

SECTION 02010

GEO-TECHNICAL ENGINEERING REPORT

PART 1- GENERAL

END OF SECTION

SECTION 02230

SITE PREPARATION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Work includes but is not limited to the following:
1. Construct and maintain temporary erosion and sedimentation control.
 2. Log and clear site of trees and remove stumps within construction limits.
 3. Remove site landscaping, vegetation, and unwanted materials.
 4. Strip and stockpile Common and Structural fills as necessary to construct improvements.
 5. Grubbing work consisting of removing and disposing of unwanted materials from below the ground surface.
 6. Export and dispose of all stripped material which are either:
 - a. not approved for use, or;
 - b. are excess of quantities required to complete the project.
 7. Protect from harm any trees, vegetation, existing sidewalks, curb and gutter, or other objects selected to remain.
- B. Project is pursuing LEED Credit SSc5.1, “Reduced Site Disturbance: Protect or Restore Habitat”. Project goal is to restore or protect a minimum of 50% of the site area (excluding the building footprint) with native or adaptive vegetation.

1.02 RELATED SECTIONS

- A. Drawings and general provisions of Contract, including and Supplementary Conditions and Division 1 Specification Sections, apply to this section. Coordinate related work specified in other parts of the Project Manual, including but not limited to the following:

1. Section 01011 – Sustainable Building Requirements
2. Section 01800 – Geotechnical Information and Recommendations
3. Section 02231 – Tree Protection and Trimming
4. Section 02300 – Earthwork
5. Section 02930 – Exterior Plants
6. Section 02917 – Soil Preparation

1.03 REFERENCES

- A. Pierce County – Site Development Manual
- B. Pierce County – Road Standards
- C. WSDOT-APWA – 2006 Standard Specifications for Road, Bridge, and Municipal Construction
- D. Standard Plans – WSDOT/APWA Standard Plans for Road, Bridge, and Municipal Construction

1.04 SUBMITTALS

- A. Demolition procedures and operational sequence for review and acceptance by Owner.
- B. Permits for transport and disposal of debris as required.
- C. Product information required for erosion control measures.

1.05 DESCRIPTION

- A. Construct and maintain erosion and sedimentation control in accordance with contract documents and Pierce County requirements. Clear and grub site as indicated. Save and protect from harm any trees, vegetation, or other objects selected to remain. Remove from area to be cleared all other growth unless otherwise indicated or directed.
- B. Project is pursuing LEED SS Prerequisite 1. Implementation of TESC plan is required for all Sustainable Site LEED credits.

1.06 **EXISTING CONDITIONS**

- A. Protection of Existing Improvements
- B. Provide, erect and maintain barricades, coverings, or other types of protection necessary to prevent damage to existing improvements.
- C. Restore any existing improvements damaged by this work to their original condition, as acceptable to Owner's Representative at no additional cost to the Pacific Lutheran University.
- D. Tree protection shall be in accordance with Contract Plans and Section 02231 of these Specifications.
- E. Construct and maintain temporary erosion and sedimentation control plan in accordance with the Contract Documents, Pierce County requirements, and the Pierce County Site Development Manual.

1.07 **OBJECTIONABLE NOISES**

- A. Conform with local governing requirements regarding Noise Control.

1.08 **PEDESTRIAN AND VEHICULAR TRAFFIC**

- A. Maintain vehicular and pedestrian traffic routes:
- B. Ensure minimum interference with roads, streets and adjacent facilities.
- C. Do not close or obstruct streets, fire lanes, sidewalks, alleys or passageways without permission from authorities having jurisdiction.
- D. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.
- E. Obtain all permits required for work within the public right of way. Coordinate all improvements within Pierce County right of way with Pierce County.

1.09 **DIMENSIONS AND LAYOUTS**

- A. The Contractor will be responsible for furnishing, setting and marking all line and location stakes, including offsets and general construction staking. When work requiring control is being performed, all necessary related equipment, supplies and instruments shall be on site. A qualified layout engineer, surveyor, or technical specialist must be assigned to the Contractor's crew for this work. This

equipment and personnel must be available, at no additional cost to the Pacific Lutheran University for the purpose of verifying layout, grades and certifying the accuracy of work on the site.

- B. The Contractor is responsible for preserving all benchmarks and stakes and the replacement of any that are displaced or missing.
- C. The Contractor is responsible for review of all utility purveyor, and City or State records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all utilities at Contractor's own expense.
- D. The Contractor is to notify the Owner's Representative immediately if underground utilities not shown or incorrectly indicated on the Project Documents are encountered.

PART 2 – PRODUCTS

- A. NOT USED – SEE SECTION 02300

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify clearing, grubbing, and site improvement removal may safely and appropriately begin.
- B. Obtain required permits and permission from local governing authorities and Owner prior to commencing work.
- C. Prior to beginning site removals and clearing, meet with Owner's Representative and review all proposed utility layouts on site. Indicate all existing trees, shrubs and landscaping as well as site improvements that will be affected by construction. Coordinate removals of landscape materials with Owner Representative.

3.02 EROSION CONTROL

- A. The implementation of the Erosion Control system and the maintenance, replacement and upgrading of these facilities is the responsibility of the Contractor until all construction is approved. The Temporary Erosion and Sediment Control (TESC) facilities must be maintained in conjunction with all

clearing and grading activities, and in such a manner as to insure that sediment laden water does not leave the site or violate applicable water standards.

1. Contractor shall implement TESC plan to conform to LEED requirements for Sustainable site Prerequisite No. 1, "Construction Activity Pollution Prevention Plan".
- B. The TESC facilities shown on the plans are the minimum requirements for anticipated site conditions. During the construction period, the erosion control facilities installed shall be maintained and upgraded (e.g. additional sumps, relocation of ditches and silt fences, etc.) as needed. Contractor shall pay for all costs associated with the construction, maintenance, phasing, upgrading and removal of the erosion control system throughout project duration.
- C. If during the course of construction, silt laden run-off exceeding standards set forth by the Pierce County Site Development Manual leaves the site or if the clearing and grading or erosion/sedimentation control measures are not maintained, a notice of violation may be issued by Pierce County. All requirements of that notice will be the responsibility of the Contractor and shall be at no extra cost to Pacific Lutheran University.
- D. Access Streets and Roadways: Install construction entrance(s) and provide wheel cleaning stations to clean wheels and undercarriage of trucks before leaving site, as necessary to prevent dirt from being carried onto public streets. If streets are fouled, clean immediately in conformance with Pierce County and all governing requirements and regulations.

3.03 **CLEARING**

- A. Save and protect trees indicated on plans to remain. Protect all off-site trees along adjacent roadways and on surrounding properties.
- B. Log and clear project site within construction limits to construct improvements.
- C. Remove all stumps and associated roots.
- D. Remove growth and underbrush within the clearing limits as required for new construction and as indicated. Perform removal operations in a manner to protect property.

3.04 **STRIPPING**

- A. General: Demo, Clear, Grub or otherwise prepare areas where clearing has occurred to receive construction or other improvements.

- B. Excavate and remove all stumps to a minimum depth of 3'-0" below finish grade.
- C. Strip and remove 12 to 18 inch layer of existing surface soil over entire site, except where noted on plans. Contractor shall assume a 16 inch average depth for stripping.
- D. Where gravel or asphalt parking exist, strip and remove all gravel or topsoil to a minimum depth of 3" below existing grade. Existing gravel and asphalt may be stockpiled for use a structural fill at a later time IF:
 - 1. The engineer and testing agency is notified before work, AND:
 - 2. A proposal has been made to the engineer for the placement, AND:
 - 3. The geotechnical engineer has been provided with, and approved, an alternative section that includes that stockpiled material.
- E. Any stripping removal required over what is mentioned above will be compensated for by Pacific Lutheran University if all of the following occur:
 - 1. The Contractor must not proceed without direction from the Testing Agency and the Owner.
 - 2. Existing conditions must be documented before extra work is started.
 - 3. Methods to calculate volumes of removed extra materials must be agreed upon by the Contractor and the Owner before the commencing work.
- F. Excavate and remove roots larger then 1-1/2 inches in diameter, rocks, boulder, any remaining paving, and the like, as well as other unsuitable materials.
- G. Use only hand methods for grubbing inside the tree protection fence.

3.05 STRIPPING OF ON-SITE MATERIALS TO BE RE-USED

- A. In addition to stripping of existing surface soil, strip and remove and stockpile cut material for reuse on site:
 - 1. Areas to be occupied by the building. Excavate these materials to not less than depth indicated by the plans.

2. Areas to be occupied by paving: Not less than 8-inches below stripped site grade after existing surface soil removal, or subgrade elevation shown on plans, whichever is lower.
 3. Areas to be occupied by landscaping: Not less than 6-inches below finished grade, or per planting soil placement schedule, whichever is lower.
- B. Strip and stockpile on-site excavated material intended to be used as “Structural Fill” per the geotechnical recommendations and in conformance with Section 02300 of these specifications.
 - C. Strip and stockpile on-site excavated material intended for planting use pre soil testing laboratory report and as specified.
 - D. Contractor shall exercise extreme caution not to mix on-site stockpiled materials of topsoil and structural fill during construction.

3.06 SEEDING

- A. Seeding shall be completed per Section 02920. Seeding between July 1 and September 1 may require additional irrigation to grow adequate cover. Contractor is responsible for ensuring adequate growth cover and to prevent erosion no matter when areas are seeded. Mulch is required for slopes greater than 3:1 and shall be provided for all areas seeded between October 15 and April 1. Any seeded areas that fail to establish at least 80 percent cover within one (1) month shall be re-seeded at no additional cost to the Owner. If re-seeding is ineffective, an alternate method, such as sodding, or nets/blankets shall be used at no additional cost to the Owner. Any area that experiences erosion shall be re-seeded and protected by mulch. Seeded areas shall be supplied with adequate moisture, but not to the extent to cause runoff, to establish planting.
- B. Fertilization for Temporary Erosion and Soil Control and final grading plan shall be landscape architects recommendations. Seed bed should be firm but not compacted such that the seeds will not vegetate quickly. Slopes steeper than 3H:1V shall be surface roughened.
- C. Temporary Erosion and Soil Control seeding shall be provided for all disturbed areas to limits of disturbance and not developed with landscape covering per Landscape plans. Seeding shall per Landscape specification. See Section 02920.

3.07 TREE PROTECTION

- A. Tree protection shall be per Section 02231.

3.08 DUST CONTROL

- A. Sprinkle excavated material and access roads as necessary to limit dust to lowest practicable level. Do not use water to extent causing flooding, contaminated run-off and icing.

3.09 DRAINAGE

- A. Keep designated drainage ways open for drainage at all times. Maintain and/or adjust erosion control facilities as required to prevent sediment transport either downstream or offsite. At no time shall more than one (1) foot of sediment be allowed to accumulate within a catch basin, ditch or swale. All catch basins and conveyance ditches shall be cleaned prior to paving. Mud/sediment build-up shall be mechanically removed and the cleaning operation shall not flush sediment-laden water into the downstream system.
- B. Keep open pits and holes caused as a result of demolition work free of standing water.

3.10 DISPOSAL OF MATERIALS

- A. Refuse from clearing, grubbing, and utility removals shall be disposed of by the Contractor at their own expense in a manner consistent with government regulations. In no case shall refuse material be left on the project site, shoved onto abutting private properties, or buried in embankments or trenches on the project site. Debris shall not be deposited in a stream or body of water, any public right of way or upon private property except by written consent of the private property owner. On-site burning is not allowed. Maintain hauling routes clean and free of debris resulting from work of this Section.
- B. Disposal of boulders removed from earthwork operations and utility trenching may be deposited on site IF approved by Engineer, and per Section 2300 of these specifications. Burial of boulders shall be in non-paving and non-building areas. Some boulders may need to be hauled off site as determined by the Contractor at no addition cost to Pacific Lutheran University.

END OF SECTION

SECTION 02231

TREE PROTECTION AND TRIMMING

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes: Protection and trimming of existing trees not designated for removal that interfere with, or are affected by, execution of the Work, whether temporary or permanent construction.
- B. Related Sections:
 - 1. 01011 – Sustainable Building Requirements
 - 2. 01500 – Temporary Facilities and Controls
 - 3. 02230 – Site Preparation
 - 4. 02810 – Irrigation
 - 5. 02917 – Soil Preparation
 - 6. 02930 – Planting

1.02 DEFINITIONS

- A. Existing Trees to Remain and Protect: Existing trees not designated for removal, as indicated on drawings.
- B. Critical Root Zone (CRZ): Area surrounding a tree or group of trees within which the most critical roots are usually found. The CRZ for trees 4 inches or less in caliper shall be defined as an area within a radius of at least five (5) feet from the trunk. The CRZ for trees over 4 inches in caliper shall be an area with a radius from the trunk of at least 1.5 foot for every inch of caliper size.
- C. Caliper: The diameter of a tree. Caliper shall be measured at a height of 6 inches above the ground for up to and including 4 inch caliper trees, and 12 inches above the ground for trees over 4 inch caliper.

- D. DBH: Diameter at breast height as measured at four and one-half feet (4'-6") above the existing grade at the base of the tree.
- E. Tree Protection Zone: Critical Root Zone (CRZ) unless otherwise indicated on drawings.

1.03 REFERENCE STANDARDS

- A. ASNS: *American Standard for Nursery Stock*, ANSI Z60.1 latest edition, published by the American Association of Nurserymen, (AAN).
- B. *Guide for Plant Appraisal*, latest edition, issued by the Council of Tree and Landscape Appraisers.

1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Pre-demolition Photographs or Videotape: Show existing conditions of all existing trees designated on drawings as existing trees to remain and be protected. Submit before work begins.
- C. Qualification Data: For tree service firm and arborist.
- D. Tree Protection Plan: Written schedule from arborist detailing scope, extent, schedule and proposed methods of tree protection and care of trees to remain that interfere with or are affected by construction.
- E. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- F. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the work.

1.05 QUALITY ASSURANCE

- A. Tree Service Firm Qualifications: An experienced tree service firm with a minimum of five (5) years experience that has successfully completed tree protection and trimming work similar to that required for this Project. Firm shall assign an experienced, qualified arborist to Project site during execution of tree protection, trimming, and any approved activities within Tree Protection Zones.

- B. Arborist Qualifications: An arborist certified by ISA or licensed in the jurisdiction where Project is located.
- C. Tree Pruning Standard: Comply with ANSI A300 (Part 1), "Tree Shrub, and Other Woody Plant Maintenance-Standard Practices (Pruning)."
- D. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Project Management and Coordination.
 - 1. Meet with Owner, Landscape Architect, consultants and other concerned entities to review tree protection and trimming procedures and responsibilities before tree protection and trimming operations begin.
 - 2. Review with Landscape Architect the schedule for relocating tree protection fencing during construction phasing.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Planting Soil: as specified in Section 02917 – Soil Preparation.
- B. Temporary Protective Fencing: Chain-Link Fence. Includes posts, braces and mesh that may be used materials, to form a minimum 6-foot high enclosure.
 - 1. Height: 6 feet (includes posts, rails, braces and mesh)
 - 2. Line posts: 1.9 inch OD
 - 3. Terminal and corner posts: 2-3/8 inch OD
 - 4. Top rails: 1-3/8 inch OD
 - 5. Mesh: 2 inch x 2 inch minimum 11 gauge woven chain link
 - 6. Post bases: Minimum 8 x 16 x 8" height concrete piers with sleeves for posts, or approved
 - 7. Tie wires, hog ring ties, and other accessories for a complete fence system
- C. Mulch: As specified in Section 02930 – Planting.

- D. Water: Provided by Contractor.

PART 3 – EXECUTION

3.04 PREPARATION

- A. Notice: Notify all workers, including subcontractors, of the requirements to protect designated trees.
- B. Mulch: Apply six (6) inch thickness mulch at tree protection zones. Do not place mulch within three (3) inches of tree trunks.

3.02 TEMPORARY PROTECTIVE FENCING

- A. Installation: Install chain link fence around trees to remain and protect at perimeter critical root zones or where shown otherwise on drawings, prior to commencement of any Work. Revise tree protection fencing locations as construction progresses when directed to do so on drawings.
 - 1. Install according to ASTM F 567 and manufacturer's written instructions.
 - 2. Receive approval of fence installation from Arborist or Landscape Architect prior to mobilization of the site.
- B. Maintenance:
 - 1. Maintain temporary fence in specified location and in good condition throughout construction period. Repair immediately when damage, regardless of cause of damage.
 - 2. Keep tree protection zones free of weeds and trash.
- C. Removal:
 - 1. Notify Landscape Architect at least five (5) days in advance and obtain approval prior to moving fence for any reason during construction period.
 - 2. Removing protection fence at Substantial Completion.

3.03 PROHIBITED ACTIVITIES

- A. Do not allow the following activities within tree protection zones:

1. Trenching, excavating or grading, except as approved by Landscape Architect.
2. Clearing of vegetation, except by hand and as directed by Landscape Architect.
3. Storage of construction materials, debris, or excavated materials.
4. Movement or storage of any vehicles.
5. Run-off, spillage or dumping of any liquid or solid materials.
6. Ponding, eroding, or excessive wetting.
7. Foot traffic, except as approved by Landscape Architect.
8. Fires.
9. Any other activities that may cause soil compaction or damage to tree roots, trunk or limbs.

3.04 **TREE PRUNING**

- A. Notify: When construction operations will unavoidably affect trees to remain and pruning becomes necessary, notify Landscape Architect at least five (5) working days in advance of commencing such operations.
- B. Schedule:
 1. Arborist to be present during any tree pruning.
 2. Tree service firm to conduct all tree pruning activities.
- C. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
- D. Cut branches with sharp pruning instruments; do not break or chop.
- E. Chip removed tree branches and dispose of off-site.

