil and Plant Laboratory, Inc., A&L Western, or approved equal.
 - 2. Laboratory Instructions: Obtain from the ITL instructions for submission of samples and minimum sample sizes.
 - 3. Laboratory Analysis Requirements for each sample submitted: Complete Soil Test for New Planting, including evaluation of chemical suitability, available nutrients, texture, and organic matter content.
 - 4. Amendment recommendations per laboratory analysis.
- C. Submit certificates of inspection as required by County Agricultural Inspector. Submit manufacturer's or vendor's certified analysis for soil amendments, fertilizer and other materials. Submit other data substantiating that materials comply with specified requirements. Such certificates may be tags, labels, and manufacturer's literature, and all submittals shall be reviewed for approval by Owner's Representative prior to installation.
- D. Submit product data for fertilizers and herbicides.
- E. Furnish 1/2 cubic foot of each of the following, including supplier's name and location of supply to Owner's Representative for approval before delivering to job site:
 - 1. Garden Compost.
 - 2. Aggregates.
- F. Closeout submittals: When the project has been deemed substantially complete, but before final approval, submit copies of invoices showing soil quantities delivered to the site.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver packaged materials in manufacturer's unopened containers fully identified by name, brand, type, weight and analysis.
- B. Store and handle packaged materials to prevent damage and intrusion of foreign matter.
 - 1. Provide erosion control measures for stockpiled topsoil on site to prevent contamination of the soil.
- C. Submit receipts of all fertilizers and compost to Owner's Representative.

SOIL PREPARATION

1.5 SITE CONDITIONS

- A. Topsoil placement and soil preparation shall not take place during periods where saturated soil or surface water is present in work areas.
- B. Work shall not take place when temperature is less than 32° F. or frozen soil is on site.
- C. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Owner's Representative before placing topsoil.
- D. Utilities: Determine location of above grade and underground utilities and perform work in a manner that will avoid damage. Hand excavate as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

1.6 PROTECTION

- A. Provide adequate measures to protect workers and passersby at the site. Execute all works in an orderly and careful manner with due consideration for any and all surrounding areas, plantings, or structures that are to remain. Protect all adjacent property and improvements from work damage, and replace any portions damaged through this operation.

PART 2 - PRODUCTS

2.1 TOPSOIL

- A. Amended Native Topsoil:
 - 1. Amended native topsoil shall be used for planting areas as shown on the Drawings. Amended native topsoil shall not be used for stormwater planting areas.
 - 2. Contractor shall test native topsoil according to the requirements of Paragraph 1.3.B, above.
 - 3. Native topsoil shall be amended according to the results of the soil test and shall meet the requirements stated in Paragraph 1.2.B.1.
 - 4. Use of unamended native topsoil is prohibited.

2.2 SOIL AMENDMENTS

- A. Calcium Carbonate Limestone: ASTM C 602, Class T, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a No. 8 sieve and a minimum 75 percent passing a No. 60 sieve.
- B. Dolomite Limestone: Provide lime in the form of dolomite limestone.
- C. Other amendments including Gypsum (calcium sulfate), Ammonium nitrate, Copper sulfate, Zinc Sulfate, Laundry Borax (10 percent elemental boron).
- D. Compost: The compost shall be derived from plant material and provided by a member of the US Composting Council Seal of Testing Assurance (STA) program. The compost shall be the result of the biological degradation and transformation of plant-derived materials under conditions designed to promote aerobic decomposition. The material shall be well composted, free of viable weed seeds, and stable with regard to oxygen consumption and carbon dioxide generation. The compost shall have no visible free water and produce no dust when handled. It shall meet the following criteria, as reported by the US Composting Council STA Compost Technical Data Sheet provided by the vendor
 - 1. 100 percent of material must pass through a ½-inch screen
 - 2. The pH of the materials shall be between 6 and 8.
 - 3. Manufactured inert material (plastic, concrete, ceramics, metal, etc.) shall be less than 1.0 percent by weight.
 - 4. The organic matter content shall be between 35 and 65 percent.
 - 5. Soluble salt content shall be less than 6.0 mmhos/cm.
 - 6. Germination (an indicator of maturity) shall be greater than 80 percent
 - 7. Stability shall be 5-7
 - 8. Carbon/nitrogen ration shall be less than 25:1
 - 9. Trace metals test result = "pass".
- E. Sand: Clean, washed, natural or manufactured sand, free of toxic materials.

2.3 OTHER MATERIALS

- A. Mycorrhizal treatment for tree planting pits: Endo/Ecto plus mycorrhizal granular inoculums as available from Mycorrhizal Applications (541) 476-3985.

SOIL PREPARATION

- B. Fertilizer: as recommended in soils report.
- C. Herbicide: TriMec, Round-up, or other herbicides as approved.
- D. Water: Potable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plantings for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until satisfactory conditions have been corrected, including adequacy of preinstalled irrigation system. Verify that subgrades and slopes of planting bed areas are acceptable to Owner's Representative prior to commencing work of this section.

3.2 PREPARATION

- A. Prepare soil at a time when moisture conditions will permit proper cultivation.
- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Remove stones over 1-inch diameter, sticks, mortar, concrete, rubbish, debris and all materials harmful to plant life.
- D. Remove or spray as required to eradicate noxious weed growth and roots.
- E. Achieve complete removal or kill of all weeds within all areas receiving new plantings.
- F. Kill achieved by working soil is permissible for annual non-noxious broad leaf type weeds, except within
- G. Locate and securely mark or flag irrigation sprinkler heads, area drains, catch basins, cleanouts, manholes, valve boxes, and other site improvements not extending above finish grade.
- H. Request inspection and allow observation by Owner's Representative of prepared soils before planting.

3.3 SOIL PREPARATION, GENERAL

- A. This section pertains to planting beds as shown on the drawings, except for planting areas within RPZ's of existing trees.
 - 1. Excavation within tree RPZ's shall comply with the requirements of Section 015639 – Tree Protection.
- B. Excavation for tree planting pits: excavate and remove soil, debris, rock and other material to 36-inches below adjacent finish grade, a minimum of 3x the size of the tree rootball.
- C. Thoroughly till subgrade in planting areas to a 6-inch depth for approval. Remove any rock or debris over 1-inch in diameter within the 6-inch subgrade area. Do not proceed with application of topsoil until subgrade scarification and removal of rock or debris has been approved by the Owner's Representative.
- D. Soil placement, general planting areas: place 6-inches of amended topsoil and then rototill into the subgrade to a depth of 6-inches.

