

SECTION 31 05 13

SOILS FOR EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes subsoil materials and topsoil materials.

1.02 REFERENCES

- A. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- B. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb. Rammer and 18-inch Drop.
- C. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- D. ASTM D2487 - Classification of Soils for Engineering Purposes.
- E. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- F. ASTM D3017 - Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- G. Geotechnical report prepared by Shannon and Wilson dated March 2008.

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures
- B. Samples: Submit, in air-tight containers, 45 lb. sample of each type of imported borrow fill to testing laboratory.
- C. Materials Source: Submit name of imported materials source. Furnish materials of each type from same source throughout the Work. Change of source requires Engineer's approval.

PART 2 - PRODUCTS

2.01 SUBSOIL MATERIALS

- A. Native: Excavated and reused material, graded, free of lumps and rocks larger than 3-inches, frozen materials, debris and deleterious material including wood, organic waste, coal, charcoal or any other extraneous or objectionable material.
- B. Common Borrow: Pit run gravel, graded, free of lumps and rocks larger than three inches, with a maximum of 10 percent passing U.S. Sieve No. 200. The material shall not contain frozen materials, debris and deleterious material including wood, organic waste, coal, charcoal or any other extraneous or objectionable material.

- C. Structural Fill: Pit run gravel, graded, free of lumps and rocks larger than three inches, with a maximum of 5 percent passing U.S. Sieve No. 200. The material shall not contain frozen materials, debris and deleterious material including wood, organic waste, coal, charcoal or any other extraneous or objectionable material.

2.02 TOPSOIL MATERIALS

- A. Topsoil: Refer to Section 32 90 00 Landscape

2.03 SOURCE QUALITY CONTROL

- A. Section 01 45 23 - Testing and Inspection Services.
- B. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D1557, ASTM D2167, ASTM D2922, and ASTM D3017.
- C. When tests indicate materials do not meet specified requirements, change material and retest at no cost to owner.
- D. Furnish materials of each type from same source throughout the Work.
- E. Refer to Section 32 90 00 Landscape for additional quality control requirements for Topsoil.

PART 3 - EXECUTION

3.01 SOIL REMOVAL

- A. Excavate subsoil and topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.
- B. Remove lumped soil, boulders, and rock.
- C. Stockpile excavated material in area designated on site and remove excess material not being used, from site.
- D. Remove unsuitable material from site.

3.02 STOCKPILING

- A. Stockpile materials on site designated by Owner and/or Owner's Representative.
- B. Stockpile in sufficient quantities to meet project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Prevent intermixing of soil types or contamination.
- E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
- F. Protect/cover stockpiled topsoil to prevent erosion and compaction.

3.03 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent freestanding surface water.

END OF SECTION

SECTION 31 05 16

AGGREGATE FOR EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes aggregate materials for fill, drainage, and grading purposes.

1.02 REFERENCES

- A. AASHTO M147 American Association of State Highway and Transportation Officials - Materials for Aggregate and Soil-Aggregate.
- B. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- C. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.
- D. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- E. ASTM D2487 - Classification of Soils for Engineering Purposes.
- F. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods Shallow Depth.
- G. ASTM D3017 - Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods Shallow Depth.
- H. ASTM D4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- I. Washington State Department of Transportation and American Public Works Association Standard Specifications for Road, Bridge, and Municipal Construction, 2008, English edition and amendments to date (WSDOT Standard Specifications).
- J. Geotechnical report prepared by Shannon and Wilson dated March 2008.

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Material Testing: Submit material test results prior to placement of all aggregates.
- C. Materials Source: Submit name and WSDOT pit identification number of imported materials suppliers. Furnish materials of each type from same source throughout the Work. Change of source requires Engineer's approval.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM or AASHTO procedure standards.

PART 2 - PRODUCTS

2.01 COARSE AGGREGATE MATERIALS

- A. Crushed Surfacing Top Course, 5/8-0" Minus Gravel and Granular Base for Slab-On-Grades: Conforming to Section 9-03.9(3) of the WSDOT Standard Specifications for top course.
- B. Crushed Surfacing Base Course: Conforming to Section 9-03.9(3) of the WSDOT Standard Specifications for base course.