3.05 WATERING

- A. Water trees during dry season as directed by Landscape Architect, particularly if root removal has occurred.
 - 1. Use a slow drip or soaker hose to apply five (5) gallons of water per caliper inch per week over tree protection zone until completion of construction. Adjust watering to compensate for weather to maintain proper moisture levels.

3.06 TREE REPAIR AND REPLACEMENT

- A. Repair: Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
- B. Removal: Designated trees to remain and protect that die or are damaged during construction operations and that arborist determines are incapable of restoring to normal growth pattern shall be removed. If Landscape Architect assesses existing trees and finds they have failed to fully foliate or conifers lacking new growth in the spring following completion of construction operations may be presumed to have been lost due to construction operations.
- C. Replacement Trees:
 - 1. Provide, plant and maintain new 4 inch caliper trees of same species as removed or of species named by Landscape Architect, and as specified in Section 02930 – Planting.

3.07 AERATION

- A. Aerate surface soil within critical root zones of existing trees if compacted during construction and directed by Landscape Architect. Do not aerate within 36 inches of trunk. Auger 2 inch diameter holes a minimum of 12 inches deep at 36 inches on center. Backfill holes with an equal mix of augured soil and sand.

3.08 PAYMENT FOR DAMAGE

- A. Assessed damages:
 - 1. For damages to trees designated to remain: Pay assessment, for damages to the crown, trunk or root system of any tree to remain, that are the result of the Contract's failure to protect and/or maintain such

tree if the Owner elects to retain the tree and hold the Contractor liable for compensation.

2. Pay assessed damages for the difference in dollar value between damaged tree and its replacement.
3. The dollar value of damages will be determined by a certified arborist and in accordance with the *Guide for Plant Appraisal*, authored by the Council of Tree and Landscape Appraisers.
4. Assessed damages will be deducted from payment due to Contractor.

3.09 **DISPOSAL OF WASTE MATERIALS**

- A. Burning is not permitted.
- B. Disposal: Remove excess material and debris from Owner's property.

END OF SECTION

SECTION 02300

EARTHWORK

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Work includes but is not limited to the following:
1. Layout of project per plans.
 2. Accomplishing indicated and required stripping, excavation, filling, compaction, subgrade preparation, rough and finish grading, and the like.
 3. Removing materials from the site which are either:
 - a. not approved for use, or;
 - b. are in excess of that required.
 4. Importing required materials.
 5. Utility Trenching

1.02 RELATED SECTIONS

- A. Drawings and general provisions of Contract, including and Supplementary Conditions and Division 1 Specification Sections, apply to this section. Coordinate related work specified in other parts of the Project Manual, including but not limited to the following:
1. Section 01800 – Geotechnical Information and Recommendations
 2. Section 02230 – Site Preparation
 3. Section 02510 – Water Distribution System
 4. Section 02530 – Sanitary Sewer System
 5. Section 02630 – Storm Drainage System

6. Section 02741 – Bituminous Concrete Paving
7. Section 02751 – Cement Concrete Paving, Curbs and Sidewalks
8. Section 02191 – Soil Preparation
9. Section 02930 – Exterior Plants

1.03 REFERENCES

- A. Geotechnical Engineering Report: KPLU and Department of Development and Communications Building, April 10, 2006
- B. Pierce County: Site Development Manual, Latest edition
- C. WSDOT/APWA Construction 2006 Standard Specifications for Road, Bridge, and Municipal
- D. Standard Plans Construction WSDOT/APWA Standard Plans for Road, Bridge and Municipal
- E. PLW Parkland Light and Water Standards and Specifications for construction
- F. PCWW Pierce County Water and Wastewater Standards and Specifications for construction.
- G. ASTM D422 Standard Test Method for Particle-Size Analysis of Soil
- H. ASTM D1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/cu ft).
- I. ASTM D2922 Standard Test methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
- J. ASTM D3017 Standard Test methods for Water Content of Soil And Rock in Place by Nuclear Methods (Shallow Depth)
- K. ASTM 1999 Annual Book of ASTM Standards

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Submit soil samples for review and approval by Testing Agency prior to placement.
- C. Gradation and Test Results for Fill for Utilities: Conform to applicable section of WSDOT-APWA, PLW and PCWW Standards.

1.05 QUALITY ASSURANCE

- A. Testing:
 - 1. The Owner's Testing Agency will take samples and perform moisture content, gradation, compaction, and density tests during placement of backfill materials to check compliance with these specifications.
 - 2. The Contractor shall remove surface material at locations designated by the Testing Agency and provide such assistance as necessary for sampling and testing.
 - 3. The Testing Agency may direct the Contractor to construct inspection trenches in compacted or consolidated backfill to determine that the Contractor has complied with these specifications. Testing by the Testing Agency does not relieve the Contractor of his responsibility to determine to his own satisfaction when and if his work meets the specification.
 - 4. Test will be made by the Testing Agency for the following items:
 - a. Moisture content – ASTM D3017
 - b. Gradation – ASTM C136
 - c. Density in-place – ASTM D2922 and D3017 or equivalent.
 - d. Moisture – density relationships – ASTM D1557

PART 2 – PRODUCTS

2.01 GRAVEL BACKFILL FOR PIPE BEDDING

- A. Rigid pipe bedding shall conform to Section 9-03.15 of WSDOT-APWA.

- B. Flexible pipe bedding shall conform to Section 9-03.16 of WSDOT-APWA.
- C. Pea Gravel (required for Sewer Pipe, refer to Section 02530).

2.02 **GRAVEL FOR TRENCH BACKFILL**

- A. Gravel for trench backfill shall conform to WSDOT-APWA Section 9-03.19

2.03 **COMMON FILL**

- A. All fill placed under landscaped and vegetated areas to specified subgrade elevations shall be “common fill” as defined herein, unless specified otherwise for particular applications.
- B. Common fill shall be imported clean granular fill or on-site material that has been accepted by the Testing Agency and Landscape Architect for use as common fill.
- C. On-site Common Fill shall conform to APWA Section 9-03.14(3) except that the percent by weight passing the U.S. No. 200 sieve shall be based on the portion passing the $\frac{3}{4}$ inch sieve, and 100 percent by weight passing the 8 inch square sieve, or as approved by the geotechnical engineer or testing agency.
- D. Imported Common Fill shall conform to the requirements of on-site Common Fill except that the percent by weight passing the U.S. No. 200 sieve shall not exceed 5% based on the portion passing the $\frac{3}{4}$ inch sieve.

2.04 **STRUCTURAL FILL**

- A. All fill placed under footings, slab-on-grade floor, roadways, sidewalks, walkways, backfill behind subgrade walls, and all other paved areas shall be “structural fill” as defined herein, unless specified otherwise for particular applications.
- B. Structural fill shall be imported clean granular fill or on-site material that has been accepted by the Testing Agency for use as structural fill.
- C. Imported Structural Fill shall consist of well-graded sand and gravel materials free of organic material, debris and other deleterious material, and shall conform to the following gradation requirements:

U.S. Standard Sieve Size	Percent Passing by Dry Weight
6 ¹ inches square	100
3 ² inches square	70 – 100
No. 4	50 – 80
No. 40	30 max.
No. 200	5 max.

¹The maximum particle size shall be limited to 4 inches when select borrow is used within 1.5 feet of final grades. Structural fill material shall contain not more than 1% organic material by weight.

- D. Structural Fill to be used within 4 inches below floor slabs shall not contain more than 3 % by weight passing the U.S. No. 200 sieve based on the portion passing the ¾ inch sieve.
- E. Structural Fill to be used as drain material behind subgrade walls shall slabs shall not contain more than 3% by weight passing the U.S. No. 200 sieve based on the portion passing the ¾ inch sieve.

2.05 APPROVAL OF FILL MATERIAL

- A. All material which is proposed to be used as fill and backfill, whether native or import, shall be graded and tested for moisture content and compactability. Gradation and test results shall be submitted for review and approved by the Testing Agency prior to placement. The Contractor shall note the geotechnical report by AMEC Earth and Environmental. It is the Contractor’s responsibility to review existing conditions, soils report, and soil types prior to bidding to determine suitability of existing soils for re-use as fill.
- B. The Contractor has the option to use on-site material for fill or backfill; however, use of on-site material must meet specification and is subject to the approval of the Testing Agency. The use of on-site material may require significant additional effort as compared to import fill material in terms of proper moisture conditioning and compactive effort necessary to obtain the required density, to achieve a stable non-yielding subgrade, and to meet the compaction requirements of Section 3.06. Additional measures can include but are not limited to scarifying, aeration, or watering.

2.06 CAPILLARY BREAK

- A. Material for capillary break under concrete slabs on grade shall conform to Section 9-03.13 of WSDOT-APWA.

2.07 TRACER TAPE

- A. Utility pipe tracer tape shall be detectable below ground surface, color coded, with utility name printed on tape. Conductive warning tape required over all sewers, drainage, water and irrigation pipe. Tape shall be manufacturer’s standard permanent, bright-colored, continuous printed plastic tape, aluminum backed, intended for direct-burial service. Tape shall be not less than 6” wide x 4 mils thick.

Tape Schedule:

<u>Piping</u>	<u>Color</u>	<u>Wording</u>
Domestic Water	Blue	Caution Domestic Water
Irrigation Water	Blue	Caution Irrigation Water
Storm Water	Green	Caution Storm Water
Sanitary Sewer	Green	Caution Sanitary Sewer

PART 3 – EXECUTION

3.01 PERMITS

- A. Obtain all required permits and inspections. Pay nay and all fees or costs for permits and inspections.

3.02 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. All work shall conform to the Contract Documents and Pierce County requirements.

3.03 STABILIZATION OF EXCAVATIONS AND TRENCHES

- A. The Contractor shall exercise sound engineering and construction practices for excavations and trenches and maintaining them so that no damage will occur to any foundation, structure, pole line, pipe line, or other facility because of sloughs or slopes, or from any other cause. If, as a result of the excavation or trenching, there is disturbance of the ground, which may endanger other property or require repair, the Contractor shall take remedial action at no expense to Pacific Lutheran University.
- B. The Contractor shall provide dewatering, shoring or other types of stabilization, in addition to the shoring required for safety by State codes, as required to maintain the integrity of the trench or excavation and protect nearby existing utilities and structures. All earthwork shall conform to the Washington

Administrative Code (WAC) 296-155 requirements for Excavation, Trenching, and Shoring. If the Contractor elects to provide stabilization by open pit excavation or flatter side slopes, no additional compensation will be made for the work including excavation, select backfill material, backfilling, and protection or existing facilities.

3.04 **SITE GRADING**

- A. General: Required contours and elevations are indicated and noted on Drawings; should indicated figures conflict with actual condition, notify Owners Representative and obtain direction before proceeding with grading of area in conflict.

3.05 **STRIPPING**

- A. Strip and remove existing surface soil, roots, organic debris, and unsuitable material from areas to be developed per Section 02230-3.04 Stripping.
- B. The Testing Agency shall approve final stripping depth.
- C. Haul and dispose of materials off-site in a legal manner.

3.06 **GRADING**

- A. Shape surface of site to grades and contours as noted.
- B. Remove debris, oversized rocks, vegetation, and other organic matter from material to be re-used as specified in Sections 2.03 and 2.04.
- C. Control grading around building areas and building excavations at all times to prevent flow of water into excavated areas and ponding adjacent to building. Slope all final grades to drain away from buildings.
- D. For paving and other site improvements, shape subgrades to lines, grades, and cross sections indicated. After design grade is reached, exposed soils shall be scarified to a depth of at least 6 inches; moisture conditioned if necessary, and then compacted to the required relative minimum. Any soft soils encountered shall be moisture conditioned and recompact or excavated and replaced with compacted fill, whichever is necessary to reach the required compaction. Excavate and remove rock encountered to a depth of 6" below finish subgrade elevations. Bring low areas up to required elevations with approved fill materials.

3.07 SUBGRADE

- A. Grading shall conform to Section 2-06 of WSDOT-APWA.

3.08 EXCAVATION

- A. Provide excavation of whatever nature required for construction of the work; verify character, quality, and disposition of material to be excavated prior to commencing. Blasting is not permitted. Keep excavations free from water while construction is in progress.
- B. The Contractor must not proceed without direction from the Owner's representative.
- C. Existing conditions must be immediately documented by the Contractor and Owner's representative before extra work is started.
- D. Methods to calculate additional compensation must be agreed upon by the Contractor and the Owner prior to commencing work of the work shall be performed per article 7 of the General and Supplementary conditions of the Contract, after the Owner's authorization, until and agreement is reached.
- E. All earthwork for utilities shall conform to the Washington Administrative Code (WAC) 296-155 requirements for Excavation, Trenching and Shoring.
- F. Contractors are advised that they are required to comply with the Washington Industrial Safety and Health Act (WISHA) standards pertaining to excavations.
- G. The principle reference is the Washington Industrial Safety and Health Act's Excavation, Trenching, and Shoring standards Chapter 296-155 Part N, which became effective December 1, 1999 and is available on the WISHA website at http://lni.wa.gov/wisha/rules/construction/HTML/296-155N_1.htm#WAC296-155-655.
- H. Contractors should take particular note of these provisions in the WISHA standards.

3.09 EXCAVATION FOR UTILITIES

- A. Trench excavation shall conform to Section 7-08 and 7-10 of WSDOT-APWA Parkland Light and Water and PCWW Standards. Grade and smooth bottoms of trenches to provide uniform bearing and support for each length of utility pipe. All trenches shall be excavated to true and smooth bottom grades and in

accordance with the lines given by the engineer. Remove rocks, boulder, and similar material to provide a minimum 6-inch clearance under and around all portions of the pipe. Placement of bedding material shall precede installation of pipe. This shall include the necessary leveling of the native trench bottom or top of foundation material as well as placement and compaction of required bedding material to a uniform grade so the entire length of pipe will be supported on a uniformly dense and non-yielding foundation.

- B. Catch basins, manholes and similar structures (as indicated): Excavate to furnish a minimum of 12 inches between sides of excavation and outer surfaces of structure. Take care to excavate to exact depths required; fill over excavation with compacted gravel for trench backfill.
- C. Boulders less than 24" minimum diameter shall be included in the contract price. Boulders in excess of 24" in minimum diameter will be compensated for by the school district if all of the following occur:
- D. The Contractor must not proceed without direction from the Owner's Representative.
- E. Existing conditions must be immediately documented by the Contractor and Owner's Representative before extra work is started.
- F. Methods to calculate additional compensation must be agreed upon by the Contractor and the Owner prior to commencing work shall be performed per article 7 of the General and Supplementary conditions of the Contract, after the Owner's authorization, until an agreement is reached.

3.10 OVER-EXCAVATION FOR BUILDING FOOTINGS

- A. In all locations of in-place native soils, over-excavation below the building footprint and replaced with compacted structural fill per section 02300.
- B. Remove all excavated material at Contractor's expense. Legally dispose of all excess material off site immediately upon excavation; no stockpiling of this excavated soil is allowed on site.

3.11 BACKFILL

- A. Fill soils shall consist of imported fill as specified herein and approved by the Testing Agency. The Testing Agency shall evaluate and/or test proposed imported material for its conformance with specifications prior to deliver to the site. The Contractor shall notify the Testing Agency 72 hours prior to importing fill to the site.

- B. Prior to start of construction, and as often as needed during construction, the Owner's Testing Agency shall determine maximum dry density and OMC of borrow soils using test method ASTM D 1557. During construction, fill from other source(s) shall not be placed until the Testing Agency determines maximum dry density and OMC for each new borrow source or change in soil type.
- C. During construction, Owner's Testing Agency shall measure field compaction using a nuclear densometer (ASTM method D 2922) or other method approved by the Owner's geotechnical engineer, and advise the Contractor when acceptable compaction is achieved.
- D. Moisture Conditioning:
 - 1. Use soil moisture content to determine if soils are in suitable condition for compaction.
 - 2. As needed, dry soils by spreading in good weather and disking to promote aeration prior to compaction. Protect stockpiles with plastic sheeting in wet weather. Use select (non-silty; less than 3 % by weight passing the U.S. No. 200 sieve based on the portion passing the ¾ inch sieve) non-silty import soils during wet weather construction.
- E. At the end of each day's work, slope fill surface to shed water and seal the surface by compaction with a smooth drum roller. Remove soft or wet surficial soils prior to start of new fill placement.

3.12 FILL PLACEMENT AND COMPACTION

- A. Prepare subgrade by removing soft, wet, or organic materials prior to new fill placement. Compact subgrade soils to a dense non-yielding condition prior to placement of structural fill. All areas that are not receive compacted fill shall be field reviewed by the Testing Agency prior to and during the placement of new fill.
- B. Place fill for compaction: loose lift thickness shall not exceed 8 inches for structural fill compacted with roller. Loose lift thickness shall not exceed 6 inches for compaction with hand vibrators. Reduce lift thickness or increase compactive effort as needed to achieve specified density.
- C. Remove boulders and/or cobbles greater than 6 inches from soil to be used as structural fill.