3.4 SOIL PREPARATION FOR PLANTING PITS OF TREES

- A. This section pertains to the amended topsoil mix for the plant pits of individual plants.
- B. Thoroughly mix approved amended topsoil with approved 14/18/12 slow release fertilizer and approved mycorrhizal treatment.
 - 1. Fertilizer rates:
 - a. Trees, shrubs, and groundcovers spaced at 18-inches on center or more: 4 oz per plant.
 - 2. Mycorrhizal inoculate rate:
 - a. Trees: 1 oz per caliper size (e.g., 2 oz for 2-inch caliper tree, 3 oz for 3-inch caliper tree, etc.).
- C. Place amended topsoil mix in planting pits as specified in Section 329300 - Trees, Shrubs and Groundcovers and as shown the Drawings.
- D. Grade smooth to elevations shown on Contract Documents.

3.5 FINE GRADING

- A. Finish grade after full settlement including mulch, shall be 1-inch below tops of curbs, walks, or existing grades in shrub areas, or as otherwise indicated on the drawings. Contractor may be required to adjust the amount of topsoil to bring the finish soil elevation to grades shown on plans.

SOIL PREPARATION

- B. Slope all areas to prevent puddling and drain surface water toward catch basins, drains, curbs, or off site, as detailed.
- C. Soil in all areas shall be thoroughly settled, with a smooth surface free of humps and hollows, and shall be firm enough to resist undesirable impressions when stepped upon.
- D. Use levels, screens, drags, or any other equipment necessary to establish and verify grades and surfaces.
- E. Schedule inspection 48 hours in advance with Owner's Representative for review of fine grading operations.

3.6 CLEAN-UP

- A. Clean up excess materials and debris from project site upon completion of work or sooner if directed.
- B. Leave in neat and tidy condition daily.

END OF SECTION

SEEDED LAWNS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Hydro seeding.
 - 2. Dry seeding.
 - 3. Lawn maintenance.
- B. Related Sections:
 - 1. Section 312000: Earth Moving, for preparation of subsoils.
 - 2. Section 329113: Soil Preparation, for topsoil and soil fertilizer and amendments.
 - 3. Section 329300: Trees, Plants, and Groundcover, for other landscape work not included in this Section.
- C. Definitions:
 - 1. Weeds include the following:
 - a. Blackberry, Canada Thistle, Dandelion, Horsetail, Morning Glory, Nut Sedge, Poison Oak, Rush Grass, Annual Bluegrass, Bermuda Grass, Brome, Crabgrass, Johnson Grass, Nut Grass, Quack Grass, Shiny Geranium, Garlic Mustard, Nutsedge and Lesser Celandine.
 - b. Other plants designated as a noxious weed by authorized State, County and City officials.

1.2 SUBMITTALS

- A. Qualification data for firm and supervisor proposed to perform Work of this Section. Provide information to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses along with the names, phone numbers, and address of Landscape Architects and owners.
- B. Submit an approved Application for Pesticide Use on Park Property.
- C. Maintenance instructions recommending procedures to be established by Owner for maintenance of lawns and grasses during an entire year.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with all local, municipal and state laws and rules and regulations governing or relating to any portion of the Work of this Section, including the Owner's Integrated Pest Management Policy.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store seed at the site in dry area.

1.5 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Apply seed when wind velocity is less than 5 miles per hour at the site.
 - 2. Do not plant lawns when the air temperature is below 40 degrees F or above 80 degrees.

1.6 COORDINATION AND SCHEDULING

- A. Perform seed work after soil preparation, planting, irrigation, and other work affecting ground surface has been completed.
- B. Plant lawns after April 15 and before October 16, unless otherwise approved by Owner.
 - 1. Apply seed within 4 hours after final preparation of seeding areas.
 - 2. Do not seed within 2 feet of base of trees.
- C. Coordinate Work with park activities.

1.7 MAINTENANCE

- A. Lawn Maintenance:
 - 1. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
 - a. Seeded Grass: Maintain for a minimum of 45 days after seeding is completed for each new grass area.
 - 1) Irrigate new seeded lawn areas at a maximum rate of 0.5 inches of water per hour to keep soil materials moist.

SEEDED LAWNS

- 2) When required by dry winds, apply pre-soaked peat moss at 1/8 inch to 3/16 inch thick and roll to a smooth surface.
 - b. If the seeding construction is performed outside the permanent seeding dates, the establishment period will end 45 calendar days after acceptance of any reseeding that is necessary due to the installation dates.
 2. Do not walk on lawn areas for the first 30 days to irrigate, weed, or replace grass seed, without using plywood protection boards to walk over prepared lawn areas.
 3. Mowing and Edging:
 - a. Mow lawns as soon as there is enough top growth to cut with mower set at height of 1-1/2 to 2 inches, removing no more than 1/3 of the grass leaf with each mowing. Repeat mowing at least once a week and as required to maintain specified height. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.
 - b. Mow grass only when ground is sufficiently firm to prevent rutting depressions in excess of 1/8 inch caused by mowing equipment wheel loads.
 - 1) Reduce or temporarily terminate watering as necessary to allow mowing machinery to be used without rutting depressions in excess of 1/8 inch.
 - c. Remove excess accumulations of grass clippings within 2 hours after mowing and legally dispose of off Project site.
 - d. Edge lawns at the same time as the first mowing. Thereafter edge with every other mowing. Edge along walks, curbs, pavements, planting bed edges, and mulch circles around trees in lawn.
 4. Postfertilization: Apply fertilizer and thoroughly water lawn areas after first mowing and when grass is dry, or on the 14th day after seeding, or sodding, whichever comes first.
 - a. Use fertilizer that will provide actual nitrogen of at 1 lb. per 1000 sq. ft. of lawn area.
 - 1) Apply Top Dress Fertilizer with mechanical rotary or drop type distributor.
 - 2) Water fertilizer into soil.
 - b. Apply fertilizer at least once every 60 days.
- B. Weeding and Cleanup:
 1. Keep all lawn areas clean and weed free. Keep all buildings, pavements, and other exterior improvements clean and free of soil and debris.
 2. Treat lawns as needed to eliminate weeds and keep weed free per the approved Application for Pesticide Use on Park Property.
 3. Police and cleanup entire site at least once a week and additionally as needed to collect seasonal debris (leaves).
 4. Dispose of collected materials off site.
- C. Repair of Seeded Lawn Areas:
 1. Apply grass seeds to bare areas which occur in lawn areas within the 90 day installers guarantee period.
 2. Reseed lawn areas where soil erosion or poor germination causes bare areas.
 3. Immediately remove and replace seeded areas showing excessive growth of perennial and annual weeds, deficient grass growth, and damage.
 4. Completely remove weeds including weed roots according to the approved Application for Pesticide Use on Park Property.
 5. Remove and replace excessively weeded, grass growth deficient, and damaged areas in accordance with requirements in this Section.
- D. Maintenance Results and Acceptance:
 1. Notify Owner's Representative in writing 5 days minimum prior to Owner assuming maintenance responsibility for lawn areas.
 2. Acceptance of seeded lawn areas is contingent meeting the requirements of this Section and the establishment of a healthy, thick, weed-free stand of grass, uniform in thickness, texture, color, and height.
 3. Weed-free Tolerance: One broadleaf or narrowleaf weed for each 50 square feet of lawn area.
 4. Provide maintenance beyond the required maintenance period as necessary to achieve specified results.