2.02 STRUCTURAL FILL

- A. Structural Fills:
 - 1. Conforming to WSDOT Standard Specifications for top course or base course.
 - 2. 1 inch minus to ¾ inch minus of recycled concrete crushed to the same specifications as top course or base course.
 - 3. Well-graded 2 inch minus pit run gravel will less than 5 percent passing U.S. Sieve No. 200 as approved by the Soils Engineer.

2.03 SOURCE QUALITY CONTROL

- A. Section 01 45 23 - Testing and Inspection Services.
- B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D1557, ASTM D2167, ASTM D2922, ASTM D3017, ASTM D4318 and ASTM C136.
- C. When tests indicate materials do not meet specified requirements, change material or material source and retest at no cost to Owner.
- D. Furnish materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.01 STOCKPILING

- A. When required stockpile materials on site at locations designated by Owner and/or Owner's Representative.
- B. Separate differing materials with dividers or stockpile apart to prevent mixing.
- C. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

3.02 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Protecting existing landscaping and irrigation indicated to remain.
 - 2. Removing existing landscaping and irrigation where indicated.
 - 3. Clearing and grubbing.
 - 4. Stripping and stockpiling topsoil.
 - 5. Removing above- and below-grade site improvements.
 - 6. Disconnecting, capping or sealing, and abandoning site utilities in place and removing site utilities.
 - 7. Temporary erosion and sedimentation control measures.
 - 8. Protect existing trees indicated to remain.

1.03 DEFINITIONS

- A. Topsoil: Refer to Section 32 90 00 Landscape.

1.04 MATERIAL OWNERSHIP

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

1.05 SUBMITTALS

- A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

1.06 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- C. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Section 31 05 13 "Soils for Earthwork."
 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Section 01 11 00 – Administrative Requirements: Verification of existing conditions before starting Work.
- B. Verify limits of site clearing prior to start of Work.
- C. Verify limits of tree protection fencing.

3.02 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly flag trees and vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.03 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- D. Provide erosion and sediment control in accordance with the approved Stormwater Pollution Prevention Plan (SWPPP) for this site.

- E. Provide additional erosion and sediment controls as necessary for compliance with local and federal guidelines at no additional cost to the Owner.

3.04 UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
 - 1. Arrange with utility companies to shut off indicated utilities.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Construction Manager not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Construction Manager's written permission.
- C. Excavate for and remove underground utilities indicated to be removed. Backfill and compact area of removed utility in accordance with Section 31 05 13 "Soils for Earthwork".

3.05 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 - 3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
 - 4. Use only hand methods for grubbing within tree protection zone.
 - 5. Chip removed tree branches and dispose of off-site.
 - 6. Remove vegetation, mulch, soil and roots to a minimum of 8-inches in shrub beds that will be replanted to allow for placement of new topsoil and amendment. This includes but is not limited to beds on the south side of the existing building and the parking lot.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of **8 inches (200 mm)**, and compact each layer to a density equal to adjacent original ground.

3.06 TOPSOIL STRIPPING

- A. Remove sod, grass and all other vegetation before stripping topsoil.

- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.
 - 2. Use Topsoil definition in Section 32 90 00 Landscape to determine presence of Topsoil during excavation.
- C. Stockpile topsoil materials away from edge of excavations, at location indicated or where directed by Owner and/or Owner's Representative, without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Limit height of topsoil stockpiles to 72 inches unless OTHERWISE APPROVED BY Owner and or Owner's Representative.
 - 2. Do not stockpile topsoil within tree protection zones.

3.07 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.08 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
 - 1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.
 - 2. Disposal waste sites shall meet all requirements of governing Health Department and Chapter 173-304 WAC.
 - 3. Refer to Section 01 74 25 Construction Waste Management and Disposal Requirements.

3.09 CLEANUP

- 1. Upon completion of site Work and project, clean the entire Work area. Remove all excess excavated material, rocks, boulders, logs, trees, pipe or debris of any type and dispose from the site.

END OF SECTION

SECTION 31 22 13

ROUGH GRADING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes site cutting, grading, filling, contouring, compacting, and preparation of site building pads.

1.02 REFERENCES

- A. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- C. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.
- D. Soil in Place by the Rubber Balloon Method.
- E. ASTM D2419 - Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
- F. ASTM D2434 - Test Method for Permeability of Granular Soils (Constant Head).
- G. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- H. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.
- I. Washington Stand Department of Transportation and American Public Works Association Standard Specifications for Road, Bridge, and Municipal Construction, 2008, English edition and amendments to date (WSDOT Standard Specifications).
- J. Geotechnical report prepared by Shannon and Wilson dated March 2008.