- D. Compact each lift to a dense non-yielding condition. Fill which exhibits “pumping” or excessive rutting under construction traffic may be rejected at Owner’s option.
- E. Compact each layer to a minimum relative compaction as listed in this Section. Relative compaction is defined as the ratio of the in-place soil dry density to the maximum dry density as determined by the ASTM D1557 test method.
- F. The Testing Agency shall observe placement of compacted fill and conduct in-place field density tests on the compacted fill to check for adequate moisture content and the required relative compaction. Where less than the required relative compaction is indicated, remove and replace the substandard soil or apply additional compactive effort and moisture-condition the soil as necessary until the relative compaction as specified in this Section is attained. Provide level testing pads for the conducting of field density test by the Testing Agency.
- G. Compaction Requirements: Compact all fill and backfill to prevent subsequent settlement. Water settling or jetting is not permitted as a means of compaction. Furnish heavy rollers or compactors except as follows:
- H. Use pneumatic hand tampers for trenches and area not accessible to heavy equipment.
- I. Compact areas within 5’ of footings, foundations and walls with and vibrators.
- J. Required compaction: Compact fill and backfill to the following minimum relative compaction (percentage of maximum dry density determined in accordance with ASTM D1557):

<u>Locations</u>	<u>Required Minimum Relative Compaction</u>
Footing subgrade or bearing pad	95%
Footing and stemwall backfill	90%
Slab-on-grade floor subgrade and subbase	90%
Concrete Sidewalk subgrade	90%
Asphaltic pavement base and subbase	95%
Asphaltic pavement subgrade (upper 2 feet)	95%
Asphaltic pavement subgrade (lower 2 feet)	90%

3.13 BACKFILLING FOR UTILITIES

- A. Bedding for utility pipes: Properly place material in trenches in accordance with the depths shown on the plans. Do not disturb sides of trenches. Compact and

shape material to conform to the barrel of the pipe to ensure continuous firm bedding for full length of pipe.

- B. Pipe zone backfill shall be placed in loose layers and compacted to 95% maximum density. Backfill shall be brought up simultaneously on each side of the pipe to the top of the pipe zone. In backfilling the pipe zone bedding Contractor shall use compactive measures such as vibratory plate compactor or hand implements to protect the pipe from any damage or shifting. Backfill above the pipe zone shall be accomplished in such a manner that the pipe shall not be shifted out of position nor damaged by impact or overloading.
- C. Backfilling of trenches in the vicinity of structures shall not take place until the cement in the masonry has become thoroughly hardened. Walking on the pipe shall not be allowed until at least one foot of earth has been placed upon it.
- D. Trench backfill shall be spread in uniform layers and be compacted by mechanical tampers. The backfill materials shall be placed in successive layers not exceeding 6 inches in loose thickness, unless otherwise approved by the Testing Agency. Compact each layer in accordance with this section.
- E. Compaction control tests shall be performed as specified in this Section. Contractor shall provide trench box or safe side slopes to enable testing as requested, and in all cases for trenches more than 4 feet below grade.
- F. If the required compaction density has not been obtained, the Contractor shall remove the backfill from the excavation, and recompact after adjusting moisture content of the backfill, reduced lift thickness, using heavier compaction equipment and/or more passes, until the required density is achieved.

3.14 **FINISH GRADING**

- A. General: Remove all concrete, rock (cobbles and boulders), rubble and debris larger than 2 inches from surface. Finish grades flush with adjacent surfaces unless indicated otherwise. Finish grades adjacent to sidewalks shall be 1 inch below elevation of sidewalk unless noted otherwise. Execute any fine grading as may be necessary or incidental to all subsequent work.
- B. Grading Tolerance: Finish grades shall match contours and elevations shown within 1/10 foot.
- C. Approval of Finish Grading: Finish grades will be inspected and subject to approval by Owner's Representative. Contractor shall correct work not approved by Owner's Representative at no additional cost or time.

- D. Protection of Finished Surfaces: Allow no heavy objects to be moved over finish grade surfaces. At no cost to Owner, repair any ruts or holes in finished surfaces, and any obstructions to positive drainage. Contractor shall repair all areas showing settlement.

END OF SECTION

SECTION 02510

WATER SYSTEMS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Work includes but is not limited to the following:
 - 1. Furnishing and installing the building domestic and fire service line, and associated appurtenances. Coordinate location of extension into building with fire sprinkler and plumbing contractor.
 - 2. Furnishing and installing waterlines, gate valves, check valves, fittings and vaults.
 - 3. Furnishing and installing fire hydrant assemblies, concrete fire hydrant pad, and associated guard posts.
 - 4. Connections to exiting water mains.
 - 5. Connections to building piping and new fire sprinkler systems.

1.02 RELATED SECTIONS

- A. Coordinate related work specified in other parts of the Project Manual, including but not limited to following:
 - 1. Section 02300 – Earthwork

1.03 REFERENCES

- A. Parkland Light and Water (PL&W) Standard Plans and Specifications
- B. Pierce County Road Standards
- C. WSDOT-APWA 2006 Standard Specifications for Road, Bridge and Municipal Construction.
- D. Standard Plans WSDOT/APWA Standard Plans for Road, Bridge, and Municipal Construction.

- E. UPC Uniform Plumbing Code
- F. AWWA American Water Works Association Standards

1.04 PERMITS

- A. Parkland Light and Water District fees, including basic engineering, legal and construction services, and meter charges will be paid by the Owner. All other permits, fees, abandonment fees and inspections are to be obtained, paid for and scheduled by the Contractor.

1.05 DIMENSIONS AND LAYOUTS

- A. See Section 02230-1.7

1.06 CONTRACTOR REQUIREMENTS

- A. All Contractors installing, inspecting, servicing or maintain fire protection systems shall be licensed by the State Director of Fire Protection Services in accordance with Chapter 18.106 RCW.
- B. Contractor is responsible for coordinating water main and fire system work on site with PL&W.

PART 2 – PRODUCTS

2.01 PIPE AND FITTINGS

- A. Pipe smaller than 3 inches in diameter:
 - 1. Polyvinyl chloride (PVC) plastic pipe per AWWA 0901 & ASTM 1248 and as approved by PL&W. Fittings of same material as pipe.
 - 2. Copper tubing Type K. Fittings of same material as pipe.
- B. Pipe three (3) inches in diameter and larger:
 - 1. New, ductile iron pipe manufactured in accordance with the requirements of AWWA C151 with a cement-mortar lining, conforming to ANSI Standard A21.51 (AWWA C-151). Pipe thickness shall be Standard Thickness Class 52.

2. Joints shall be flanged, mechanical or push-on, unless otherwise noted. Pipe with push-on joints shall be furnished with a single rubber ring gasket. All gaskets, including MJ shall be lubricated to affect the seal. Pipe with mechanical joints shall be furnished with a mechanical joint of the stuffing box type, including rubber gasket, cast-iron gland, and tee-head bolts and nuts to effect the seal. All joints shall conform to ANSI Standard A21.11 (AWWA C-111). Flanged joints shall conform to ANSI Standard A21.5 (AWWA C115).
3. Ductile iron fittings shall be short body for pressure rating of 150 psi, unless otherwise noted. Metal thickness and manufacturing process shall conform to applicable portions of ANSI Standard A21.10, A21.11, A21.53, B16.2m and B16.4.

2.02 BEDDING AND BACKFILL MATERIAL

- A. Bedding material shall be clean granular well graded sand and gravel material conforming to Parkland Light and Water Standards. Gradation of Material shall be as follow:

U.S. Standard Sieve Size	Percent Passing by Dry Weight
¾ inch square	100
No. 200	0 – 3

Minimum sand equivalent of 50.

- B. Backfill material shall conform to Section 02300 and PL&W Standards.

2.03 VALVES

- A. Gate valves shall be per Parkland Light and Water Standards. Gate valves shall conform to AWWA 509.
- B. Install valves per PL&W Standards.
- C. Valve boxes shall conform to Section 9-03.3(4) of WSDOT-APWA specifications Parkland Light and Water approved manufacturer. Unless otherwise noted on the plans, install valve boxes on all buried valves. Provide cast iron extensions as necessary conforming to Parkland Light and Water requirements.

2.04 FIRE HYDRANTS

- A. Fire Hydrants shall conform to Parkland Light and Water Standards and AWWA C502. Manufactures shall be Clow, Mueller or Dresser, with MJ end. Threading on pumper nozzle per local Fire District Standards.

- B. Fire hydrant guard posts and valve marker post shall be in accordance with Parkland Light and Water Standards.

2.05 FIRE DEPARTMENT CONNECTIONS

- A. The Fire Department Connection shall be equipped with 2 – ½ inch female swivel connection(s). They shall be provided with “Knox” locking caps (order forms available at the local fire district).

2.06 BUILDING CONNECTIONS

- A. Service connections shall be per WSDOT/APWA Section 9-30.6.
- B. Fire protection connections shall be in accordance with NFPA-13 and NFPA-20.
- C. Fire Department Connection (FDC) shall be per Parkland Light and Water and Pierce County Fire Department.
- D. Coordinate with building sprinkler connections shown on mechanical drawings and as constructed by the building sprinkler installer.

2.07 OTHER MATERIALS

- A. Concrete for Thrust Blocks shall conform to PL&W standards and at minimum shall be Class 5 (1 – ½), poured in place.
- B. Plastic Foam for pipe protection: Federal spec. PPP-C-1752B Type 1, Class 2.
- C. Valve Marker Post shall be per Parkland Light and Water or approved.
- D. Utility pipe tracer tape shall be detectable below ground surface, color coded, with utility name printed on tape. Conductive warning tape required over all sanitary sewer and water pipe. Tape shall be manufacturer’s standard permanent, bright-colored, continuous printed plastic tape, aluminum backed, intended for direct-burial service. Tape shall be not less than 6” wide x 4 mils thick.

<u>Piping</u>	<u>Color</u>	<u>Wording</u>
Domestic Water	Blue	Caution Domestic Water
Irrigation Water	Blue	Caution Irrigation Water

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that trench is ready to receive work, and excavations, dimensions, and elevations are as indicated on Drawings.
- B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATIONS

- A. All trenching shall conform to the Washington Administrative Code (WAC) 296-155 requirements for Excavation, Trenching and Shoring.
- B. Install trench excavation, foundation bedding, and backfill for water mains in accordance with WSDOT-APWA Standard Specification Section 7 – 10, unless otherwise specified by **Parkland Light and Water District**.
- C. Boulders and oversize material may be encountered during trench excavation and shall be disposed of per section 02230 and 02300 of these specifications.
- D. Pipe will have bedding unless otherwise noted.
- E. Join pipe sections in such a manner as not to damage the lining or coating. Any damage to the lining or coating shall be repaired by the Contractor and the Contractor's expense. All touch-up coating for outside watermain pipe accessories shall be made with epoxy coal tar. Inside parts of the pipe accessories shall be touched up with asphaltic varnish, Royston Roykote #612XM, or approved equal. The method of pulling or jacking the pipe home must allow both vertical and horizontal movement of the pipe for the protection of the gasket.
- F. Fire service pipe terminations shall be within 5 feet from building. Provide temporary plug for piping extension into building. Coordinate with work of Division 15.
- G. Install pipe, fittings and appurtenances in accordance with Section 7-11 of WSDOT-APWA and in accordance with manufacture's instructions.
- H. Install tracer tape per manufacturer's direction above all non-metallic water lines.

- I. Fire protection piping shall be installed by a licensed Contractor in accordance with NFPA-13 and NFPA-20. All piping shall be installed straight, true and plumb. Minimum depth of bury shall be four (4) feet.

3.03 CONNECTIONS TO EXISTING MAINS

- A. Connections to existing mains shall be in accordance with WSDOT-APWA Section 7-11.3(9)A and shall be approved by Parkland Light and Water.
- B. Flush existing lines prior to connection in accordance with WSDOT-APWA Section 7-11.3(12).

3.04 HYDRANT INSTALLATION

- A. Hydrants including guard posts shall be installed per Parkland Light and Water.
- B. Hydrants when installed must be covered in a burlap bag or other suitable covering until accepted by PL&W and placed in service.

3.05 CONCRETE BLOCKING

- A. Install thrust blocking in accordance with the plans and per PL&W standards.

3.06 TESTING AND DISINFECTION

- A. Pressure test pipe in accordance with PL&W and Section 7-11.3(11) of WSDOT-APWA.
- B. Disinfection of water lines shall be in accordance with Parkland Light and Water Specifications.
- C. After disinfection, dispose of all contaminated water into the sanitary sewer or neutralize prior to discharge into the storm drainage system. Accomplish flushing of the water mains in such a manner as not to cause flooding or downstream property damage.
- D. Fire protection piping and valves shall be flushed and tested in accordance with NFPA 13 and 24 and local Fire Marshall requirements.

END OF SECTION

SECTION 02530

SANITARY SEWER SYSTEM

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Work includes but is not limited to the following:
 - 1. Furnishing and installing cleanouts and sanitary sewer piping.
 - 2. Connection to existing sanitary sewer system.
 - 3. Coordination with Pierce County Public Works and Utility.

1.02 RELATED SECTIONS

- A. Drawings and general provisions of Contract, including and Supplementary Conditions and Division 1 Specification Sections, apply to this section. Coordinate related work specified in other parts of the Project Manual, including but not limited to the following:
 - 1. Section 02300 – Earthwork

1.03 REFERENCES

- A. Pierce County Utilities Standard Specifications and Details
- B. Pierce County Wastewater Division (PCWW)
- C. Pierce County Development and Road Standards
- D. WSDOT/APWA 2006 Standard Specifications for Road, Bridge, and Municipal Construction
- E. Standard Plans WSDOT/APWA Standard Plans for Road, Bridge, and Municipal Construction

1.04 PERMITS

- A. All permits, fees and inspections are to be obtained or scheduled by the Contractor at his expense.

1.05 DIMENSIONS AND LAYOUTS

- A. See Section 02230 – 1.7.
- B. The Contractor is responsible for preserving all benchmarks and stakes and the replacement of any that are displaced or missing.
- C. The Contractor is responsible for review of all Engineers' records relative to the existing underground utilities. The Contractor is responsible for avoiding damages to these facilities and shall restore all utilities at its own expense.
- D. The Contractor is to notify the Owner's Representative immediately of underground utilities encountered, which are not shown on the Engineer's record.

PART 2 – PRODUCTS

2.01 GENERAL

- A. All materials, installation and workmanship shall conform and be in accordance with PCWW District Standards and the latest edition of the WSDOT/APWA Standard specification as amended by the APWA for local governments.

2.02 POLYVINYL CHLORIDE (PVC) PIPE

- A. PVC pipe and fittings shall be JM Ring-Tite or approved equal and shall meet the requirements of ASTM D3034 for SDR 35.
- B. All fittings and accessories shall be as manufactured and furnished by the pipe supplier or approved equal.

2.03 CLEANOUTS

- A. Clean-outs shall conform to the Contract Documents.

2.04 TRACER TAPE

- A. Utility pipe tracer tape shall conform per Section 02300.

2.05 **BEDDING MATERIAL**

- A. Pea gravel shall be placed 4" below the invert to 6" above the top of the pipe. No other bedding material is acceptable.

2.06 **TRENCH BACKFILL**

- A. Native material may be used provided it is free of organic material, contains no rocks larger than 1" in diameter, and is within private property. Trench backfill in the County ROW must conform to the most current adopted County Standards.

PART 3- EXECUTION

3.01 **TRENCHING**

- A. Trenching shall be in accordance with PCWW District Construction Standards and Specifications. Excavation shall be made to alignment, elevation, grade and slope as indicated on the drawings.
- B. Accomplish trenching utilizing equipment with slope and depth control; such as "laser plane control system." so as to insure accuracy in the bottom of the trench and placement of the pipe. No high points above designated invert of calculated trench bottom elevation will be permitted. No sloughing of site material or loose excavated soil will be permitted in trenches.

3.02 **TRENCHES**

- A. Trenches shall be in accordance with PCWW Construction Standards and Specifications.
- B. Keep the trench free from water until pipe is laid and backfilled. Divert all surface water so as not to enter the trench. Entirely remove boulders, rocks, roots, and other obstructions, or cut out to the width of the trench and to a depth of 6" below the elevation of bottom of pipe. Remove and dispose of all loose and excess excavated materials off-site at Contractor's prearranged location.

3.03 **PIPE INSTALLATION**

- A. Install pipe in accordance with PCWW Construction Standards and Specifications.
- B. Make connections to existing sewer lines at locations shown on the drawings.

- C. Install tracer tape per manufacturer's direction above all non-metallic sewer lines.

3.04 BEDDING AND BACKFILLING

- A. Bedding shall be in accordance PCWW Construction Standards and Specifications.
- B. Backfilling shall be in accordance with PCWW Construction Standards and Specifications.

3.05 TESTING

- A. Testing shall be in accordance with PCWW Construction Standards and Specifications. All sewer lines will be subject to television testing for conformance prior to acceptance.

END OF SECTION

SECTION 02630

STORM DRAINAGE SYSTEM

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Work includes but is not limited to the following:
 - 1. Furnishing and installing catch basins and storm drain piping of the type and sizes designated in the plans and specifications.
 - 2. Connection to existing facilities.

1.02 RELATED SECTIONS

- A. Coordinate related work specified in other parts of the Project Manual, including but not limited to the following:
 - 1. Section 02300 – Earthwork

1.03 REFERENCES

- A. Pierce County 2005 Stormwater Management and Site Development Manual
- B. Pierce County Development and Road Standards
- C. WSDOT-APWA2006 Standard Specifications for Road, Bridge, and Municipal Construction
- D. Standard Plans WSDOT/APWA Standard Plans for Road, Bridge, and Municipal Construction

1.04 PERMITS

- A. All permits are to be obtained by Contractor at his expense.

1.05 **DIMENSIONS AND LAYOUT**

- A. See Section 02230 – 1.7.
- B. The Contractor is responsible for preserving all benchmarks and stakes and the replacement of any that are displaced or missing.
- C. The Contractor is responsible for review of all Owners and purveyors records relative to the existing underground utilities. The Contractor is responsible for avoiding damages to these facilities and shall restore all utilities at its own expense.
- D. The Contractor is to notify the Owner's Representative immediately of underground utilities encountered, which are not shown on project plans.

PART 2 – PRODUCTS

2.01 **CONCRETE PIPE**

- A. Concrete pipe less the 12" in diameter shall be ASTM designation C-14, Class 3 with rubber gasket joints.
- B. Concrete pipe 12" in diameter or larger shall be ASTM C-76, Class IV with rubber gasket joints.
- C. Connections to manholes and catch basins shall be by mortar joint. Portland cement joints on pipe are prohibited.