PART 2 - PRODUCTS

2.1 GRASS MATERIALS

- A. Grass Seed Mixture: Sunmark Seeds "Northwest Supreme Lawn Mix".

SEEDED LAWNS

1. Seeding rate: 8 lbs per 1,000 sf.
- 2.2 TOPSOIL, SOIL AMENDMENTS, AND FERTILIZER
 - A. Topsoil, soil amendments, and fertilizers are specified in Section 329113, "Soil Preparation."
- 2.3 HERBICIDE
 - A. As listed on the approved Application for Pesticide Use on PP&R Property.
- 2.4 HYDRO MULCH
 - A. Material: Virgin wood cellulose fiber containing no growth or germination inhibiting factors.
 - B. Application Metering Material: Green dye to facilitate visual metering.
 - C. Performance Characteristics: Forms a homogenous slurry upon agitation for rapid and even dispersal.
 - D. Acceptable Wood Fiber Mulches; One of the following, or approved:
 1. Weyerhaeuser; Silva-Fiber.
 2. Conwed Corp.; 1000 Hydro Mulch.
 3. Spray Mulch Industries; Spray Mulch.
- 2.5 EQUIPMENT
 - A. Hydro Seeding Equipment:
 1. Hydraulic Equipment: Continuous mixing and agitating action to mix water, seed, fertilizer, and mulch and distribute the mixture on lawn areas.
 - B. Temporary Fence:
 1. Plastic Construction Fence 36 inches minimum height.
 2. Warning Signs: 8-1/2 by 11 inches, wrapped in plastic or waterproof, with one inch high letters.
 3. Sign Copy: THANK YOU FOR NOT WALKING ON GRASS
 - C. Dry Seeding Equipment:
 1. Type: Rotary or drop distributor.
- 2.6 ACCESSORY MATERIALS
 - A. Seed Lawn Fertilizer: Commercial mix, 16-4-8, not less than 50 percent cold water insoluble nitrogen derived by incorporating a minimum of 800 pounds urea formaldehyde per ton of fertilizer.
 - B. Ammonium Sulfate: 21-0-0 composition.
 - C. Peat Moss: Pre-soaked, natural, shredded or granulated peat moss, fine texture, with pH of 4 to 6 water capacity of 1,100 to 2,000 percent.
 - D. Vapor Retarder: 6 mil thick, black polyethylene sheet, ASTM D 2103.
 - E. Water: Free of weed seed and chemicals harmful to plant growth.

PART 3 - EXECUTION

- 3.1 SUBGRADE AND TOPSOIL PREPARATION
 - A. Subgrade preparation is specified in Section 312000, "Earth Moving."
 - B. Topsoil preparation is specified in Section 329113, "Soil Preparation."
- 3.2 PREPARATION - GENERAL
 - A. Examine areas to receive lawns for compliance with requirements and for conditions affecting performance of Work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.
 1. Verify completion of underground utility lines in lawn areas.
 - B. Protect existing utility systems, paving, walks, curbs, and other site improvements from damage during seeding and sodding.
 - C. Seeding Preparation:
 1. Remove hard or soft topsoil areas and adjust grade of topsoil where required.
 2. Lightly irrigate dry planting soil.
 3. Allow time for free surface water to drain prior to seeding.
 - D. Hydro Seeding Preparation:
 1. Install 10 feet minimum width vapor retarder sheet cover at perimeter of hydro seeding area to prevent hydro seeding drift on adjacent surfaces.

SEEDED LAWNS

2. Lap joints 6 inches minimum.

3.3 SEEDING NEW LAWNS

- A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.
 1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
 2. Do not seed within 2 feet from base of trees.
 3. Adjust method of seeding application only after written request, and receiving approval from the Owner.
- B. Sow seed at 8 pounds for each 1,000 square feet.
- C. Apply 3 pounds ammonium sulfate for each 1000 square feet.
- D. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray. Keep area moist, but not soggy, until grasses become firmly rooted.

3.4 HYDRO SEEDING NEW LAWNS

- A. Apply seed, mulch, fertilizer and water uniformly in one application with hydraulic equipment to prepared lawn areas.
 1. Apply 8 pounds seed mixture for each 1,000 square feet.
 2. If approved by Owner to seed after October 15th, increase grass seed mixture by one pound per week per 1000 square feet up to a total of 14 pounds per 1000 square feet.
- B. Apply 35 pounds (dry weight) wood fiber mulch for each 1,000 square feet for slopes 8 to 1 or less and 50 pounds (dry weight) wood fiber mulch for each 1,000 square feet for slopes steeper than 8 to 1.
- C. Apply 3 pounds ammonium sulfate for each 1000 square feet.
- D. Apply mixture through a pressure spray distribution system providing a continuous, nonfluctuating discharge of mixture in the above quantities uniformly on lawn areas.
- E. Apply seed and mulch mixture using a sweeping, horizontal motion of spray distribution system.
- F. Do not seed within 2 feet from base of trees.

3.5 ADJUSTING, CLEANING, AND PROTECTION

- A. During landscaping, keep pavements clean and work area in an orderly condition.
- B. Protect lawns from damage due to other landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.
 1. Install temporary fence at perimeter of lawn areas.
 - a. Install posts at 10 feet on center maximum, to a depth of 12 inches.
 - b. Install warning signs on posts at 50 foot intervals with minimum of one sign on each side of each lawn area.
 - c. Remove fence when lawn areas are established.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

TREES, SHRUBS, AND GROUNDCOVER

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Install trees, shrubs and groundcovers as detailed and specified herein.
 - 2. Secure and maintain all plant material to have minimum 1-year acclimation in a similar climate to project site.
 - 3. Establish a coordination schedule for supplying and installing plants and related materials.
 - 4. Provide an allowance for additional plant material to be selected by Owner or Owner's Representative.
- B. Related Sections:
 - 1. Section 015639 – Tree Protection.
 - 2. Section 329113 – Soil Preparation.

1.2 REFERENCES

- A. Standards: Comply with botanical names, sites, and conditions provided in:
 - 1. Botanical Names: American Joint Committee on Horticulture Nomenclature, "Standardized Plant Names" or "Hortus Third".
 - 2. Sizes and Conditions: American National Standards Institute (ANSI) Z60.1, "American Standards for Nursery Stock", latest edition.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this project and with a record of successful landscape establishment, with 5 years minimum experience.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping is in progress. Government Inspection: All plants and planting material shall meet or exceed the specifications of federal, state, and county laws requiring inspection for plant disease and control. Submit certificate of inspection of plant material by State or Federal authorities if required.
- B. All plant material is to be grown from cuttings or seed. Collected plants are not acceptable.
- C. Provide quality, size, genus, species, and variety of trees and shrubs indicated, complying with applicable requirements of ANSI Z60.1, "American Standard for Nursery Stock".
 - 1. Plant sizes indicated shall be the size of the plant at installation.
- D. Measurements: Measure trees and shrubs according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6-inches above ground for trees up to 4-inch caliper size, and 12-inches above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.
- E. Pre-installation conference: Conduct conference at Project site to comply with requirements.

1.4 QUALITY CONTROL

- A. Inspection:
 - 1. All trees shall be inspected and tagged by the Owner's Representative at the growing or holding site. All trees tagged by the Owner's Representative shall have a unique tree tag and ID number. Any trees delivered to the project site without the unique tree tag shall be rejected.
 - 2. All other plants shall be subject to inspection by the Owner's Representative at the growing or holding site or on the job site. Plants not conforming to specifications shall be rejected.
 - 3. Approval of material at a growing or holding site is a qualified endorsement of general quality only, and does not certify a compliance with the specifications in all particulars; such approval does not preclude the right of rejection on the job site.
- B. The presence of noxious weeds in plant balls shall be cause for rejection of any or all plants from that source.

1.5 SUBMITTALS

- A. The Contractor shall make all submittals in accordance with Section 013300 – Submittal Procedures.

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- B. Submit list of growers for each plant species to be installed within 30 days after the award of Contract. List to include plant sizes and conditions. Certify, in writing, confirmed orders for plants and provide the quantity, location, phone number, and address of the grower who has agreed to provide any plant material. Verify that the sizes of plants indicated will be available at the time of installation. Each plant species shall be supplied by 1 grower only unless approved by Owner's Representative.
 - 1. All trees must be secured before the end of digging season.
- C. Substitutions:
 - 1. Requests for substitutions of plants not available in size, quantity or type specified must be made within 30 days after the award of bid. Submit proof on non-availability to Owner's Representative.
 - 2. Where evidence is submitted that a specified plant cannot be obtained, substitutions in kind, size and grade will be made only upon written approval by the Owner's Representative.
 - 3. Provide a minimum of (2) substitution options for each plant for review by Owner's Representative. Proposed substitutions shall be similar to the specified plant in growing conditions, habit, size at installation, size at maturity, and color (leaf and flower). Different varieties of the same species are preferred.
 - 4. The plant search shall not be limited to Oregon, and shall include sources of supply in California, Washington State, and British Columbia, as allowed by local and federal regulations.
- D. Contractor shall inspect plants at growing or holding area and send letter of confirmation of plant quantities and conditions to Owner's Representative 100 days before planting time.
- E. Product submittals:
 - 1. Submit a 1/2 cu.ft. sample of bark mulch for approval prior to delivery.
 - 2. Submit product data for fertilizer tablets.
 - 3. Submit product data for tree stakes and ties.
- F. Submit planting schedule indicating anticipated dates and locations for each type of planting.
- G. With application for final payment, submit duplicate copies of delivery invoices, labels, or other acceptable proof of quantities of materials used.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in manufacturer's unopened containers, fully identified by name, brand, type, weight and analysis.
- B. Store materials to prevent damage or intrusion of foreign matter.
- C. Plant Materials: Deliver trees and shrubs after preparations for planting have been completed. Protect trunks and branches from damage. Protect root systems from drying out. Label 1 of each tree and shrub species with securely attached waterproof tag bearing botanical name and suppliers name.
- D. Heel-in plants immediately upon delivery if not planted within 4 hours.
- E. Store plants in shade and protect from harmful weather until planted.
- F. Water, maintain, and protect stored material from drying or other injury or damage.
- G. Store plants in upright position and allow sufficient ventilation.
- H. Do not drop plants.
- I. Do not pick up containerized or balled plants by stems or trunks.
- J. Deliver seed in original sealed, labeled, and undamaged containers. Ship and store seed, compost and fertilizer with protection from weather or other conditions that would damage or impair the effectiveness of the product.

1.7 INSPECTIONS

- A. Notify Owner's Representative 48 hours in advance for the following reviews of work:
 - 1. Review of plant stock upon arrival to site or at nursery as determined by Owner's Representative.
 - 2. Review of plant materials located in position for planting, but not yet planted.
 - 3. Schedule inspection to take place during the last weeks of the 60-day establishment period.

1.8 COORDINATION AND SCHEDULING

- A. Coordinate planting of trees and shrubs during normal planting seasons for such work in location of Project.
 - 1. Plant frost-tender trees and shrubs only after danger of frost is past or before frost season to allow establishment before first frost. Do not plant in frozen ground.

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- B. Coordinate delivery, placement, and installation of specimen trees with other trades.

1.9 WARRANTY, MAINTENANCE AND ACCEPTANCE

- A. All plant materials installed by the Contractor shall be guaranteed and maintained for a period of 1 year, beginning at Substantial Completion.
- B. Remove and replace trees, shrubs, or other plants found to be dead or in unhealthy condition during warranty period. Make replacements during growth season following end of warranty period. Replace trees and shrubs, which are in doubtful condition, at end of warranty period; unless requested by Owner's Representative, it is advisable to extend warranty period for a full growing season.
- C. Another inspection will be conducted at end of extended warranty period, if any, to determine acceptance or rejection. Only 1 replacement (per tree, shrub or plant) will be required at end of warranty period, except for losses or replacements due to failure to comply with specified requirements.
 - 1. All tree stakes and ties shall be removed at the 1-year warranty walkthrough.
- D. Maintenance:
 - 1. Begin maintenance immediately after planting. Maintenance shall continue through the duration of the warranty period.
 - 2. During the warranty period the Contractor is responsible for watering, weeding, spraying, replacement of plants, mowing, edging, cleanup and other Work to keep the landscaped areas in a neat and clean condition. Maintain trees, shrubs and other plants by pruning, cultivating and weeding as required and needed for healthy growth. Restore planting basins. Adjust and repair stake supports and reset trees and shrubs to proper grades or vertical position as required. Spray as required to keep trees, shrubs, and other plantings free of insects and disease. Replace mulch as required.
 - 3. At the end of the 1-year warranty period walkthrough, remove all tree stakes and ties.