2.02 **POLYVINYL CHLORIDE (PVC) PIPE**

- A. PVC pipe shall conform to Section 9-5.12 of WSDOT-APWA. Pipe shall be ASTM 3034, SDR 35, with rubber gasket joints. PVC pipe may only be used in areas with 2 feet or greater cover.
- B. Connections to catch basins or manholes shall be by a GPK manhole adapter or sand collar.

2.03 **DUCTILE IRON PIPE**

- A. Ductile iron pipe shall conform to AWWA C151 Class 52 with push-on joint. Ductile iron pipe shall be cement mortar lined conforming to AWWA C104.

2.04 **POLYETHYLENE PIPE (CPEP)**

- A. Double walled smooth interior corrugated polyethylene pipe CPEP. Pipe shall meet the requirements of AASHTO M252 Type S for pipe 8 inches in diameter and less, and AASHTO M294 Type S, for pipe 12 inches in diameter and greater. Fittings and coupling for pipe 12 inches in diameter and greater shall be watertight.

2.05 **CORRUGATED PVC PIPE**

- A. Corrugated PVC pipe shall be IPEX Ultra Rib or approved equal double walled smooth interior corrugated PVC Pipe. Corrugated PVC Pipe shall conform to ASTM F794 and shall be watertight.

2.06 **COUPLINGS AND JOINTS**

- A. Tees on existing pipe shall be connected by core drilling and flexible connections.
- B. Pipe to pipe connections shall be made with a flexible gasketed coupling, adapter or coupling-adapter to make a watertight joint. Couplings shall be those manufactured by Romac or Caulder or approved equal.

2.07 **BEDDING AND BACKFILL MATERIAL**

- A. Bedding and backfill material shall conform to Section 02300, and the drawing details.

2.08 **CATCH BASINS**

- A. Type 1 catch basins shall conform to Standard Plans. Metal frame shall conform to Standards; grate shall conform to requirements of the American Disabilities Act (ADA). Grates shall have locking bolts.
- B. Type 1L catch basins shall conform to Standard Plans. Metal frames shall conform to Standard Plans Grate shall conform to requirements of the American Disabilities Act (ADA). Grates shall have locking bolts.
- C. Type 2 catch basins shall conform to Standard Plans. Metal frame shall conform to Standard Plans; grate shall conform to requirements of the American Disabilities Act (ADA). All grates shall have locking bolts. Ring and Cover shall be locking and conform to Standard Plans. Cover shall be marked "DRAIN".

PART 3 – EXECUTION

3.01 TRENCHING

- A. Excavation and preparation of the trench shall be in accordance with Section 7-04.3(1) of WSDOT-APWA. All trenching shall conform to the Washington Administrative Code (WAC) 296-155 requirements for Excavation, Trenching and Shoring.
- B. Excavation shall be made to alignment, elevation, grade and slope as indicated on the drawings. Trenching shall be accomplished utilizing equipment with slope and depth control, such as “laser plane control system”, so as to insure accuracy in the bottom of the trench and placement of the pipe. No high points above designated invert or calculated trench bottom elevation will be permitted. No sloughing of site material or loose excavated soil will be permitted in trenches.
- C. Hand dig excavation within the tree protection line of trees to remain. Cut no roots larger than 1 inch. At no time shall roots be pulled by equipment.

3.02 TRENCHES

- A. Trenches shall be in straight lines as indicated on the drawings. Where feasible, trench width at the top shall be no greater than 24”. If sloughing of trench side is encountered, a cribbing form will be required to maintain trench side stability. Excavate to a depth below invert grade to allow for bedding as specified.
- B. Keep the trench free from water until pipe is laid and backfilled. Divert all surface water so as not to enter the trench. Entirely remove boulders, rocks, roots and other obstructions, or cut out to the width of the trench and to a depth of 6” below the elevation of bottom of pipe. Remove and dispose of all loose and excess excavated materials off-site at Contractor’s pre-arranged location.

3.03 PIPE INSTALLATION

- A. Install pipe in accordance with Section 7-08.3 of WSDOT-APWA. Provide ductile iron pipe where top of storm drainpipe is less than 1’-0” below finished grade under paved areas.
- B. Make all connections with approved fittings. Join pipe and fittings by flexible compression rings conforming to ASTM C443. Make connections to existing storm sewer lines at locations shown on the drawings.

3.04 **BEDDING AND BACKFILLING**

- A. Bedding for rigid pipe shall be per Contract Documents. Install bedding in accordance with WSDOT-APWA Section 7-08.3(1)C.
- B. Bedding for flexible pipe shall per the Contract Documents. Install bedding in accordance with WSDOT-APWA Section 7-08 and the drawings.
- C. Backfill trenches in accordance with Section 02300 and WSDOT-APWA Section 7-08.3.
- D. Bedding and backfill with the Pierce County Right of Way shall be per the County Road Standards.

3.05 **CATCH BASIN INSTALLATION**

- A. Install structures in accordance with Section 7-05.3 of WSDOT-APWA and the Contract Documents.

3.06 **CLEANING AND TESTING**

- A. Clean and test in conformance with Section 7-04.3 of WSDOT-APWA. All new lines shall be subjected to testing after installation. Tests shall be exfiltration test or air pressure test. Conduct tests in the presence of the Owner's Representative.
- B. Clean all existing and new storm lines and catch basins following completion of new storm drain installation. Mechanically remove all sediment displaced from lines from the system, and do not flush downstream.

END OF SECTION

SECTION 02741

ASPHALT PAVING

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Work includes but is not limited to the following:
 - 1. Furnishing and installing crushed surfacing for asphalt concrete paving.
 - 2. Furnishing and installing asphalt concrete paving.
 - 3. Furnishing and installing asphalt patching for utilizes.

1.02 RELATED SECTIONS

- A. Drawings and general provisions of Contract, including and Supplementary Conditions and Division 1 Specification Sections, apply to this section. Coordinate related work specified in other parts of the Project Manual, including but not limited to the following:
 - 1. Section 02300 – Earthwork
 - 2. Section 02751 – Cement Concrete Paving, Curbs and Sidewalks
 - 3. Section 02765 – Pavement Markings & Signage

1.03 REFERENCES

- A. Pierce County Road Standards
- B. WSDOT-APWA2000 Standard Specifications for Road, Bridge, and Municipal Construction.
- C. Standard Plans WSDOT/APWA Standard Plans for Road, Bridge, and Municipal Construction.
- D. ASTM D1557 Methods of Test for Moisture-Density Relations of Soils, Using 10 lb (4.5 kg) Rammer and 18 In. (457 mm) Drop.

- E. APAW Design and Specifications for Asphalt Concrete Pavements and Bases, 1990 Edition.

1.04 **SYSTEM DESCRIPTION**

- A. This work shall consist of one or more course of plant mixed asphalt concrete placed on a prepared foundation or base in accordance with these specifications and in reasonably close conformity with the lines, grades, thicknesses, and typical cross-sections shown in the plans or established by the Owner's Representative.
- B. Asphalt concrete shall be composed of asphalt and aggregate which, with or without the addition of mineral filler and blending sand as may be required, shall be mixed in the proportions specified to provide a homogenous, stable and workable mixture.

1.05 **PROJECT SITE CONDITIONS**

- A. Environmental Requirements:
 - 1. In accordance with referenced standard specifications and the following:
 - 2. Do no paving in rain or when subgrade or base is wet or frozen.
 - 3. Do not apply tack coats when temperature is below 50 degrees F. or when base is wet.
 - 4. Apply asphalt concrete paving only when temperature is above 40 degrees and when base is dry.

1.06 **DIMENSIONS AND LAYOUTS**

- A. See Section 02230 – 1.7.
- B. The Contractor shall immediately notify the Owner's Representative if underground utilities not shown on the Agency's record are encountered.

1.07 **QUALITY CONTROL**

- A. Contractor shall be responsible for corrections to all non-conforming asphalt. Non-conforming asphalt. Non-conformance shall include pavement with aggregate separation, soft spots, and excess porosity.

- B. Contractor shall repair cracks and unsatisfactory elevation irregularities immediately upon notification at no additional cost to Pacific Lutheran University.
- C. Contractor shall replace any paving not draining properly.

1.08 WORK WITHIN PIERCE COUNTY RIGHT OF WAY

- A. All work within Pierce County Right of Way shall meet Pierce County Road Standards.
- B. Contractor is responsible for obtaining all permits for work with the Right of Way and coordinating with Pierce County traffic and Pierce County inspector.

1.09 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Submit product data for all materials specified.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Comply with “Quality Control” provisions, “References”, Specifications, and Manufacturer’s data. Where these may be in conflict, the more stringent requirements govern.
- B. Conform to APAW – Section II, “Specifications for Asphalt Paving” of above-referenced manual. Provide bases, type and thickness of asphalt concrete as required by type of soils for indicated use.

2.02 CRUSHED SURFACING BASE COURSE

- A. Install a base course of 1 – ¼” maximum crushed surfacing, per WSDOT/APWA 9.03.9(3), as indicated. The gradation of the base course shall be:

U.S. Standard Sieve Size	Percent Passing by Dry Weight
1 – ¼ inches	100
5/8 inch	50 -80
¼ inch	30 – 50
No. 40	3 – 18
No. 200	0 – 7.5
Sand Equivalent	40 min.

- B. The fracture requirement (75% minimum) shall be at least one mechanically fractured face and will apply to material retained on each sieve size No. 10 and above if that sieve retains more than 5% of the total sample. The portion of crushed surfacing retained on a ¼ inch square sieve shall not contain more than 0.15% wood waste.

2.03 CRUSHED SURFACING TOP COURSE

- A. Install a top course of 5/8" maximum crushed surfacing, per WSDOT/APWA 9.03.9(3), as indicated. Gradation of the top course shall be:

U.S. Standard Sieve Size	Percent Passing by Dry Weight
5/8 inch	100
¼ inch	55 – 75
No. 40	8 – 24
No. 200	10.0 max.
Sand Equivalent	40 min.

- B. The fracture requirement (75% minimum) shall be at least one mechanically fractured face and will apply to material retained on each sieve size No. 10 and above if that sieve retains more than 5% of the total sample. The portion of crushed surfacing retained on a ¼ inch square sieve shall not contain more than 0.15% of wood waste.

2.04 TACK COAT

- A. Tack coat shall be diluted emulsion, type SS-1, SS-1h, CSS-1 or CSS-1h, with equal parts of water.

2.05 ASPHALT BINDER

- A. Asphalt binder and tack coat for overlay shall be AR-4000W meeting the requirements of Section 0-02.1(4) of WSDOT-APWA.

2.06 ASPHALT CONCRETE

- A. Aggregate shall be Class B per WSDOT-APWA Section 9-03.8(6).
- B. Modified Class B with the following gradation may be considered as an alternate to Class B with prior approval of the engineer:

Sieve Size	Percent Passing
¾"	100%
½"	95 – 100%
3/8"	80 – 95%
¼"	60 – 80%
#10	35 – 50%
#40	15 – 30%
#200	3 – 8%

- C. Asphalt binder shall be paving asphalt, Grade AR-4000, and shall comply with Section 9-02.1 of WSDOT-APWA. Asphalt concrete mixing and proportioning shall comply with Section 9-03.8 of the WSDOT-APWA.

2.07 SOIL STERILANT

- A. Use the following materials in accordance with the manufacturer’s specifications. Soil sterilant materials include:
 - 1. Carsinon W-50 Wettable Powder.
 - 2. Pramitol 25E.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes your acceptance of conditions as satisfactory.
- B. Construction shall conform to the details, dimensions and grades specified. Maximum variations in finished grade of paving shall be +/-0.05 feet.
- C. Grade and compact all areas to be paved in accordance with Section 02300.

3.02 PREPARATION

- A. Protect surrounding areas and surfaces to preclude damage from work of this Section.
- B. Protect work of other trades. Take special care in work adjacent to buildings.
- C. Should any defacement or damage occur, Contractor shall repair or replace as directed at no additional cost to the Owner.
- D. Preparation of Asphalt Patches:
 - 1. Where existing asphalt concrete pavement upon a granular base is required to be removed due to deterioration, settlement, concrete curb construction or trenching, uniformly define the area in size and shape. Remove the existing asphalt by cutting pavement vertically at a sufficient distance of at least 6" over the undisturbed base surface, and then break up and remove the affected pavement.
 - 2. Replace the granular base under the removed pavement as shown on the plans.
- E. Preparation of Existing Surface for overlay.
 - 1. Existing surfaces shall be prepared in accordance with WSDOT-APWA Section 5-04.3(5)
- F. Preparation of Untreated Roadway or parking lot for paving or gravel:
 - 1. Prepare roadway or parking lot subgrade in accordance with Section 02300. Place crushed surfacing in accordance with WSDOT-APWA Section 4-04.3(4), to the thicknesses shown on the drawings.
- G. Traffic Control:
 - 1. Traffic Control shall be provided as required in accordance with the Pierce County requirements, the Manual on Uniform Traffic Control Devices, and WSDOT requirements.

3.03 SOIL STERILANT

- A. Sterilize all areas to be paved or to be graveled with a relative application of material at a minimum of twenty (20) pounds of polyborchlorate per 1,000 sq. ft. of surface, mixed with water and applied with power spraying after grading is

completed, or as recommended by the manufacturer. Apply soil sterilants in accordance with Section 8-02.3(2) of WSDOT-APWA and per the manufacturers recommendations.

3.04 **CRUSHED SURFACING BASE AND TOP COURSE**

- A. Place aggregate base and top course in accordance with Section 4-04 of the WSDOT-APWA. Relative dry compaction shall be a minimum of 95% of modified proctor maximum dry density as determined in accordance with ASTM D1557.
- B. Prior to asphalt concrete placement, treat the prepared surface in accordance with Section 5-04.3 of WSDOT-APWA.

3.05 **TACK COAT**

- A. Apply a tack coat to all existing pavement surfaces to be overlaid or abutted with new asphaltic pavement. Apply tack coat at a rate of 0.05 to 0.15 gal/sy. Allow enough time for complete breaking to occur before the overlay is place. Place no more tack coat than can be covered the same day. Place no tack coat when the surface temperature of the pavement is below 50 degrees F or when rain is imminent.

3.06 **ASPHALT CONCRETE**

- A. Place asphalt in accordance with Section 5-04 of WSDOT-APWA. Spread, finish and compact in accordance with Section 5-04.3(9) and 5-04.3(10).
- B. Construct joints in accordance with Section 5-04.3(11). Provide surface smoothness in accordance with Section 5-04.3(13). Accomplish paving in accordance with the weather limitations outlined in Section 5-04.3(16).
- C. Sample and test asphalt concrete in accordance with Sections 5-04.3(10B and 5-04.3(12).
- D. The completed surface of the wearing course shall not vary more than ¼ inch in 10 feet from the rate of slope shown in project plans.

3.07 **CLEANING**

- A. After completion of paving operations clean surfaces of excess or spilled asphaltic materials.
- B. Contractor shall phase the final lift of pavement in a manner to limit Construction traffic within this area after completion.

- C. Do not permit vehicular traffic on asphaltic paving until it has cooled and hardened, and in no case sooner than twelve (12) hours after placing.

END OF SECTION

SECTION 02751

CONCRETE PAVING

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Work includes but is not limited to following:
 - 1. Provide and install vertical, rolled and extruded concrete curbs.
 - 2. Provide and install cement concrete sidewalks, and curb ramps.
 - 3. Coordinate and provide for miscellaneous concrete for footings and pads for site furnishings, fencing, equipment, and signs.
 - 4. Provide and install pre-cast concrete wheel stops.
 - 5. Provide and install porous concrete paving.

1.02 RELATED SECTIONS

- A. Drawings and general provisions of Contract, including Supplementary Conditions and Division 1 Specification Sections, apply to this section. Coordinate related work specified in other parts of the Project Manual, including but not limited to the following:
 - 1. Section 02300 – Earthwork
 - 2. Section 02511 – Hot-Mix Asphalt Paving

1.03 REFERENCES

- A. Pierce County Road Standards
- B. WSDOT/APWA 2006 Standard Specifications for Road, Bridge, and Municipal Construction.

1.04 SUBMITTAL

- A. Submit concrete mix design.

PART 2 – PRODUCTS

2.01 CEMENT CONCRETE ROLLED, EXTRUDED, AND VERTICAL CURB

- A. Construct cement concrete rolled, vertical and extruded curb with air entrained concrete Class 3000 conforming to the requirements of WSDOT-APWA Section 8-04.3. Portland Cement and aggregates shall conform to Section 8-04.2 of WSDOT-APWA. Calcium chloride is not allowed as an admixture.

2.02 CEMENT CONCRETE SIDEWALKS AND CURB RAMPS

- A. Construct cement concrete sidewalks and integral curb and sidewalks with air entrained concrete Class 3000 conforming to the requirements of WSDOT-APWA Section 6-02. Portland cement, aggregates, joints filler and curing materials shall conform to Section 8-14.2 of WSDOT-APWA. Calcium chloride is not allowed as an admixture.

2.03 PRE-CAST CONCRETE WHEEL STOP

- A. See detail on Contract Drawings.

2.04 COLOR ADMIXTURE

- A. Color admixture application shall be done by a Contractor with a thorough working knowledge of the product and procedures. Submit documentation referencing at least ten (10) previous successful installations.
- B. Where shown on the drawings, flatwork shall receive Scofield Chromix admixture at the manufacturer's recommended rate per sack of cement in the mix in accordance with Scofield tech bulletin #A – 304.07. Provide smooth troweled finish on colored banding, light broom finish on other flatwork. Provide clear sealer per tech bulletin. Apply Lithochrome colorwax as a curing membrane coat in accordance with Scofield Tech Data Bulletin #A – 503.