PART 2 - PRODUCTS

2.1 TREE, SHRUBS AND GROUNDCOVER MATERIAL

- A. Trees, shrubs and groundcover shall conform to the following requirements:
 - 1. Well rooted in the container but not root bound.
 - 2. No encircling, girdling, or potentially binding roots.
 - 3. The top of rootball must be within 3-inches of the top of the container.
 - 4. No weeds may be growing in the container.
 - 5. Single trunked, not headed or topped.
 - 6. No bark in the crotches of any main branches.
 - 7. No branches can be larger than 2/3 the trunk diameter.
 - 8. The trunk of the tree must have a visible taper. No portion of the trunk above 6-inches can be larger than the portion below this point. The bottom of the trunk must be of greater diameter than all other portions of the trunk.
 - 9. Free of insects or diseases at time of acceptance.
- B. Grade: Provide trees and shrubs of sizes and grades conforming to ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Owner's Representative, with a proportionate increase in size of roots or balls.
- C. Label at least 1 tree and 1 shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.
 - 1. Where formal arrangements or consecutive order of trees or shrubs are shown, select stock for uniform height and spread, and number label to assure symmetry in planting.

2.2 CONTAINER-GROWN STOCK

- A. Provide healthy, vigorous, well-rooted trees or shrubs established in container. Provide balled and burlapped stock when required trees or shrubs exceed maximum size recommended by ANSI Z60.1 for container-grown stock.
 - 1. Established container stock is defined as a tree or shrub transplanted into container and grown in container long enough to develop new fibrous roots, so that root mass will retain its shape and hold together when removed from container.

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- B. Containers: Rigid containers that will hold ball shape and protect root mass during shipping. Provide trees and shrubs established in containers of not less than minimum sizes recommended by ANSI Z60.1 for kind, type, and size of trees and shrubs required.
- 2.3 BACKFILL SOIL MIXTURE
 - A. See Section 329113 - Soil Preparation.
- 2.4 TREE STAKES AND TIES
 - A. Tree Stakes to be 2-inch diameter by 8-foot Doug Fir stakes.
 - B. Tree ties to be thick plastic chain tie.
- 2.5 MULCH
 - A. Mulch: Organic fine ground well-aged dark hemlock bark, free from deleterious materials and suitable as a top dressing of trees, shrubs, and groundcover areas.
- 2.6 ANTI-DESICCANT
 - A. Commercially available spray protective coating, designed to reduce plant transpiration loss, which produces a moisture-retarding barrier not removable by rain or snow.
- 2.7 WATER
 - A. Potable, free from ingredients harmful to plant life.

PART 3 - EXECUTION

- 3.1 EXAMINATION
 - A. Examine areas to receive trees and shrubs for compliance with requirements and for conditions affecting performance of Work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.
 - B. Fine grading and Soil Preparation: Verify that fine grading and soil preparation work is complete.
- 3.2 PREPARATION
 - A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
- 3.3 ANTI-DESICCANT/TRANSPIRATION TREATMENT
 - A. Treat all plants delivered to project site from June 1st through September 15th. Apply anti-desiccant/transpirant immediately prior to or upon delivery to project site.
 - B. Follow manufacturer's recommendations and precautions. Apply in spray form to foliage, branches, limbs and trunks of plants.
- 3.4 PLANT PITS
 - A. Stake locations of trees and shrubs for approval prior to digging. Field place trees and shrubs in locations shown on Contract Drawings. Placement must meet approval of Owner's Representative prior to backfilling. Owner's Representative may request rotation or slight movement of tree to give a better appearance with respect to adjacent plants and structures.
 - B. Size of Tree Pits: Minimum width three times the diameter of ball.
 - C. Scarify bottom and sides of hole with shovel.
 - D. Set trees on unamended native soil where possible. This is not applicable where soil is imported in depths greater than depth of root mass. To prevent settling of trees and large shrubs, soil added to the bottom of hole is to be foot tamped and unamended.
- 3.5 PLACING
 - A. Set top of deciduous rootballs no less than 1-inch above finish grade and conifers and rhododendrons no less than 3-inches above grade and mound; deep planting not permitted. If hole for trees is too deep, fill hole with native soil only where applicable or prepared soil to correct levels. Use unamended soil and foot tamp to prevent settling. Large rhododendrons and #20 containers or larger shall be 5-inches high.
 - B. Set plants plumb and faced for best appearance.

TREES, SHRUBS, AND GROUND COVER

- C. Remove wire baskets, burlap, fasteners from rootball completely if rootball will not be damaged. If damage is suspected, notify Owner's Representative for concurrence and remove tops and sides of baskets minimum. Use bolt cutters on wire if necessary to remove wire baskets. Bending back is not acceptable.
- D. Remove metal cans or plastic containers completely from rootball.
- E. Neatly cut off broken, girdling, or frayed roots and any root growth growing in a circular manner conforming to its container.

3.6 BACKFILLING

- A. Backfill half of plant pit around rootball with prepared planting soil, carefully tamp soil around rootballs. See Specification 329113 - Soil Preparation for planting soil mixture.
- B. Complete backfilling, firming to surface grade. Thoroughly hand-water each plant and entire bed immediately after planting. Adjust rootball and soil as necessary.
- C. Remove tree tags.
- D. When area is not to be immediately irrigated and dry conditions exist, holes are to be watered half full and again when backfilling is complete.

3.7 TREE STAKING

- A. Tree Stakes and Ties:
 - 1. Install stakes and ties as detailed on the Drawings.
 - 2. Trees shall be able to stand upright without support, and shall return to the vertical after their tops have been deflected horizontally and released.
 - 3. Trees shall remain plumb and straight from installation through the warranty period.

3.8 MULCH INSTALLATION

- A. Install medium fir bark mulch over tree-watering basins, shrubs, and ground cover areas. Do not place mulch against trunks or stems. Rake mulch surface smooth after installation.
 - 1. Do not install mulch in seeded areas.
- B. Mulch thickness:
 - 1. At-grade planting areas: install an average thickness of 2-inch medium fir bark mulch and finish level with adjacent finish grades.
 - 2. Raised planters and roof planting areas: install an average thickness of 1-inch medium fir bark mulch. Keep mulch 1-inch below top of walls.

3.9 PRUNING

- A. Prune plant material if necessary and as directed by Owner's Representative to balance root and top growth.
- B. Prune all dead and broken limbs after inspection by Owner's Representative.

3.10 CLEANUP AND PROTECTION

- A. During tree and shrub work, keep all work surfaces and pavements clean and work area in an orderly condition. Protect surfaces as required to prevent damage from installation activities. Ensure that any damage that occurs as a result of installation is appropriately and immediately repaired.
- B. Protect trees and shrubs from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.
- C. Following installation, remove all excess materials and tools from job site.

3.11 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove subbase surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the property.