2.05 POROUS CONCRETE

- A. Cement: Portland Cement Type I or II conforming to ASTM C 150 or Portland Cement Type IP or IS conforming to ASTM C 595, or ASTM C 1157.
 - 1. The total cementitious material content shall not be less than 600 lbs. per cu. yd.
- B. Fly ash and Ground Iron Blast-Furnace Slag: Fly ash conforming to ASTM C 618 may be used in amounts not to exceed 30% of total cementitious material.

Ground Iron Blast-Furnace Slag conforming to ASTM C 989 may be used in amount not to exceed 50% by weight of total cementitious material.

1. Note: When Class "F" Fly ash is used as part of the minimum cementitious content, bond strength development may be delayed and additional curing time is required.
- C. Aggregate: Use coarse aggregate (3/8 to No. 16) per ASTM C 33 or No. 89 coarse aggregate (3/8 to No. 50) per ASTM D448. If other gradation of aggregate is to be used, submit data on proposed material to Owner for approval.
1. Aggregate Content: The volume of aggregate per cu. yd. shall be a minimum 18 cu. ft. when calculated as a function of the unit weight determined in accordance with ASTM C 29 jigging procedure. Fine aggregate, if used, should not exceed 3 cu. ft. and shall be included in the total aggregate volume.
- D. Air Entraining Agent: Shall comply with ASTM C 260.
- E. Admixtures: Shall be used in accordance with the manufacturer's instructions and recommendations.
1. Type A Water Reducing Admixtures – ASTM C 494.
 2. Type B Retarding – ASTM C 494.
 3. Type D Water Reducing/Retarding – ASTM C 494.
 4. Water: Comply with ASTM C 94.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes your acceptance of conditions as satisfactory.
- B. Verify proper compaction of subgrade, Section 02300, for on-grade work.

3.02 PREPARATION

- A. Field Measurements:

- B. Carefully verify and coordinate with all Pierce County and WSDOT/APWA requirements.
- C. Verify existing dimensions and shapes. Conform to existing where applicable.
- D. Accessible ramp shall be in accordance with project plans. Notify the Owner's Representative immediately if grades and slope to meet ADA are not achievable.

3.03 **INSTALLATION**

- A. Install cement concrete extruded curbs and vertical curbs in accordance with Contract Documents and WSDOT/APWA Section 8-04.3(1). Provide expansion joints at 15-foot spacing maximum spacing. Coordinate expansion joints with the Architectural scoring pattern.
- B. Perform the work in a manner, which results in a curb constructed to specified line and grade, uniform in appearance and structurally sound. Remove curbs found with unsightly bulges, ridges or other defects and replaced at Contractor's expense if Owner's Representative considers them irreparable. When checked with a 10-foot straightedge, grade shall not deviate more than 1/8 inch, and alignment shall not vary more than ¼ inch. Curb repairs shall match existing grades.
- C. Cement concrete sidewalks and walkways shall be installed in accordance with the plan drawings and WSDOT-APWA Section 8-14. Expansion joints shall be provided at 12 to 15 foot spacing unless noted otherwise. Contractor shall coordinate the joints with the scoring pattern. Sidewalks shall be divided into equal panels (i.e. 4 foot for 8 foot walk and 5 foot for 5 and 10 foot walk) scoring pattern, by scoring ¼ inch deep. Walkways shall be installed flush with adjacent walks.
- D. Provide light broom finish. Float finished slab and promptly after initial set, broom finish uniformly and perpendicularly to traffic.

3.04 **DEFECTIVE WORK**

- A. Remove and replace defective work not conforming to the specified tolerances at the Contractors expense.
- B. Remove and replace, when directed slabs, walks, or curbing that show excessive shrinkage cracks and slabs that do not freely drain.

3.05 **CLEANING**

- A. Leave premises clean and free of residue of work of this Section.

3.06 **POROUS CONCRETE SUB-GRADE PREPARATION AND FORM WORK**

- A. Subgrade Material: The top 6 inches shall be composed of granular or gravelly soil that is predominately sandy with no more than a moderate amount of silt or clay.
- B. Subgrade Permeability: Prior to placement of Portland Cement Pervious Pavement, the subgrade shall be tested for rate of permeability by double ring infiltrometer, or other suitable test of subgrade soil permeability. The tested permeability must reasonably compare to the design permeability.
- C. Subgrade Support: The subgrade shall be compacted by a mechanical vibratory compactor a minimum density of 92% of a maximum dry density as established by ASTM D 1557 or AASHTO T 180. Subgrade stabilization shall not be permitted.
- D. If fill material (embankment) is required to bring the subgrade to final elevation, it shall be clean and free of deleterious materials. It shall be placed in 8 inch maximum layers, and compacted by a mechanical vibratory compactor to a minimum density of 92% of a maximum dry density as established by ASTM D1557 or AASHTO T 180.
- E. Subgrade Moisture: The subgrade shall be in a moist condition (within +/-3% of the optimum moisture content as determined by the modified compaction test ASTM D 1557 or AASHTO T 180).
- F. Forms: Forms may be of wood or steel and shall be the depth of the pavement. Forms shall be sufficient strength and stability to support mechanical equipment without deformation of plan profiles following spreading, strike-off and compaction operations.

3.07 **POROUS CONCRETE MIXING, HAULING AND PLACING**

- A. Mix Time: Truck mixers shall be operated at the speed designated as mixing speed by the manufacturer for 75 to 100 revolution of the drum.
- B. Transportation: The Portland cement aggregate mixture may be transported or mixed on site and should be used within one (1) hour of the introduction of mix water.

- C. Discharge: Each mixer truck will be inspected for appearance of concrete uniformity according to Section 304. Water may only be added by the concrete producer to obtain the required mix consistency. A minimum of 20 revolutions at the manufacturer's designated mixing speed shall be required following any addition of water to the mix. Discharge shall be a continuous operation and shall be completed as quickly as possible. Concrete shall be deposited as close to its final position as practicable and such that fresh concrete enters the mass of previously placed concrete. The practice of discharging onto subgrade and pulling or shoveling to final placement is not allowed.
- D. Placing and Finishing Equipment: Unless otherwise approved by the Owner or Engineer in writing, the Contractor shall provide mechanical equipment of either slip form or form riding with a following compactive unit that will provide a minimum of 10 psi vertical force. The pervious concrete pavement will be placed on the required cross section and shall not deviate more than +/-3/8 inch in 10 feet from profile grade. If placing equipment does not provide the minimum specified vertical force, a full width roller or other full width compaction device that provides sufficient compactive effort shall be used immediately following the strike-off operation. After mechanical or other approved strike-off and compaction operation, no other finishing operation will be allowed. If vibration, internal or surface applied, is used, it shall be shut off immediately when forward progress is halted for any reason. The Contractor will be restricted to pavement placement widths of a maximum of fifteen (15') feet unless the Contractor can demonstrate competence to provide pavement placement widths greater than the maximum specified to the satisfaction of the Engineer.
- E. Curing: Curing procedures shall begin within 20 minutes after the final placement operations. The pavement surface shall be covered with a minimum six (6) mil thick polyethylene sheet or other approved covering material. Prior to covering, a fog or light mist shall be sprayed above the surface when required due to ambient conditions (temperature, wind and humidity). The cover shall overlap all exposed edges and shall be secured (without using dirt or stone) to prevent dislocation due to winds or adjacent traffic conditions.
- F. Cure Time:
1. Portland Cement Type, I, II or IS – days minimum.
 2. Portland Cement Type I or II with Class F Fly ash (as part of the 600 lbs/cy minimum cementitious) or Type IP – 10 days minimum.
 3. No truck traffic shall be allowed for ten (10) days (no passenger car/light trucks for seven (7) days).

- G. Jointing: Control (contraction) joints shall be installed at 40-foot intervals for pavements designed for vehicular traffic. They shall be installed at a depth; of $\frac{1}{4}$ the thickness of the pavement. These joints can be installed in the plastic concrete or saw cut. If saw cut, the procedure should begin as soon as the pavement has hardened sufficiently to prevent raveling and uncontrolled cracking (normally after curing). Transverse construction joints shall be installed whenever placing is suspended a sufficient length of time that concrete may begin to harden. In order to assure aggregate bond at construction joints, a bonding agent suitable for bonding fresh concrete to existing concrete shall be brushed, rolled or sprayed on the existing pavement surface edge. Isolation (expansion) joints will not be used except when pavement is abutting slabs or other adjoining structures.
- H. Mix Water: Mix water shall be such that the cement paste displays a wet metallic sheen without causing the paste to flow from the aggregate. (Mix water yielding a cement paste with a dull-dry appearance has insufficient water for hydration).
1. Insufficient water results in inconsistency in the mix and poor bond strength.
 2. High water content results in the past sealing the void system primarily at the bottom and poor surface bond.

3.08 **POROUS CONCRETE TESTING, INSPECTION AND ACCEPTANCE**

- A. Laboratory Testing: The Owner will retain an independent testing laboratory. The testing laboratory shall conform to the applicable requirements of ASTM E 329 "Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction" and ASTM C 1077 "Standard Practice for Testing Concrete and Concrete Aggregates for use in Construction, and Criteria for Laboratory Evaluation".
- B. The Agent of the testing laboratory performing field sampling and testing of concrete shall be certified by the American Concrete Institute as a Concrete Field Testing Technician Grade I, or by a recognized state or national authority for an equivalent level of competence. The Concrete Producer shall endorse technicians testing proficiency of Portland Cement Pervious Concrete.
- C. Testing and Acceptance: A minimum of 1 gradation test of the subgrade is required every 5000 square feet to determine percent passing the No. 200 sieve per ASTM C 117.

- D. A minimum of one test of reach day's placement of pervious concrete in accordance with ASTM C 172 and ASTM C 29 to verify unit weight shall be conducted. Delivered unit weights are to be determined in accordance with ASTM C 29 using a 0.25 cubic foot cylindrical metal measure. The measure is to be filled and compacted in accordance with ASTM C 29 paragraph 11, jiggling procedure. The unit weight of the delivered concrete shall be ± 5 pcf of the design unit weight.
- E. Average strength such that at least 90% of tests are equal to or greater than 150 psi.
- F. Any individual test shall be greater than 130 psi.

Part 4 – ROADS, WALKS, PARKING LOTS

4.01 DROPPED CURBS AND CURB RAMPS

- A. Must comply with handicapped accessibility as outlined in the Uniform Accessibility Standard (UAS), American Disabilities Act (ADA), Accessibility Guidelines (AG), Building Code, and the American National Standards Institute (ANSI).

4.02 PARKING LOTS

- A. Parking lots shall be site specific. Their dimensions and orientation shall suit the specific site conditions. Generally, 90° parking spaces are the best, but on occasion 45°, 60°, or 180° (parallel) spaces are permitted. Driving aisles shall be no less than 24' (twenty-four feet). All 90° parking spaces shall be 8.5' wide x 16'.0 long (with overhang), 8.5' wide x 18'.0 long (without overhang). Handicapped parking spaces shall be 8.5' wide x 16' or 18' long with a 8.5' buffer strip on at least one side.

4.03 ROADS/DRIVES

- A. Minimum width for two-way main roads is 22' (twenty-two feet). Minimum width for major two-way service drives is 22' (twenty-two feet). Minimum width for minor two-way service drives is 20' (twenty feet). Minimum width for one-way traffic is 12' (twelve feet).

4.04 WALKS

- A. Minimum width is 6' (six feet), 8' (eight feet) along curb edges of parking lots and where pedestrian traffic volume is higher. Minimum 5' (five foot) radii required

at intersections. Ramps not greater than 1:12' are preferable in lieu of stairs for mechanical snow removal. Walks should generally be continuous across driveways, must have dropped curbs.

4.05 **SNOW PLOWING**

- A. Snow is plowed and moved aside. It is not picked up or hand shoveled except on stairs. Provide space where it can be piled. Give special attention to loading docks and other critical areas. Pull-off lanes shall have at least a 10' (ten foot) radius at the points of curvature. This smooth transition will allow efficient snowplowing and street cleaning.

4.06 **CONCRETE ENTRANCE SLABS**

- A. All concrete entrance slabs at points of impaired accessibility to campus structures, or at other flush with finished floor conditions, shall be supported on structural foundations and tied to the structure in such a manner as to preclude vertical displacement through resistance to shear of concrete reinforcement, i.e., dowel reinforcement rods from entrance slab to structure and grout, if required.

4.07 **GRASS PAVING**

- A. Grass paving used in areas of Emergency Vehicle areas in lieu of concrete.

END OF SECTION

SECTION 02765

PAVEMENT MARKINGS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Work includes but is not limited to the following:
 - 1. Furnish and install pavement markings upon asphalt surfaces.
 - 2. Furnish and install site, traffic and reserved parking signs as indicated.

1.02 RELATED SECTIONS

- A. Drawings and general provisions of Contract, including Supplementary Conditions and Division 1 Specification Sections, apply to this section. Coordinate related work specified in other parts of the Project Manual, including but not limited to the following:
 - 1. Section 02741 – Bituminous Concrete Paving
 - 2. Section 02751 – Cement Concrete Paving, Curbs and Sidewalks

1.03 REFERENCES

- A. Pierce County Road Standards
- B. WSDOT/APWA 2006 Standard Specifications for Road, Bridge, and Municipal Construction
- C. Standard Plans WSDOT/APWA Standard Plans for Road, Bridge, and Municipal Construction
- D. Manual On Uniform Traffic Control Devices (MUTCD) Current Edition
- E. Federal Specification TT-P-115, Traffic Paint.

1.04 SAMPLING AND TESTING

- A. Store materials proposed for use on the project site in sealed and labeled containers or segregate at source of supply, sufficiently in advance of needs.

Clearly identify materials by designated name, specification number, batch number, intended use and quantity formulation number, project contract number, intended use, and quantity involved. AT the discretion of the Owner's Representative, material may be approved for use based on the following data furnished by the Contractor.

- B. A test report showing that the proposed batch meets all specified requirements.

1.05 **TEMPORARY TRAFFIC CONTROLS**

- A. Place suitable warning signs for alerting approaching traffic. Place traffic cones or markers along newly painted lines to control traffic and prevent damage to newly painted surfaces.

1.06 **WORK WITHIN PIERCE COUNTY RIGHT OF WAY**

- A. Contractor is responsible for obtaining all permits and coordinating with Pierce County Traffic for installation of signs and striping within Pierce County Right of Way.

PART 2 – PRODUCTS

2.01 **TRAFFIC PAINT**

- A. Paint shall be lead free. Acceptable products, or approved equal:
 - 1. Morton International
(503) 364-2277
Duraline 2000, Rapid-Dry, Lead-Free, water-based
 - 2. Farwest Paint
(206) 244-8844
TTP85 Lead-Free yellow, alkyd and water-based, 1070 Lead-Free White, 1076 Lead-Free Red, 1073 Lead-Free Black
 - 3. C & C Paint
(206) 783-8835
Rodda's Lead-Free Traffic Paint, yellow, red, white, black and blue available in alkyd and water-based.
- B. Paint shall be delivered and stored in sealed containers that plainly show the designated name, formulation, or specification number, batch number, color, date of manufacture, manufacturer's name, formulation number and directions,

all of which shall be printed legibly at time of use. The paint shall be homogeneous, easily stirred to a smooth consistency, and shall show no hard settlement or other objectionable characteristics.

- C. Paint for pavement marking shall conform to Federal Specification TT-P-115, color: white, yellow and red.

2.02 **SIGNS**

- A. "Reserved Parking" MUTCH (R7-8)
- B. "Van Accessible" MUTCD (R7-201a) Modified
- C. "Stop" MUTCD (R1-1)
- D. "Do Not Enter" MUTCD (R5-1)

PART 3 – EXECUTION

3.01 **EXAMINATION**

- A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes your acceptance of conditions as satisfactory.
- B. Pavement markings shall conform to WSDOT/APWA Section 8-22.
- C. All permanent signs shall conform to WSDOT/APWA Section 8-21.

3.02 **PREPARATION**

- A. All surfaces to be marked shall be thoroughly cleaned before application of the paint. Dust, dirt and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water or a combination of the methods as required. Large areas of tar, grease, rubber deposits, or freight material shall be completely removed with scrapers, wire brushed, sandblasting, steam cleaning, power brooming or approved chemicals or mechanical abrasion.

3.03 **APPLICATION**

A. Paint Application:

1. Two applications of paint will be required to complete all paint markings. Apply paint evenly to the pavement surface to be coated at the rate of 105, plus or minus 5, square feet per gallon. Apply paint to clean, dry surfaces, and unless otherwise approved, only when air and pavement temperatures are above 40 degrees F and less than 95 degrees. Maintain paint temperature within these same limits. Apply paint pneumatically with approved equipment.
2. Provide guidelines and templates as necessary to control paint application. Take special precautions in marking letters and symbols. Sharply outline edges of marking. The maximum drying time requirement of the paint specifications shall be strictly enforced, to prevent undue softening of bitumen, and pickup, displacement or discoloration by tires of traffic. Discontinue painting if there is a deficiency in drying of the marking, until cause of the slow drying is determined and corrected.

B. Parking Area:

Parking stall striping shall be 4 inches wide painted white unless otherwise noted on the plans.

Directional Arrows and Handicapped Parking Stall Symbol shall be in accordance with Section 8-22.1 of WSDOT/APWA.

Accessible/ADA Parking Stall Symbol shall be in accordance with project plans and Section 8-22.1 of WSDOT/APWA.

3.04 **SIGN INSTALLATION**

- A. Install signs at locations as shown on plans and in accordance with Section 8-21.3(2) of WSDOT/APWA and MUTCD.

3.05 **CLEANING**

- A. Leave premises clean and free of residue of work of this Section.

END OF SECTION

SECTION 02810

IRRIGATION

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Piping
2. Manual valves
3. Automatic control valves
4. Drain valves
5. Sprinklers
6. Drip irrigation
7. Temporary irrigation
8. Quick couplers
9. Controllers
10. Wiring
11. Valve boxes

B. Related Sections:

1. 01011 – Sustainable Building Requirements
2. 15450 – Plumbing Fixtures and Trim

1.02 DEFINITIONS

- A. Lateral Piping: Downstream from control valves to sprinklers, specialties and drain valves. Piping under pressure only during flow.

- B. Irrigation Mainline Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.
- C. GPM: Gallons per minute
- D. GPH: Gallons per hour
- E. POC: Point of connection
- F. PSI: Pounds per square inch

1.03 **PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Design 100% coverage irrigation system, including comprehensive system analysis by a qualified irrigation designer, using performance requirements and design criteria indicated.
 - 1. Design automatic operation irrigation system with controller and automatic control valves.
 - 2. Include pop-up spray heads, low volume drip, tree root bubblers and temporary fixed-riser spray head irrigation where shown.
- B. Do not exceed pipe flow velocities of five (5') feet per second.
- C. Working Pressures: Verify and maintain proper working pressures:
 - 1. Minimum working pressure: Verify minimum 60 psi at point of connection and minimum pressure throughout system for proper operation.
 - 2. Maximum working pressures: Regulate as required for optimal operation of each type of component.

1.04 **SUBMITTALS**

- A. Product Data: Include pressure ratings, rated capacities, and settings of selected models for the following:
 - 1. General-duty valves
 - 2. Specialty valves

3. Valve boxes
 4. Sprinklers
 5. Pipes, tubes, and fittings and pipe anchors for sprinkler system
 6. Automatic controllers; include wiring diagrams
 7. Control wires; include splice kits
 8. Pressure regulators and filters for irrigation system
 9. Drip tubing
- B. LEED™ Product Documentation: For each type of product indicated.
1. Show Contractor's official stamp indicating specific products used in the Work.
 2. Indicate whether each product contains post-consumer or post-industrial recycled materials, or both.
 3. Indicate location of manufacture, highlighting those materials manufactured within a 500-mile radius.
 4. Indicate water efficiency of irrigation fixtures.
- C. Test Reports: As specified in "Field Quality Control" Article in Part 3.
- D. Maintenance Data: To include in maintenance manuals specified in Division 1. Include data for the following:
1. Water regulations
 2. Automatic control valves
 3. Sprinklers
 4. Specialties
 5. Controllers
- E. Shop Drawings: Provide irrigation plan drawings to Landscape Architect a minimum of four (4) weeks prior to start of work. Provide drawing that is legible

and concise on CAD base provided by Landscape Architect. Include the following minimum information:

1. Point of connection information including water meter, backflow preventer, master valve, and current pressure at POC.
2. Automatic controller location. Coordinate exterior, wall-mounted location with Owner.
3. Irrigation system plan including piping, head layout, and locations, types, sizes, capacities, and flow characteristics of irrigation system piping components.
4. Location of valves, sprinklers, quick couplers, devices, accessories, and controls on plan.
5. Areas of sprinkler spray and overspray.
6. Separate zones for:
 - a. Sun and shade
 - b. Street trees with bubblers
7. Wire size and number of conductors for each control cable.
8. Graphic and written legend clearly indicating symbol used for individual product types, materials and nozzles, for all components including optimal operating pressure, spray radii, GM per head, etc.
9. Direction of subsurface drip tubing in beds.
10. Locations of PVC supply and flush manifolds in subsurface drip zones.
11. All flush valves in vacuum relief valves in subsurface drip zones.
12. Drain valves at low points in system for winterization.
13. Table showing hydraulic calculations for maximum pressure loss for farthest head from POC and for farthest head in largest zone.
14. Zoning Chart: Show zones, sizes of valves, and GPM per zone.

- F. Component Detail Drawings: Show installation details for piping and major system components. Indicate interface and spatial relationship between piping, system components, adjacent utilities, finish grade, and structures. Provide details for all system components including but not limited to:
1. Point of connection including water meter, backflow preventer, master valve, and quick coupler.
 2. Valve and valve box.
 3. Later and mainline installation and depth.
 4. Sleeving installation and depths.
 5. Pop-up spray heads.
 6. Fixed riser spray heads.
 7. Bubblers.
 8. Quick couplers.
 9. Subsurface irrigation drip tubing installation.
 10. Subsurface irrigation air/vacuum relief valves.
 11. Subsurface irrigation automatic flush valves.
 12. Subsurface irrigation valve and filter.
 13. Subsurface irrigation check valve.
 14. Typical subsurface irrigation drip tubing layout.
 15. Controller installation.
 16. Rain sensor and moisture sensor installation.
- G. Operation and Maintenance Data: For irrigation systems, to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01780 – Operation and Maintenance Data, include data for the following:
1. Automatic-control valves.

2. Subsurface irrigation system.
 3. Sprinklers.
 4. Controllers.
 5. Rain Sensor.
 6. Moisture Sensor.
- H. Project Record Drawings: Submit as specified in Section 01780 – Closeout Submittals.

1.05 **QUALITY ASSURANCE**

- A. Regulatory Requirements: For all irrigation system work, meet or exceed minimum requirements of authorities having jurisdiction, including Uniform Plumbing Code (UPC) and Standard Specifications for Public Works Construction and accompanying Standard Details, as amended and adopted by authorities having jurisdiction.
- B. Electrical Products: All electrical wiring, controls, motors, and devices UL listed and so labeled. Comply with requirements of authorities having jurisdiction, including National Electrical Code (NEC).
- C. Installer's Qualifications: Washington State licensed landscape contractor specializing in irrigation system installation, within minimum five (5) years documented experience. Each person installing solvent welded joints trained in techniques for correctly making joints, prior to start of Work at Project site.
- D. Pre-Installation Conference: Prior to commencing irrigation system Work, convene a pre-installation conference at the Project site to review Contract Drawings and Contract Specifications and field conditions.
1. Coordinate so that Contractor, Landscape Architect, Installer and irrigation system design consultant will attend.
 2. At conference, review field conditions including location of existing trees and coordination with other Work indicated on Contract Drawings, to determine actual configuration necessary for landscape irrigation system.
 3. Immediately notify Owner's Representative of conflicts requiring substantial alterations to irrigation system configuration.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.07 WARRANTY

- A. Special Warranty: Provide written guarantee that for one (1) year from date of substantial completion all work is warranted against all defects in materials, equipment, and workmanship. Provide warranty that also covers repair or damage to any part of the premises resulting from leaks or other defects in material, equipment, and workmanship to the satisfaction of the Landscape Architect. If required, make repairs promptly upon notification by the Owner and, at no cost to the Owner.

1.08 MAINTENANCE

- A. General: Concurrent with one-year warranty period for planting and irrigation, monitor, maintain and repair the new irrigation system in an operational, water efficient condition. Ensure balanced precipitation rates, no excessively wet or dry areas, properly functioning equipment including controller, valves and heads. Make all repairs required during warranty period.
- B. Maintenance Schedule: Provide a schedule of proposed maintenance, for Owner's approval. Perform scheduled maintenance required during the one-year warranty period. Examples of requirements would include:
 - 1. Fall winterization and spring activation procedures of the system.
 - 2. Monitoring and adjusting automatic control scheduling.
 - 3. Checking and adjusting elevation of valve boxes and irrigation heads.
 - 4. Checking and correcting for any settling of trench backfill.
- C. Owner Inspection:
 - 1. Owner will inspect periodically during the maintenance period. Deficiencies will be noted and reported to the Contractor who will correct deficiencies to the satisfaction of the Owner within five (5) working days after notification.
 - 2. Eleven (11) months after the date of Final Acceptance, the Owner and the Architect will make a final warranty walk through review of irrigation

system. Deficiencies will be noted and corrections required. If the deficiencies are major in scope, it may result in an extension of the warranty period for the affected item after corrections are made.

3. Damages due to vandalism will be repaired by Owner.
- D. Temporary Irrigation removal:
1. One (1) year after the date of Final Acceptance, remove all temporary irrigation including control valves for temporary zones. Cap mainlines. Deliver removed valves to Owner. Remove all other removed equipment from site.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - a. Select products that contain recycled content. Products with post-consumer recycled content are preferred.
 - b. Select products that are manufactured/assembled within a 500-mile radius of the project site.
 - c. Select high efficiency irrigation technology.

2.02 PIPES, TUBES, AND FITTINGS

- A. PVC Pipe: ASTM D 1785, PVC 1120 compound, Schedule 40 and Class 200.
1. PVC Fittings, Schedule 40 and Schedule 80: ASTM D 2466 and 2467.
- B. Polyethylene Tubing: 100 psi rating.
1. PVC insert fittings.
 2. Fasteners as required to secure to ground surface at temporary irrigation zones.

- C. Copper pipe and fittings: Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.
 - 1. Copper Pressure Fittings: ASME B16.22, wrought-copper, solder-joint fittings, and 95-5 lead free solder.
 - 2. Bronze Flanges: ASM B16.24, Class 150, with solder-joint end.
 - 3. Copper Unions: MSS SP-123, cast-copper-ally, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

2.03 PIPING JOINING MATERIALS

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

2.04 GENERAL-DUTY VALVES

- A. Mainline Gate Valve: Hammond brass, screw-end, 150# WOG with cross handle, of same size as PVC mainline.
- B. Backflow Preventer: See Civil.
- C. Operating Wrenches: Furnish total of two (2) steel, tee-handle operating wrenches with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.
- D. Drain Valves: LawnLife manual drain valves, straight or angle style commercial grade.

2.05 VALVE BOXES

- A. Carson Industries, green body with locking lid.
- B. Electrical control valves and master valve: Standard or Jumbo rectangular box for all size accordingly.

- C. Double check valve assembly: Super Jumbo XL Model or as needed to house deduct meter, backflow preventer, quick coupler.
- D. Use extensions as required to protect 4" below valves and 12" below the DCVA.

2.06 **SPECIALTY VALVES**

- A. Plastic Automatic Control Valves and Master Valve: Molded-plastic body, normally closed, diaphragm, globe type with manual flow adjustment, and operated by 24-V ac solenoid, with a manufacturer's limited warranty of not less than five (5) years.
 - 1. Acceptable Manufacturer: Provide Rainbird PEB-PRS-D automatic control valves.
- B. Quick-Couplers: Factory-fabricated, bronze or brass, two-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, locking rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.
 - 1. Acceptable Manufacturer: Provide Rainbird 44LRC quick couplers.
- C. Drainage Backfill: Cleaned gravel or crushed stone, graded from 1-inch minimum to 2 inches maximum.

2.07 **POP-UP SPRINKLERS, PERMANENT – AT LAWN**

- A. Description: Plastic housing and corrosion-resistant interior parts designed for uniform coverage over entire spray area indicated, at available water pressure.
 - 1. Acceptable Manufacturer: Provide Rainbird 1800-PRS Series, pop-up spray heads.
 - 2. 6" Pop-up Spray Sprinklers: Fixed pattern, with screw-type flow adjustment and stainless steel retraction spring. All sprinklers bottom inlet only. Install self-sealing feature in any sprinkler where there is a potential for low head drainage.

2.08 **FIXED-RISER SPRINKLERS, TEMPORARY**

- A. Description: Plastic housing and corrosion-resistant interior parts designed for uniform coverage over entire spray area indicated, at available water pressure.

1. Acceptable manufacturers:
 - a. Rainbird 1800-PRS Series, spray nozzles.
 - b. Walla Walla Sprinkler Company, MP Rotators.
- B. Stakes for securing risers: 1 x 2 stakes driven into ground until secure, with 4" of stake above ground.

2.09 **TREE BUBBLERS, PERMANENT – AT STREET TREES**

- A. Acceptable Manufacturer: Rainbird Root Watering System with Bubbler and Grate.

2.10 **SPRINKLER SPECIALTIES**

- A. Automatic Controller: Rainbird ESP-LX Plus, sized accordingly.
 1. Wall-mounted in weatherproof, lockable cabinet.
- B. Wiring: UL 493, Type UF-B multiconductor, with solid-copper conductors and insulated cable; suitable for direct burial.
 1. Available Manufacturers:
 - a. American Electric Cable Co.
 - b. American Insulated Wire Corp.
 - c. Southwire Company.
 2. Feeder-Circuit Cables: No. 12 AWG minimum, between building and controllers.
 3. Low-Voltage, Branch-Circuit Cables: No. 14 AWG minimum, between controllers and automatic control valves; color-coded different from feeder-circuit-cable jacket color; with jackets of different colors for multiple-cable installation in same trench.
 4. Splicing Materials: Manufacturer's packaged kit consisting of insulating, spring-type connector, or crimped joint and epoxy resin moisture seal, suitable for direct burial.

- C. Rain Sensor: Capable of temporarily disabling the irrigation system during periods of significant rainfall through use of an electromechanical device, offering several rainfall settings; capable of withstanding the elements, and be furnished with connection hardware and extension wire suitable for low voltage 24VAC control circuits.
- D. Moisture Sensor: Capable of temporarily disabling the irrigation system when moisture levels in soil reach specified level for one or multiple zones; with multiple settings for different soil types, corrosion resistant carbon rod probes and manual override in a durable weatherproof cabinet.

2.11 SUBSURFACE IRRIGATION

- A. Acceptable Manufacturer: Subject to compliance with requirements, provide Netafim, USA products.
- B. Drip Tubes: Nominal size of 5/8" diameter flexible PE or PVC tubing housing turbulent flow, integral and evenly spaced pressure compensating drippers inside the tubing at specified intervals, evenly spaced at 12", 18" or 24" centers. Flow rates shall vary from .5 to 1 GPH. The emitters shall be impregnated with root inhibitor to prevent root intrusion for a minimum period of ten (10) years and shall be guaranteed by the manufacturer to inhibit root intrusion for this period.
- C. Strainer/Filter Units: Brass or glass reinforced plastic housing with corrosion-resistant internal parts; of size and capacity required for devices downstream from unit.
- D. Automatic Flush Valve: Molded from plastic with compression adapter to fit tubing diameter specified. The flush valve shall be normally open, and shall close when pressure reaches 1 psi.
- E. Air Vacuum Relief Valve: Molded plastic with an internal valve and ½ inch male pipe thread. The air vacuum relief valve shall operate at a minimum of 7 psi and maximum of 130 psi.
- F. Pressure Regulators: Brass or glass reinforced plastic housing with corrosion-resistant internal parts, and capable of controlling outlet pressure to approximately 20 psi.

PART 3 – EXECUTION

3.01 EARTHWORK

- A. Refer to Section 02300 – Earthwork for excavating, trenching. Do not trench through tree roots.
- B. Install rigid PVC piping and wiring in sleeves under sidewalks, driveways, and parking lots.
- C. Provide cover over top of irrigation piping according to the following:
 - 1. Permanent Irrigation Zones:
 - a. Mainline: Minimum 12 inches cover.
 - b. Lateral Lines: Minimum 10 inches cover.
 - c. Sleeves: Minimum 12 inches cover.
 - 2. Temporary Irrigation Zones:
 - a. Mainline: Minimum 18 inches cover.
 - b. Lateral Line: Lay on surface of mulch 1 to 2”.
 - c. Sleeves: Minimum 18 inches cover.

3.02 PREPARATION

- A. Layout:
 - 1. Prior to installation, stake out all pressure supply lines, routing and location of sprinkler heads, valves, backflow preventer and automatic controller.
 - 2. Layout irrigation system and make minor adjustments required due to differences between site and Drawings. Where piping is shown on Drawings under paved areas, but running parallel and adjacent to planted areas, install piping in planted areas.
- B. Water Supply: Make connections to water service at locations indicated on Drawings or, if not indicated, as directed. Make minor adjustments due to actual site conditions at no change in Contract Time and Contract Sum.

- C Electrical Service:
 - 1. Make line voltage connections to electrical services at locations indicated on Drawings or, if not indicated, where directed. Make minor adjustments due to actual site conditions at no change in Contract Time and Contract Sum.
 - 2. Make electrical connections to the irrigation controller. Verify that others have provided electrical power source to controller locations.

3.03 PIPING APPLICATIONS

- A. Piping in control-valve boxes and above ground may be joined with flanges instead of joints.
- B. Underground Irrigation Main Piping: Schedule 40, PVC pipe and socket fittings; and solvent-cemented joints.
- C. Lateral Piping:
 - 1. At permanent zones: Class 200, PVC pipe and socket fittings; and solvent-cemented joints.
 - 2. At temporary zones: Class 200, PVC pipe and socket fittings; and solvent-cemented joints.
- D. Sleeves: Schedule 40, PVC pipe and socket fittings; and solvent-cemented joints.
- E. Transition Fittings: Use transition fittings for plastic-to-metal pipe connections according to the following:
 - 1. Couplings:
 - a. Underground Piping NPS 1 – ½ and Smaller: Manufactured fitting or coupling.
 - b. Underground Piping NPS 2 and Larger: AWWA transition coupling.
 - 2. Fittings:
 - a. Aboveground Piping: Plastic-to-metal transition fittings.

- b. Underground Piping: Union with plastic end of same material as plastic piping.

3.04 **INSTALLATION**

- A. Install piping free of sags and bends.
- B. Install groups of pipes parallel, spaced to permit valve servicing.
- C. Install fittings for changes in direction and branch connection.
- D. Install unions adjacent to valves and to final connections to other components.
- E. Pipe Cleaning: Take great care to ensure that the inside of the pipe is absolutely clean. Any pipe ends not being worked must be protected and not left open. Removal of cutting burrs is mandatory.
- F. Lay piping on uniform bearing surface of specified bedding material, uniformly sloped without humps or depressions:
 - 1. Mainlines: Sand, 4" minimum depth and free of rocks and sharp objects under entire length of pipe.
 - 2. Permanent Lateral Lines: Clean planting soil and sand. If rocks or foreign matter over 1" or other deleterious materials are encountered, bed pipe with 4" of fill sand on all sides of pipe and/or wire.
 - 3. Temporary Lateral Lines: Mulch at surface of planting area.
 - a. Fasten lines to stakes driven to within 4" of ground, to keep ground-tight during operation and throughout establishment period.
- G. Underground Gate Valves: Install in valve box with top flush with grade.
 - 1. Install valves and PVC pipe with restrained, gasketed joints.
- H. Underground, Manual Control Valves: Install in manual control-valve box.
- I. Control Valves: Install in control-valve box where indicated on Drawings. Group valve boxes where feasible. Install boxes parallel to each other and perpendicular to adjacent hardscape.