END OF SECTION

STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes on-site gravity-flow nonpressure storm drainage, with the following components:
 - 1. Pipe and pipe fittings.
 - 2. Cleanouts;
 - 3. Nonpressure transition couplings.
 - 4. Area drains.
 - 5. Catch basins.
- B. Related Sections:
 - 1. Section 312000: Earth Moving, for trenching, backfilling, compacting, and geotextile fabrics.

1.2 SUBMITTALS

- A. Product Data, for each type product indicated:
 - 1. Cleanouts.
 - 2. Area drains.
 - 3. Catch basins.
 - 4. Pipe.
 - 5. Fittings.
 - 6. Transition couplings.
- B. Field quality-control reports.
- C. Submit one copy of City of Albany standard Certificate of Inspection for each drainage system.
- D. For inclusion in closeout submittals, as-built record drawings of drainage systems. Include actual invert elevations with location dimensions from drains lines to property and building lines.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with requirements of governing agencies for each sewerage and drainage system.

1.4 PROJECT CONDITIONS

- A. Site Information: Research public utility records, and verify existing utility locations.
 - 1. Notify Owner immediately if any discrepancies are found in the project Survey.
- B. Coordination and Scheduling:
 - 1. Coordinate Work with park activities.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, those listed in this Specification.
- B. Substitutions: Submit in accordance with requirements of Division 01 Section "Substitutions."

2.2 SOIL MATERIALS

- A. Refer to Section 312000, "Earth Moving," for bedding, other soil materials, and geosynthetic drainage fabric.
- B. Bedding, pipe zone, and backfill for Solid-Wall Storm Drain Pipe: $\frac{3}{4}$ "-0 Crushed Rock per ODOT Standard Specifications 02630.
- C. Bedding, pipe zone, and backfill for Perforated Storm Drain Pipe: $\frac{3}{4}$ "-0 Crushed Rock per ODOT Standard Specifications 02630.

2.3 CONCRETE

- A. Refer to Section 033000, "Cast-In-Place Concrete," for concrete materials for ballast and pipe supports, including reinforcing fabric and bars.

2.4 PE PIPE AND FITTINGS (Perforated Drain Pipe)

- A. Perforated, corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints, without fabric sock.

STORM DRAINAGE SYSTEM

- B. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.
- C. Perforated, corrugated PE Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294M, Type S, with smooth waterway for coupling joints, without fabric sock.
- D. Soiltight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.

2.5 PVC PIPE AND FITTINGS (Solid Wall Drain Pipe)

- A. PVC Corrugated Sewer Piping:
 - 1. Pipe: ASTM F 949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
 - 2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.
 - 3. Gaskets: ASTM F 477, elastomeric seals.
- B. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35 with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.
 - 1. Provide perforated piping where indicated in the Drawings.

2.6 NONPRESSURE TRANSITION COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
 - 1. For Concrete Pipes: ASTM C 443, rubber.
 - 2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Unshielded, Flexible Couplings:
 - 1. Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
- D. Shielded, Flexible Couplings:
 - 1. ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- E. Ring-Type, Flexible Couplings:
 - 1. Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.7 CLEANOUTS

- A. Plastic Cleanouts:
- B. PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.
- C. Provide traffic grade frame and cover. Frame and cover shall be H20 rated cast iron valve box with flange top as detailed on drawings with "storm" marking.

2.8 AREA DRAINS

- A. Prefabricated steel, 12 inches square by 24 (minimum) inches deep, 10 gauge minimum, asphalt paint inside and out, 6 inch minimum water seal with hinged lid on trap, outlet size as specified on drawings. Cast iron or steel grate with bicycle bars. Lynch or Gibson and as indicated in the Drawings. Use any of the following pipe materials from the catch basin to lateral where cover is less than one foot as detailed on drawings: Ductile Iron pipe and fittings (cement-lined), Class 52, AWWA C151; PVC, AWWA C900, CL150; Schedule 40 PVC, ASTM D2665, F891, or D1785 (latest revision).

2.9 CATCH BASINS AND SEDIMENTATION BASIN

- A. Catch Basins: Custom-prefabricated steel, 24 inches square by 36 (minimum) inches deep, 10 gauge minimum, asphalt paint inside and out, 6 inch minimum water seal with hinged lid on trap, outlet size as specified on drawings. Provide custom fabricated to accommodate decorative grate below. Lynch or Gibson and as indicated in the Drawings. Use any of the following pipe materials from the catch basin to lateral where cover is less than one foot as detailed on drawings: Ductile Iron pipe and fittings (cement-lined), Class 52, AWWA C151; PVC, AWWA C900, CL150; Schedule 40 PVC, ASTM D2665, F891, or D1785 (latest revision).

STORM DRAINAGE SYSTEM

- B. Catch Basin Grates: Cast Ductile Iron, ADA-compliant.

2.10 ACCESSORIES

- A. Location Tracer:
 - 1. Wire Size and Type: No. 18, insulated copper.
 - 2. Insulation Cover Color: Green.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas of Work, and that existing conditions will not adversely affect execution or quality of work.
 - 1. Report existing conditions detrimental to completion of Work.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection:
 - 1. Protect utility lines, storm drainage lines, site improvements, and underground utilities.
 - a. Stake location of underground utilities and avoid trenching in those areas beyond safe limits.
 - b. Hand excavate trenches where required to avoid utility line damage.
 - 2. Protect existing utility systems, paving, walks, curbs, and other site improvements from damage during construction operations.
- B. Excavate trenches to depths required to achieve specified slope for drain lines.
- C. Stockpiling: Stockpile and protect excavated trench soil for inspection and backfilling in designated locations on-site.

3.3 EARTHWORK

- A. Perform excavation, trenching, and backfilling in accordance with requirements of Section 312000 "Earth Moving."
 - 1. Install tracer wire directly over piping and at outside edges of underground structures.

3.4 PIPING INSTALLATION

- A. General Locations and Arrangements:
 - 1. Drawings and details indicate general location and arrangement of underground storm drainage piping.
 - 2. Location and arrangement of piping layout take into account design considerations.
 - 3. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert.
 - 1. Place bell ends of piping facing upstream.
 - 2. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected.
 - 1. Reducing size of piping in direction of flow is prohibited.
- D. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process or microtunneling.
- E. Install gravity-flow, nonpressure drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow at a minimum slope of 1 percent, unless otherwise indicated.
 - 2. Install piping with 36-inch minimum cover, unless otherwise indicated.
 - 3. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
 - 4. Install PE corrugated sewer piping according to ASTM D 2321.
 - 5. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 6. Install piping below frost line.
- F. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:

STORM DRAINAGE SYSTEM

1. Ductile-iron pipe and fittings.

G. Clear interior of piping and manholes of dirt and superfluous material as work progresses.

3.5 PIPE JOINT CONSTRUCTION

A. Follow piping manufacturer's written instructions for basic pipe joint construction.

B. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
2. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
3. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
4. Join PVC corrugated sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints.
5. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.6 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to terminate between 4 and 8 inches from finished grade.