- J. Flush circuit piping with full head of water and install sprinklers after hydrostatic test is completed.
- K. Install six (6) quick couplers. Locations to be designated by Owner.
- L. Sprinklers:
 - 1. Pop-up: Install at manufacturer's recommended heights.
 - 2. Temporary, fixed risers: Install at 6" height and secure with anchors. Stake risers plumb. Ensure that stakes are shorter than risers.
 - 3. Locate part-circle sprinklers to maintain a minimum distance of 4 inches from walls and 2 inches from other boundaries, unless otherwise indicated.
- M. Tree Root Bubblers at Street Trees: Install on separate zone and per manufacturer's recommendations, two (2) per tree.
- N. Install control cable in same trench as irrigation piping. Provide conductors of size not smaller than recommended by controller manufacturer.
 - 1. Tape control wires together at 10-foot intervals, then place along the mainline or lateral lines at least 2 inches from side piping. Do not tape the wire harness to any piping.
 - 2. Provide an 18" harness loop at all sleeve ends and direction changes.
 - 3. Install cable in separate sleeve under paved areas if irrigation piping is installed in sleeve.
 - 4. Install cable in separate sleeve anywhere it changes direction from piping.

3.05 CONNECTIONS

- A. Ground equipment according to Section 16452 Grounding.
- B. Connect wiring according to Section 16120 Conductors & Terminators.

3.06 LABELLING AND IDENTIFYING

- A. Warning Tapes: Arrange for installation of continuous, underground, detectable warning tape over underground piping, during backfilling of trenches.

- B. Refer to 02300 – Earthwork for warning tapes.

3.07 **BACKFILL**

- A. Initial backfill material on all lines: Fine granular texture with no sharp stones and no foreign matter larger than ½ inch in size.

3.08 **FLUSHING AND ADJUSTING IRRIGATION SYSTEM**

- A. Sequencing: Install, flush and adjust entire irrigation system for proper operation before commencing planting operations. Make final adjustments to irrigation heads after completion of planting operations.
- B. Flushing Irrigation System:
 - 1. Prior to installation of irrigation heads, open valves and using full head of water, flush out lines and risers.
 - 2. Install irrigation heads after flushing of system has been completed.
- C. Adjusting Irrigation System:
 - 1. Adjust valves, align heads, and check coverage of each segment of irrigation system prior to coverage test.
 - 2. If it is determined by Landscape Architect that additional adjustments or nozzle changes will be required to provide proper coverage, make necessary changes or adjustments prior to commencing planting operations.
 - 3. Adjust automatic control valves so that the irrigation heads operate within water pressure criteria recommended by manufacturer.

3.09 **FIELD QUALITY CONTROL**

- A. Perform tests and inspections.
 - 1. Hydrostatic Mainline Test: Subject mainline to a hydrostatic pressure test of 150 psi. To be valid, perform all tests under the direction review of the Landscape Architect.
 - a. Attach test pump or air compressor to head of mainline after double check valve.

- b. Attach gate valve to opposite end of mainline.
 - c. Open gate valve at end of mainline and open main shut-off valve until all air is removed from the mainline.
 - d. Close gate valve at end of mainline and install pressure gauge and reopen valve.
 - e. Close main shut-off valve and apply 150-pound test to mainline, hold for one (1) hour. Maximum allowable drop is 5 psi in a one-hour test.
2. Subject lateral lines to a hydrostatic pressure test at existing static water pressure.
3. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
4. Coverage Test: Test coverage after leak test is completed, backfills in place, and sprinkler heads are adjusted to final position.
 - a. Demonstrate that system meets coverage requirements and that automatic controls function properly.
 - b. Make all necessary adjustments, including realignment of heads, to provide required coverage as directed.
 - c. Coverage requirements are based on operation of one circuit at a time.
 - d. Should any components be found to be inoperative or functioning improperly, make corrections immediately by adjustment or, if component cannot be adjusted, by replacement with new material of like kind, at no change in Contract Sum or Contract Time.
 - e. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment. Retest.
5. Prepare test and inspection reports. Record when and by whom observations were made and submit written report to Landscape Architect. Record all comments concerning progress and quality of installation.

6. Any irrigation product will be considered defective if it does not pass tests and inspections.

B. Observations of Tests:

1. Request observations by Landscape Architect at least three (3) days in advance of tests to be observed:

a. System Layout

b. Flushing

c. Pressure Tests

d. Coverage: To observe sprinkler system operation and to verify performance before planting.

2. In the event an observation is scheduled and the system is not fully ready, project record drawings are not current, or previously required corrective actions have not been completed, reimburse Owner for all time, materials and expenses incurred for that review. Do not schedule further reviews until defective conditions are corrected.

3.10 **ADJUSTING**

A. Adjust settings of controllers.

B. Adjust automatic control valves to provide flow rate at rated operating pressure required for each sprinkler circuit.

C. Adjust pop-up sprinklers and other devices so they will be flush with, or not more than ½ inch above, finish grade.

D. Adjust temporary irrigation so risers are plumb and secure.

3.11 **DEMONSTRATION**

A. At end of warranty period, demonstrate irrigation system to Owner's Representative and train to adjust, operate and maintain system.

3.12 WINTERIZATION

- A. Deactivate and drain system prior to the onset of the freezing season and reactivate at the onset of the spring season. Certify by letter the dates of winterization/activation. Repair damage from failure to comply.
 - 1. When using compressed air to winterize the system, do so in short cycles at no more than 40 psig air pressure. Do not allow pipe close to the compressor to become hot to the touch.

END OF SECTION

SECTION 02870

SITE FURNISHINGS

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Waste Receptacles.
 - 2. Benches.
 - 3. Bike racks.
- B. Related Sections:
 - 1. 01011 – Sustainable Building Requirements

1.02 SUBMITTALS

- A. Product Data: Submit complete product data for each item.
- B. Shop Drawings: Show details of fabrication and installation. Indicate materials, finishes, fasteners, anchorages, and accessory items.
- C. Samples:
 - 1. Submit samples of wood and steel finishes.

PART 2 – PRODUCTS

2.01 METALS

- A. Steel and Iron:
 - 1. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.02 MISCELLANEOUS MATERIALS

- A. Fasteners: Stainless steel, with Phillips flat-head screws for exposed fasteners.
- B. Anchors: Fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six (6) times the load imposed when installed in unit masonry and four (4) times the load imposed when installed in concrete, as determined per ASTM E 488

2.03 FABRICATION

- A. Form metal true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arras.
- B. Mill joints to a tight, hairline fit. Cope or miter corner joints. Fabricate connections that will be exposed to weather in a manner to exclude water.
- C. Comply with AWS for recommended practices in shop welding. Clean exposed welded joints of flux, and dress exposed and contact surfaces.

2.04 WASTE RECEPTACLE

Waste Receptacles:

2.05 BENCHES

2.06 BICYCLE RACKS

- A. Bicycle Racks:

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Provide anchorage devices and fasteners where necessary for securing to in-place construction.
- B. Set products accurately in location, alignment, and elevation. Fit exposed connections accurately together to form tight, hairline joints or, where indicated, with uniform reveals and spaces for sealants and joint fillers.

- C. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

END OF SECTION

SECTION 02917

SOIL PREPARATION

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Subgrade preparation
2. Planting soils
3. Preparation of planting, lawn and meadow areas

B. Related Sections:

1. 01011 – Sustainable Building Requirements
2. 02230 – Site Clearing for protection of existing trees and plantings, topsoil stripping and stockpiling, and site clearing.
3. 02231 – Tree Protection and Trimming for protecting, trimming, pruning, repairing and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
 - a. 02300 – Earthwork for rough grading

1.02 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Finish Grade: Elevation of finished surface of planting soil.
- C. Planting Area: Area to be planted with trees, shrubs and groundcovers other than seeded areas.
- D. Planting Soil: A base soil that has been modified with soil amendments and perhaps fertilizers to produce a planting soil mixture best for plant growth.

- E. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- F. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- G. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project Site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.03 SUBMITTALS

- A. Submit the following to Landscape Architect:
 - 1. Product Data: For each type of product indicated, including soils.
- B. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of Owners' contact persons.
- C. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 - 1. Manufacturer's certified analysis of standard products.
 - 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- D. Quantity Certification: Submit certification of quantities of planting soils and recommended amendments (load tickets, invoices, receipts, etc.) prior to commencement of planting or seeding.
- E. Material Test Reports for:
 - 1. Each unamended base soil type used.
 - 2. Compost (tested within 90 days prior to application).
- F. Warranty: Sample of special warranty.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
- B. Soil Nutrient Analysis: For each unamended base soil type, furnish soil nutrient analysis and a written report by a qualified, regional soil-testing laboratory.
 - 1. Soil Samples: Using a soil probe, take a minimum of ten (10) representative samples from equally spaced locations for each base soil to be used for planting or seeding. If dissimilar soil types exist on the same site or will be imported, conduct separate soil tests for each type.
 - a. At each sampling spot, dig a spade-width hole at least 8 inches deep. Shave a 1 inch slice from the side of each hole.
 - b. Thoroughly mix all slices in a separate clean bucket for each soil type.
 - c. Place two (2) cups of the mix into a sealable plastic bag for testing. Verify quantity of soil required by soil testing laboratory.
 - d. Label bag with site information, area of sample, contractor name and phone number.
 - 2. Provide testing laboratory with plant list, planting specifications including lawn and meadows, project location, and copy of compost analysis prior to soil testing.
 - 3. State percentages in report of total organic carbon; gradation of sand, silt, and clay content per USDA Soil Classification system; pH; and complete mineral and plant nutrient content of the soil.
 - 4. Report suitability of tested soil for intended uses, whether specific plant materials, lawns or meadows.
 - a. State recommendations for soil amendments to be incorporated, in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments including compost to be added to produce satisfactory planting soil suitable for healthy, viable plants.

- C. Compost Analysis: Furnish most recent analysis (within 90 days of application) from a qualified soil testing laboratory for each category listed in Part 2.
- D. Pre-Installation Conference: Conduct conference at Project Site, with Landscape Architect and Landscape Installer present. Discuss the following items:
 - 1. Soil Nutrient Analysis
 - 2. Products
 - 3. Preparation
 - 4. Installation
- E. Notification: Notify Architect five (5) days in advance of the following review points:
 - 1. Subgrade Preparation Review
 - 2. Soil Preparation and Finish Grading Review

1.05 DELIVER, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

1.06 PROJECT CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations and dimensions of planting, lawn and meadow areas and adjacent construction by field measurements before proceeding with planting and seeding work. Notify Landscape Architect if discrepancies exist between plans and actual conditions.
- B. Weather Restrictions: Do not perform work of this section when soils or subgrades are excessively wet.

1.07 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace work of this Section that fails in materials or workmanship, within specified warranty period.
 - 1. Failures include, but are not limited to the following:

- a. Excessive settling of soils.
 - b. Presence of noxious weeds in planting soils.
2. Warranty Period from Date of Planting Completion: 12 months.
 3. Include the following remedial actions as a minimum at end of warranty period:
 - a. Correct grades that have settled
 - b. Provide noxious weed eradication from planting areas, lawns and meadows.

1.08 MAINTENANCE

- A. Maintenance: Maintain as required to eradicate imported weeds and correct settlement. Begin maintenance immediately after plants are installed and continue for one (1) year after Planting Completion.

PART 2 – PRODUCTS

- 2.01 **WSDA APPROVED PRODUCTS:** Use only soil amendments and fertilizers approved by the Washington State Department of Agriculture for use in organic production and handling. A list of approved products can be found at the link below:

- A. <http://agr.wa.gov/FoodAnimal/Organic/MaterialsLists.htm>

2.02 ORGANIC SOIL AMENDMENT

- A. Compost: Well-composted, stable, and weed-free organic matter; not resembling the raw materials from which it was derived and meeting the following:
 1. pH range of 5.5 to 8.5
 2. Moisture content 35 to 55 percent by weight
 3. 100 percent passing through ¾ inch sieve
 4. Soluble salt content of maximum 5 decisiemens/m

5. Manufactured inert contaminants less than 0.5 percent dry weight or volume basis
6. Carbon: Nitrogen Ratio: Maximum 20
7. Free of substances toxic to plants
8. Feedstock: Recycled plant waste; food or industrial residuals; or source-separated or compostable mixed solid waste
9. Tested within 90 days prior to application
10. Certified through the U.S. Composted Council's Seal for Testing Assurance Program

2.03 **PLANTING SOILS**

- A. Planting Soil consists of one (1) of the following base soils that has been modified with soil amendments and perhaps fertilizers to produce a planting soil mixture best for plant growth:
 1. Existing, on-site surface soils:
 - a. Undisturbed, surface soil left in place on site.
 - b. Surface soil stockpiled. Supplement with imported soil if quantity is insufficient.
 2. Imported soils:
 - a. Imported, naturally occurring soil.
- B. Verify suitability of base soil to produce viable planting soils through soil testing. Remove from base soil all roots, plants, weeds, sod, stones larger than 1-inch in any dimension, clods, pockets of coarse sand, construction debris and other extraneous materials harmful to plant growth.
 1. Mix approved base soil with soil amendments and fertilizers in the quantities recommended by soil testing agency to produce satisfactory planting soil that is suitable for healthy, viable plants.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive planting soil for compliance with requirements and conditions affecting installation and performance.
 - 1. Verify that subgrades allow for installation of planting soil to required depths.
 - 2. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar roofing compound, or acid has been deposited in planting areas, lawns or meadows.
 - 3. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 4. Suspend soil spreading, grading and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 5. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, lawn or meadow, remove the soil and contamination and replace with new planting soil.

3.02 PLANTING AREA, MEADOW AND LAWN AREA ESTABLISHMENT

- A. Preparation at Planting Areas, Meadows and Lawns: Eradicate unwanted vegetation. Remove all construction debris and extraneous matter.
 - 1. For existing, undisturbed surface soil left in place:
 - a. Loosen surface soil to a minimum depth of 8 inches. Do not loosen soil in tree protection zones or where existing vegetation is to remain. Remove stones larger than 2 inches and sticks, roots, rubbish and other extraneous matter and dispose off site.

2. For areas to receive stockpiled or imported soil:
 - a. Loosen subgrade to a minimum depth of 8 inches. Remove stones larger than 2 inches and sticks, roots, rubbish and other extraneous matter and legally dispose of them off Owner's property.
 - b. Notify Landscape Architect for Subgrade Preparation Review.
- C. Install stockpiled or imported soil:
1. Planting soil placement schedule:
 - a. At planting areas: 14" depth
 - b. At meadows: 8" depth
 - c. At lawns: 8" depth
 2. Spread to required depths, but not less than required to meet finish grades and profiles after amending and natural settlement, and light rolling at meadows and lawns. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
 - a. At Planting Areas: Spread approximately one-half the thickness of soil shown over loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of soil.
- D. Planting Soil Mixing: Thoroughly blend planting soils with amendments and fertilizers.
1. Existing, on-site surface soil: Test soil. Apply soil amendments and fertilizer to surface, and thoroughly blend planting soil to a depth of 8 inches.
 2. Stockpiled or imported natural soil: After spreading, test soil. Apply recommended soil amendments and fertilizer to surface, and thoroughly blend planting soil to depth of 8 inches.
 3. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 4. If lime is required, mix with dry soil before mixing fertilizer.

5. Minimum compost amendment, unless soil testing laboratory recommends against:
 - a. Planting Areas: 3" compost
 - b. Meadows and Lawns: 2" compost
- D. Finish Grading: Grade planting, meadow and lawn areas to a smooth, uniform surface plane with loose, uniformly fine texture.
 1. At Planting Areas: Rake, remove rids, and fill depressions to meet finish grades and profiles shown.
 2. At meadows and lawns: Grade to within ½ inch of finish elevation.
 - a. Roll and rake, remove rids and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
 - b. Moisten prepared meadow and lawn areas before seeding, if soil is dry. Water thoroughly and allow surface to dry before seeding. Do not create muddy soil.
 3. Provide positive drainage at all areas. Slope grades away from buildings.
- E. At completion of work of this section and before planting or seeding, notify Landscape Architect for Soil Preparation and Finish Grading Review. Eradicate unwanted vegetation and restore planting areas, lawns and meadows if eroded or otherwise disturbed after finish grading.

3.03 MAINTENANCE

- A. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas subsidence.

3.04 CLEANUP AND PROTECTION

- A. During soil preparation, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect planting soils from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damage or disturbance.

3.05 **DIPOSAL**

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

END OF SECTION

SECTION 02920

LAWNS AND MEADOWS

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Seeding
 - 2. Meadow grasses and wildflowers
- B. Related Sections:
 - 1. Section 02917 – Soil Preparation for subgrade preparation, planting soils and preparation of planting areas, meadows and lawns.
 - 2. 01011 – Sustainable Building Requirements

1.02 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Planting Soil: A base soil that has been modified with soil amendments and perhaps fertilizers to produce a planting soil mixture best for plant growth.
- C. Seed from Local Genetic Stock – Seeds that are descendants of indigenous native plants form within a specified range of the project site. For this Project, the specified range includes western Washington and northwestern Oregon. Other specifications for seed still apply.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. LEED™ Documentation:
 - a. Indicate whether each product contains post-consumer or post-industrial recycled materials, or both.