1. Use PVC fittings in sewer pipes at branches for cleanouts and PVC pipe for riser extensions to cleanouts.
2. Install piping so cleanouts open in direction of flow in sewer pipe.
3. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.

B. Set cleanout with meter box covers in earth, as indicated on plans. Set with tops flush with surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.7 AREA DRAIN AND CATCH BASIN INSTALLATION

A. Set frames and grates to elevations indicated.

3.8 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.9 CONNECTIONS

A. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
3. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

B. Pipe couplings and expansion joints with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
2. Shielded flexible couplings for same or minor difference OD pipes.
3. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
4. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.10 IDENTIFICATION

A. Install green tracer wire directly over piping and at outside edges of underground structure.

1. Provide 12 AWG minimum solid copper insulated High Molecular Weight Polyethylene (HMW PE) tracer wire or approved.
2. Provide green tracer wire insulation for sewer pipe, a minimum of 45 mil. thick.
3. Provide waterproof Joints or splices waterproof.
4. Provide wire rated for 30 Volt

STORM DRAINAGE SYSTEM

3.11 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 1. Submit separate reports for each system inspection.
 2. Defects requiring correction include the following.
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 4. Reinspect and repeat procedure until results are satisfactory
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours advance notice.
 4. Submit separate report for each test.
 5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Option: Test plastic piping according to ASTM F 1417.
 - b. Option: Test concrete piping according to ASTM C 924.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Leaks and loss in test pressure constitute defects that must be repaired

3.12 ADJUSTING AND CLEANING

- A. Repair or replace defective lines and system components.
- B. Excavate and recompact backfill where settlement has caused damage to site improvements.
- C. Replace or repair walks, paving, site, and landscape improvements damaged by backfill settlement.
- D. Remove excess soil materials from paving, walk, and lawn areas as soon as backfilling is completed, and legally dispose of off Owner's property.

END OF SECTION

SUBDRAINAGE SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes drainage systems for the following:
 - 1. Landscaped areas.
 - 2. Pedestrian walkways.
- B. Related Sections:
 - 1. Section 033000: Cast-In-Place Concrete.
 - 2. Section 312000: Earth Moving, for trenching, backfilling, compacting, and geotextile fabrics.
Section 321313: Concrete Paving, for concrete for catch basin bases, thrust blocks, and cleanout slabs.
 - 3. Section 334100: Storm Drainage System, for sewer lines.

1.2 SUBMITTALS

- A. Product Data, for each type product specified.
- B. Submit one copy of site test reports for water exfiltration tests on installed non-perforated drainage systems.
- C. For inclusion in closeout submittals, as-built record drawings of drainage systems. Include actual invert elevations with location dimensions from drains lines to property and building lines.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Obtain permits required by governing regulatory agencies, to connect drain and storm sewer lines to existing storm sewer system.
 - 2. Comply with requirements of governing agencies for each sewerage and drainage system.

1.4 PROJECT CONDITIONS

- A. Existing Utilities:
 - 1. Contact utility-locator service for area where Project is located before trenching in exterior areas.
- B. Temperature and Moisture Requirements:
 - 1. Do not excavate trenches, backfill, or compact soils, unless ambient air temperature is above 35 degrees F. and soils are within acceptable moisture limits.
- C. Coordination and Scheduling:
 - 1. Coordinate Work with park activities.
- D. Do not cover trenches with soil and aggregate materials prior to acceptance of required inspections and tests.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - 1. Substitutions: Submit according to requirements of Division 01 Section for "Substitutions."

2.2 PIPE COMPONENTS

- A. Corrugated Polyethylene (PE) Drain Tubing:
 - 1. Industry Standard: ASTM F 405.
 - 2. Tubing Components: Corrugated polyethylene drainage tubing, slotted with drain filter and nonperforated.
 - 3. Tubing Joint Accessories: Coupling, reducing coupler, tee, 90 degree ell, 45 degree wye, and end plugs.
 - 4. Solvent Cement: ASTM D 2235.
 - 5. Acceptable Tubing:
 - a. Advanced Drainage Systems, Inc.; ADS Drain Guard.
 - b. Hancor; Agri-Flow.
- B. High Density Corrugated Polyethylene (HDPE) Drain Pipe:
 - 1. Industry Standard: ASTM D 1248, Type III, Class C, Category 4 or 5, Grade P33 or P34.
 - 2. Pipe Joint Couplings: AASHTO Standard Specifications for Highway Bridges, Section 23, 2.23.3.

SUBDRAINAGE SYSTEM

3. Pipe Stiffness: 50 for 4 and 6 inch pipe at 5 percent deflection.
 4. Solvent Cement: ASTM D 2235.
 5. Acceptable Pipe: ADS N-12 by Advanced Drainage Systems, Inc.
- C. ABS Sewer Pipe:
1. Industry Standard: ASTM D 2751, SDR 23.5, SDR 35 or SDR 42.
 2. Sizes: 3, 4, and 6 inch diameter pipe.
 3. Solvent Cement: ASTM D 2235.
- D. ABS Plastic Drain, Waste, and Vent Pipe:
1. Industry Standard: ASTM D 2661, Schedule 40.
- E. PVC Small Diameter Sewer Pipe:
1. Industry Standard: Gasket bell end pipe, ASTM D 3034, SDR 35 from PVC components of ASTM D 1784.
 2. Diameters: 4, 6, 8, 10, 12, and 15 inches.
 3. Rubber Gaskets: ASTM F 477.
 4. Fittings: Manufacturer's standard.
 5. Solvent Cement: ASTM D 2564.
- F. PVC Drain Pipe:
1. Industry Standard: ASTM D 2729, bell end pipe.
 2. Standard Pipe Diameter: 2, 3, 4, 5, and 6 inches.
 3. Perforated Pipe Diameter: 3, 4 and 6 inches.

2.3 CATCH BASINS AND GRATES

- A. Steel Catch Basin and Cast Iron Grate:
1. Basin Metal: 10 gage welded steel.
 2. Basin Coating: Asphalt coated.
 3. Basin Size: 24 inches, square.
 4. Basin Depth: 30 inches minimum.
 5. Grate Material: Cast iron, ASTM A 48, Class 30B.
 6. Acceptable Medium Duty Grates: 1,000 pound wheel load for parking areas, bicycle safe grate pattern.
 - a. Neenah Foundry Company; R-1690 or R-2510.
 - b. Valley Iron and Steel Co.; 123.
 - c. The Lynch Company, Inc.; Standard grate.
 7. Acceptable Light Duty Grates: No wheel load for landscape areas, bicycle safe grate pattern.
 - a. Neenah Foundry Company; R-1793-EG, R-2570, or R-5903.
 - b. The Lynch Company, Inc.; Standard grate.