- b. Indicate location of manufacture, highlighting those materials manufactured within a 500-mile radius.
 - c. Indicate native species from seed mixes.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
- C. Qualification Data: For qualified landscape Installer.
- D. Product Certificates: For fertilizers, from manufacturer.
- E. Planting Schedule: Indicating anticipated planting dates for each type of planting.
- F. Maintenance Instructions: Recommend procedures to be established by Owner for maintenance of meadows during per calendar year. Submit before expiration of required warranty period.
- G. Record Documents for LEED™.
 - 1. Show use on LEED™ Calculator Spreadsheet of Section 01101 LEED™ Program Requirements.
 - 2. Show Contractor's official stamp indicating specific products used in the Work.

1.04 **QUALITY ASSURANCE**

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn and meadow grass establishment.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.
- B. Pre-installation Conference: Conduct conference at Project site.

1.05 **DELIVERY, STORAGE, AND HANDLING**

- A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.06 PROJECT CONDITIONS

- A. Planting Restrictions: Do not install seed during the following conditions:
 - 1. Cold Weather: Less than 32 degrees F.
 - 2. Hot Weather: Greater than 90 degrees F.
 - 3. Wet Weather: Saturated soil
 - 4. Windy Weather: Wind velocity greater than 30 mph
- C. Seeding Seasons: Install seed during the following periods.
 - 1. Meadows: Between September 1 and October 31.
 - 2. Lawns: Fall between March 15 and October 31.
- D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.07 MAINTENANCE SERVICE

- A. Meadows and Lawns: Provide full maintenance by skilled employees of landscape Installer, Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable meadows and lawns are established, but for not less than one (1) year from date of Planting Completion.

PART 2 – PRODUCTS

2.01 SEED

- A. Grass Seed: Fresh, clean dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Seep Species: As follows, with not less than 95% germination, not less than 85% pure seed, and not more than 0.5% weed seed:

2.02 MEADOW GRASSES AND WILDFLOWERS

- A. Provide meadow grass and wildflower see from Local Genetic Stock.

- B. Acceptable Source may include but not be limited to:
1. Heritage Seedlings, Inc.
- C. Native Meadow Grass Seed Mixes: Fresh, clean, dry, new seed, mixed species as follows:
1. Meadow Grass Seed Mix #1:

% by weight:	Seed species:
100%	Danthonia californica (California Oatgrass)
 2. Meadow Grass Seed Mix #2:

% by weight:	Seed species:
70%	Festuca roehmeri (Roehmer's Fescue)
30%	Poa secunda (syn. P. scabrella)(Pine Bluegrass)
- D. Wildflower Seed Mix: Fresh, clean, dry, new seed, mixed species as follow:
- | % by weight: | Seed species: |
|--------------|---|
| 1% | Achillea millifolium (Yarrow) |
| 3% | Clarkia amoena (Farewell to Spring) |
| 3% | Eriophyllum lanatum (Oregon Sunshine) |
| 12% | Lomatium utriculatum (Spring Gold) |
| 48% | Lupinus polycarpus (syn. L. micranthus)
(Miniature Lupine) |
| 23% | Ranunculus occidentalis (Western Buttercup) |
| 10% | Prunella vulgaris var lanceolata (Lance-leaf
Self-heal) |
- E. See Carrier: Inert material, sharp clean medium grade vermiculite, slightly moistened, mixed with seed at a ratio of not less than two (2) parts seed carrier to one (1) part seed.

2.03 **LAWN**

- A. Seed: Fresh, clean, dry new seed, mixed species as follows:

% by weight:	Seed type:
60%	Essence Perennial Ryegrass
20%	Derby Perennial Ryegrass
20%	Longfellow Chewing Fescue

1. Acceptable Mix and Source: Pro-Time 309 Supreme Mix for Fine Lawns by Hobbs and Hopkins, Ltd., 1712 SE Ankeny, Portland, OR 97214, (503) 239-7518.

2.04 PLANTING ACCESSORIES

- A. WSDA Approved Products: Use only soil amendments and fertilizers approved by the Washington State Department of Agriculture for use in organic production and handling. A list of approved products can be found at the link below:

1. <http://agr.wa.gov/FoodAnimal/Organic/MaterialsLists.htm>

2.05 MULCHES

- A. Compose: Compost, as specified in Section 02917 – Soil Preparation.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive meadow grasses for compliance with requirements and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Install meadows and lawns only after soil preparation and finish grading is completed and reviewed by the Landscape Architect.

3.01 PREPARATION

- A. Protect, structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
- 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.

3.02 MEADOW GRASS SEEDING

- A. Sow meadow grass after Camas bulbs have been planted and soil preparation is complete.

- B. Do not use wet seed or seed that is moldy or otherwise damaged.
- C. Limit extent of seed to outside edge of tree planting circles. Do not seed against existing trees.
- D. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed. Do not hydroseed.
- E. Sow meadow grasses at all meadow areas using broadcast spreader or seeding machine.
 - 1. Sow each meadow grass mix in separate bands 10 – 15' wide
 - a. Mix #1 – Cover approximately 1/3 of total meadow area.
 - b. Mix #2 – Cover approximately 2/3 of total meadow area.
- F. Sow seed at the following rates:
 - 1. Seed Mix #1: 15-25 pounds per acre (50-70 seeds per square foot).
 - 2. Seed Mix #2: 7-10 pounds per acre (100-150 seeds per square foot).
- G. Rake seed lightly into top 1/8 inch of soil, roll lightly with water-filled roller, and water with fine spray.

3.03 **WILDFLOWER SEEDING**

- A. Sow wildflower seed over meadows previously seeded with meadow grasses using spreader or seeding machine.
- B. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two (2) directions at right angles to each other. Do not hydroseed.
- C. Do not use wet seed or seed that is moldy or otherwise damaged.
- D. Limit extent of seed to outside edge of tree planting circles. Do not seed against existing trees.
- E. Sow seed at a total rate of 4-7 pounds per acre *80-140 seeds per square foot).
- F. Roll areas lightly with water-filled roller to press seed into soil and improve seed-to-soil contact, and water with fine spray.

- G. Protect seeded areas from hot, dry weather or drying winds by applying a very thin layer of compost within 24 hours after completing seeding operations.
 - 1. Soak areas, scatter compost uniformly to a depth of no more than 1/8 inch.

3.04 **LAWN SEEDING**

- A. Dry seeding:
 - 1. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two (2) directions at right angles to each other.
 - 2. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 3. Do not seed against existing trees. Limit extent of seed to outside edge of mulched area at trees.
 - 4. Sow seed at a total rate of seven (7) pounds per 1000 square feet.
 - 5. Rake seed lightly into top 3/16 inch of soil, roll lightly, and water with fine spray.
 - 6. Protect seeded area from rapid drying by applying compost mulch within 24 hours after completing seeding operations. Water areas, scatter compost uniformly to a depth of ¼ inch, and roll surface smooth.

3.05 **MEADOW MAINTENANCE**

- A. Maintain and establish meadow by watering, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch.
- B. Watering: If rainfall is not adequate, or if rainfall occurs after seeding and weather subsequently becomes warm and dry, water meadow with fine spray at a rate that keeps meadow uniformly moist but not wet for eight (8) weeks after planting until rainfall precipitation is adequate.
 - 1. Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources.

2. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
3. Mow twice per year to a height of 4 to 6 inches after perennials have bloomed (approximately once in late spring and once in mid-summer).

3.06 **LAWN MAINTENANCE**

- A. Maintain and establish lawn 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. Provide materials and installation the same as those used in the original installation.
 1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 2. Watering: Provide, maintain and use permanent irrigation to keep lawn uniformly moist to a depth of 4 inches.
 - a. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.
 - b. Water lawn with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
 3. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matter. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - a. Mow grass to a height of 1 ½ to 2 inches.
 4. Lawn Post –Fertilization: Apply fertilizer after initial mowing and when grass is dry.
 - a. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft.

3.07 **CLEANUP AND PROTECTION**

- A. Promptly remove soil and debris, created by lawn work, from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after lawn is established.

END OF SECTION

SECTION 02930

EXTERIOR PLANTS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Plants.
2. Tree stabilization.
3. Landscape Edging.

B. Related Sections:

1. 01011 – Sustainable Building Requirements
2. 02230 – “Site Clearing” for protection of existing trees and plantings, topsoil stripping and stockpiling, and site clearing.
3. 02231 – Tree Protection and Trimming for protecting, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by execution of the Work.
4. 02917 – Soil Preparation, for subgrade preparation, planting soils and preparation of planting areas.
5. 02920 – Lawns and Grasses for (lawn) and meadow planting, hydroseeding, and erosion-control materials.

1.02 DEFINITIONS

- A. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than diameter and depth recommended by ANSI Z60.1.
- B. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid

enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

- C. Plants from Local Genetic Stock – Plants that are descendants of indigenous native plants from within a specified range of the project site. For this Project, the specified range shall include Western Washington south to northern half of Western Oregon. Other specifications for plants still apply.
- D. Planting Area: Areas to be planted.
- E. Planting Completion: Date upon which approval is given for completion of planting work and beginning of warranty period.
- F. Planting Soil: A base soil that has been modified with soil amendments and perhaps fertilizers to produce a planting soil mixture best for plant growth.
- G. Root Flare: Also called “trunk flare.” The area at the base of the plant’s stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

1.03 SUBMITTALS

- A. Submit the following to Landscape Architect:
 - 1. Product Data: For each type of product indicated.
 - a. Plant Materials: Submit minimum 30 days prior to planting. Include botanical names, quantities, sizes, physical locations of nurseries where plants were grown and suppliers for plant materials.
 - b. Plant Photographs: Prior to delivery of plants to the site, submit color photographs in digital format of each required species and cultivar on plant list, in size as will be furnished to the Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species or cultivar where more than twenty (20) plants are required, include a minimum of three (3) photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

- c. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to the Project.
 - 1. Samples for Verification: For each of the following:
 - a. Mulch: 1-quart volume of mulch; in sealed plastic bag labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
 - b. Edging Materials and Accessories: Manufacturer's standard size in color specified.
- B. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and address of owner's contact persons.
- C. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 - 1. Manufacturer's certified analysis of standard products.
 - 2. Compost certified through the U.S. Composting Council's Seal for Testing Assurance Program.
- D. Material Test Reports for:
 - 1. Compost (tested within 90 days prior to application)
- E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before Planting Completion.
- F. Warranty: Sample of special warranty.

1.04 **QUALITY ASSURANCE**

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network of the American Nursery and Landscape Association.
 2. Experience: Five (5) years' experience in landscape installation in addition to requirements in Section – 01400 Quality Requirements.
 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 4. Personnel Certifications: Installer's field supervisor shall have certification in the following categories from the Professional Landcare Network.
 - a. Certified Landscape Technician – Exterior, with installation and maintenance specialty areas, designated in CLT – Exterior.
 - b. Pesticide Applicator: State licensed, commercial.
- B. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
- C. Notification for Review: Notify Architect minimum five (5) days in advance of each of the following review points:
1. Plant Materials:
 - a. Plant Material Review: At Project site.
 - b. Landscape Architect may review plant materials either at nursery, holding area or site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect retains right to review trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
 2. Layout and Sample Planting Review: After an initial planting of 500 square feet but prior to installation of remaining plant materials.
 3. Completion Review.

- D. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.
- B. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- C. Handle planting stock by root ball.
- D. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six (6) hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
 - 1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 2. Do not remove container-grown stock from containers before time of planting.
 - 3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

1.06 PROJECT CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work. Notify Landscape Architect if discrepancies exist between plans and actual conditions.
- B. Planting Restrictions: Do not plant during the following conditions unless approved.
 - 1. Cold weather: When ambient temperature is below 32 degrees F

2. Hot weather: When temperature exceeds 90 degrees F
 3. Wet weather: When soil becomes saturated
 4. Windy weather: When wind velocity exceeds 30 mph
- C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.07 **WARRANTY**

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.
 - c. Faulty performance of tree stabilization and edgings.
 - d. Deterioration of materials beyond normal weathering.
 2. Warranty Period from Date of Planting Completion:
 - a. All Plant Materials: 12 months.
 3. Include the following remedial actions as a minimum, at end of warranty period:
 - a. Replace plants that are more than 25% dead, in unhealthy condition, not exhibiting satisfactory growth, that appear to be a different species or variety than specified or do not match adjacent plants by same name.
 - b. Reset plant materials that have settled or become un-set.
 - c. Provide noxious weed eradication from planting areas.

4. A limit of one (1) replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
 - a. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.08 MAINTENANCE

- A. Maintenance for Plant Materials: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue for one (1) year after Planting Completion.

PART 2 – PRODUCTS

2.01 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, and other features indicated in Plant List or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, weeds, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two (2) branches or between branch and trunk (“included bark”); crossing trunks; cut-off limbs more than $\frac{3}{4}$ inch in diameter; trunks that are not uniformly tapering; or with stem girdling roots will be rejected.
 2. Deciduous tree branching height, unless otherwise shown:
 - a. 1.5” caliper: 4-6’ height
 3. Coniferous tree branching height: Furnish coniferous trees full, even branching; lowest branches within 12” of ground level.
 4. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.
- C. Provide plants from Local Genetic Stock where shown on Plant Schedule.
- D. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Ensure that root flare is visible before planting.
- E. Furnish balled and burlapped stock with biodegradable burlap.
- F. Furnish containerized plants with healthy, well-established roots that reach to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container.
- G. Ensure that plants are acclimated to outdoor conditions before delivery.
- H. Labeling: Label at least one (1) plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus, species and cultivar. Where two (2) or more similar species or cultivars are provided, label each plant.

2.02 ORGANIC SOIL AMENDMENTS

- A. Compost: See Section 02917 – Soil Preparation.

2.03 FERTILIZERS

- A. See Section 02917 – Soil Preparation.

2.04 PLANTING SOILS

- A. See Section 02917 – Soil Preparation.

2.05 MULCH

- A. Provide compost mulch free from deleterious materials and suitable as a top dressing of planting area to depth shown.
 - 1. Compost, as specified in Section 02917 – Soil Preparation.

2.06 PESTICIDES AND HERBICIDES

- A. WSDA Approved Products: Use only soil amendments and fertilizers approved by the Washington State Department of Agriculture for use in organic production and handling. A list of approved products can be found at the link below:

1. <http://agr.wa.gov/FoodAnimal/Organic/MaterialsLists.htm>

2.07 MISCELLANEOUS PRODUCTS

- A. Burlap: Non-synthetic, biodegradable.
- B. Mycorrhizal Fungi: Dry, granular inoculant containing at least 60,000 spores per lb of vesicular-arbuscular mycorrhizal fungi and 110 million spores per lb of ectomycorrhizal fungi and a maximum of 5.5% inert material.

2.08 LANDSCAPE EDGINGS

- A. Steel Edging: Standard commercial-steel edging, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.
1. Edging Size: 1/8 inch wide by 4 inches deep.
 2. Stakes: Tapered steel, a minimum of 12 inches long.
 3. Accessories: Standard tapered ends, corners, and splicers.
 4. Finish: Zinc coated.
 5. Color: Black.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within planting area.

- B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination and replace with new planting soil.

3.02 EXCAVATION FOR PLANT MATERIALS

- A. Stake individual tree locations and outline areas for multiple plantings. Set plants in place and plant a sample 500 square feet of plant materials for review. Adjust locations when requested, and obtain Landscape Architect's acceptance of layout before continuing with planting. Make minor adjustments as required.
- B. Planting Pits: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit glazed or smoothed during excavation.
 - 1. Excavate approximately three (3) times as wide as ball diameter for all trees.
 - 2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 - 3. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 - 4. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
- C. Subsoil removed from excavations may not be used as planting soil.
- D. Mycorrhizal Fungi: Broadcast dry product uniformly over prepared surface of planting holes at manufacturer's recommended rates.
- E. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
- F. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

3.03 PLANT MATERIAL INSTALLATION

- A. Before planting trees:
1. Verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil from the root ball in a level manner to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
 2. Remove stem girding roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- B. Set plant materials plumb and in center of planting pit with tree root flares raised 3-inches above and shrub crowns raised 1 ½ inches above adjacent finish grades as shown.
1. Use planting soil for backfill of type designated for each particular planting area.
 2. Balled and burlapped stock:
 - a. After placing some back fill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - b. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - c. Continue backfilling process. Water again after placing and tamping final layer of soil.
 2. Container-grown stock:
 - a. Carefully remove root ball from container without damaging root ball or plant.
 - b. Score rootballs ½ inch depth in three (3) places.

- c. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill.
 - d. Continue backfilling process. Water again after placing and tamping final layer of soil.
 - e. Unless otherwise shown, plants are triangular spaced and in even rows.
- C. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.04 PRUNING

- A. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Landscape Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

3.05 PLANTING AREA MULCHING

- A. Install mulch at all planting areas and other areas indicated within 24 hours of planting.
 - 1. Trees and Tree-like Shrubs in Turf Areas: Apply mulch of 3-inch average thickness, 6 feet in diameter, around trunks or stems. Do not place mulch within 3 inches of trunks or stems.
 - 2. Mulch in Planting Areas: Apply 3-inch average thickness of mulch over whole surface of planting area and other areas shown, and finish ½ inch below adjacent finish grades as shown. Do not place mulch within 3-inches of tree trunks or 1 ½ inch from shrub stems.

3.06 EDGING INSTALLATION

- A. Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches apart, driven below top elevation of edging.

3.07 **PLANT MAINTENANCE**

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- B. Replace mulch materials damaged or lost in areas of soil subsidence.
- C. Apply treatments are required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.08 **PESTICIDE APPLICATION**

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. After installation and before Planting Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.09 **DIPOSAL**

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

END OF SECTION