2.4 ACCESSORIES

- A. Aggregate Backfill and Geotextile Filter Fabric:
1. Bedding, Haunching, Initial Backfill Aggregate: Initial backfill aggregate as indicated in Section 312000, "Earth Moving."
 2. Drainage Aggregate: Drain gravel as indicated in Section 312000, "Earth Moving."
 3. Geotextile Filter Fabric: Geotextile nonwoven drainage fabric as indicated in Section 312000, "Earth Moving."
- B. Geotextile Erosion Control Fabric:
1. Thickness: 19 mils.
 2. Weight: 6.5 ounces per square yard.
 3. Acceptable Fabrics:
 - a. Amoco; Propex 1199, 1325, 2006.
 - b. Mirafi; 700X.
- C. Geotextile Soil Stabilization Fabric:
1. Thickness: 23 mils.
 2. Weight: 4 ounces per square yard.
 3. Acceptable Fabrics:
 - a. Amoco; Propex 2002.
 - b. Mirafi; 500X.
- D. Location Tracer:

SUBDRAINAGE SYSTEM

1. Wire Size and Type: No. 18, insulated copper.
 2. Insulation Cover Color: Green.
- E. Exterior Cleanouts:
1. Access Box: Heavy duty cast iron.
 2. Covers and Flanges: Secured, cast iron.
 3. Cutoff Sections: Serrated.
 4. Plugs: Threaded bronze.
 5. Mounting: 18 inches square by 6 inches thick concrete pad at grade.
 6. Acceptable Cleanouts: 58860 by Josam.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas of Work, and that existing conditions will not adversely affect execution or quality of work.
 1. Report existing conditions detrimental to completion of Work.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection:
 1. Protect utility lines, storm drainage lines, site improvements, and underground utilities.
 - a. Stake location of underground utilities and avoid trenching in those areas beyond safe limits.
 - b. Hand excavate trenches where required to avoid utility line damage.
- B. Protect existing utility systems, paving, walks, curbs, and other site improvements from damage during construction operations.
- C. Excavate trenches to depths required to achieve specified slope for drain lines.
- D. Stockpiling: Stockpile and protect excavated trench soil for inspection and backfilling in designated locations on-site.

3.3 INSTALLATION – GENERAL

- A. Install PVC pipe sleeves under walks and paving as indicated in Drawings, or as required to provide pipe access under Work.
- B. Fill excavated trenches with bedding aggregates to height required for 0.5 percent continuous slope in drain tubing, drain pipe, and storm sewer pipe, unless otherwise indicated in Drawings
- C. Cover exposed ends of drain and sewer lines during construction work to protect lines from debris.

3.4 INSTALLATION – STORM SEWER AND NON-PERFORATED FOUNDATION DRAIN PIPE

- A. Install bedding aggregate 4 inches thick in trench and excavate bedding for base of pipe and pipe bells.
- B. Install drain system in sizes and locations indicated in Drawings with ells, tees, wyes, couplers, and end plugs as required.
- C. Extend storm sewer drain lines to storm sewer catch basins, drain ditches, or holding basins.
- D. Pressure test non-perforated lines prior to haunching.
- E. Install haunching aggregate to spring line of pipe.
- F. Install initial backfill aggregate to at least 6 inches over pipe, tamp, and vibrate to required density.
- G. Install location tracer wire over non-metallic pipe.
- H. Backfill and compact subsequent lifts in accordance with Section 312000, "Earth Moving."

3.5 INSTALLATION – PERFORATED DRAIN PIPE

- A. Install geotextile filter fabric on trench bottom and lap fabric edges and ends 12 inches minimum.
- B. Install drainage aggregate 4 inches thick on top of filter fabric.
- C. Install perforated pipe systems in sizes and locations indicated in Drawings with ells, tees, wyes, couplers, and end plugs as required.
- D. Continue perforated pipe to non-perforated pipe distribution lines.
- E. Install perforated pipe at 1 percent continuous slope.

SUBDRAINAGE SYSTEM

- F. Install drainage aggregate to spring line of pipe and tamp in place.
- G. Install drainage aggregate to 6 inches over and around pipe and tamp and vibrate.
- H. Pull filter fabric over drainage aggregate, lap fabric edges 12 inches minimum and tie loose edges of fabric with 18 gage tie wire.
- I. Install location tracer wire over non-metallic pipe.
- J. Backfill and compact subsequent lifts in accordance with Section 312000, "Earth Moving."
- K. Solvent weld perforated PVC drain pipe joints in accordance with ASTM D 2855.

3.6 INSTALLATION – NON-PERFORATED DRAIN TUBING

- A. Install geotextile filter fabric on trench bottom and lap fabric edges and ends 12 inches minimum.
- B. Install drainage aggregate 4 inches thick on top of filter fabric.
- C. Install perforated pipe systems in sizes and locations indicated in Drawings with ells, tees, wyes, couplers, and end plugs as required.
- D. Continue perforated pipe to non-perforated pipe distribution lines.
- E. Install perforated pipe at 1 percent continuous slope.
- F. Install drainage aggregate to spring line of pipe and tamp in place.
- G. Install drainage aggregate to 6 inches over and around pipe and tamp and vibrate.
- H. Pull filter fabric over drainage aggregate, lap fabric edges 12 inches minimum and tie loose edges of fabric with 18 gage tie wire.
- I. Install location tracer wire over non-metallic pipe.
- J. Backfill and compact subsequent lifts in accordance with Section 312000, "Earth Moving."
- K. Solvent weld perforated PVC drain pipe joints in accordance with ASTM D 2855.

3.7 FIELD QUALITY CONTROL

- A. Exfiltration Testing Non-Perforated Drain Pipe:
 - 1. Provide water test for water exfiltration of installed non-perforated drain pipe.
 - 2. Internal water head must be two feet greater than the top of pipe or two feet greater than ground water level whichever is greater.
 - 3. Exfiltration shall not exceed 50 gallons per inch of internal pipe diameter per mile per day.
 - 4. Maximum internal pressure at the lowest point shall not exceed 25 feet of water or 10.8 psi.
- B. Testing Requirements:
 - 1. Notify Owner 24 hours before conducting tests.
 - 2. Test in large sections before covering.
 - 3. Continue to monitor water test levels during backfilling and compacting.

3.8 ADJUSTING AND CLEANING

- A. Repair or replace defective lines and system components.
- B. Excavate and recompact backfill where settlement has caused damage to site improvements.
- C. Replace or repair walks, paving, site, and landscape improvements damaged by backfill settlement.
- D. Remove excess soil materials from paving, walk, and lawn areas as soon as backfilling is completed, and legally dispose of off Owner's property.

END OF SECTION