1.03 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution Requirements: Requirements for submittals.
- B. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM and AASHTO procedure standards.

PART 2 - PRODUCTS

2.01 FILL MATERIALS

- A. Subsoil Fill: Native Subsoil and Imported Subsoil (common fill material) as specified in Section 31 05 13.
- B. Structural Fill: As specified in Section 31 05 13.

- C. Topsoil – Refer to Section 32 90 00 Landscape.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Section 01 11 00 - Administrative Requirements: Verification of existing conditions before starting Work.
- B. Verify site conditions under provisions of Section 01 11 00.
- C. Verify intended elevations for the Work are as indicated on Drawings.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect utilities indicated to remain, from damage.
- D. Notify utility company to remove and relocate utilities.
- E. Protect above and below grade utilities indicated to remain.
- F. Protect plant life, lawns, and other features remaining as portion of final landscaping.
- G. Protect bench marks, survey control points, existing structures, fencing and concrete apron from excavating equipment and vehicular traffic.

3.03 SUBSOIL EXCAVATION

- A. All excavation shall be considered as unclassified.
- B. Do not process wet material to obtain optimum moisture content.
- C. Stability: Replace damaged or displaced subsoil as specified for fill.
- D. Remove all unsuitable excavated materials from site.

3.04 FILLING

- A. Compact the top 12 inches of existing subsoil subgrade to 95 percent of dry maximum density, prior to placing any fill.
- B. Fill areas to contours and elevations with excess excavated subsoils or imported subsoils.
- C. Place fill material on continuous layers and compact in accordance with schedule at end of this section.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.
- E. Make grade changes gradual. Blend slope into level areas.
- F. Remove surplus fill materials from site.

3.05 BUILDING PAD PREPARATION

- A. Construct and compact building pads to subgrade elevations in accordance with the geotechnical report recommendations.

3.06 TOLERANCES

- A. Section 01 45 16.13 – Contractor Quality Control.
- B. Top Surface of Subgrade Building Pads and Parking Area: Plus or minus 1-Inch from required elevation.
- C. Top Surface of Landscape Areas: Plus or minus 0.10 (1 tenth) foot from required elevation.

3.07 FIELD QUALITY CONTROL

- A. Section 01 45 23 - Testing and Inspection Services.
- B. Testing: In accordance with ASTM D1556, ASTM D1557, ASTM D2167, ASTM D2922, and ASTM D3017.
- C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- D. Frequency of Compaction Tests:
 - 1. Parking lot and graveled areas subgrade: 1 test per 250 square yards of area per constructed lift.
 - 2. Building subgrade: minimum 12 tests evenly space per constructed lift.

3.08 SCHEDULES

- A. Structural Fill:
 - 1. Maximum 8 inch compacted depth.
 - 2. Compact to minimum 95 percent of maximum of dry density.
- B. Subsoil Fill:
 - 1. Native Subsoil and Imported Subsoil: Maximum 8 inch compacted depth.
 - 2. Compact to minimum 95 percent of maximum dry density.

END OF SECTION

SECTION 31 23 17

TRENCHING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes excavating trenches for utilities; compacted fill from top of utility bedding to subgrade elevations; and backfilling and compaction.

1.02 REFERENCES

- A. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- C. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb Rammer and 18-inch drop.
- D. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- E. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- F. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.
- G. Washington State Department of Transportation and American Public Works Association Standard Specifications for Road, Bridge and Municipal Construction 2008 and amendments to date, English edition.
- H. Revised Code of Washington (RCW), Chapter 49.17, Washington Industrial Safety and Health Act.
- I. Geotechnical report prepared by Shannon and Wilson dated March 2008.
- J. *US Green Building Council (USGBC)*, www.usgbc.org
- K. *Related references per reference guide (e.g. Forest Stewardship Council, www.fscus.org)*
- L. *Local resources (e.g. Metro Recycling Toolkit, www.metro-region.org)*

1.03 DEFINITIONS

- A. Utility: Any buried pipe, duct, conduit, cable or structure.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Samples: Submit, in airtight containers, 45 lb. (20 kg) sample of each type of soil trench backfill material to testing laboratory. Submit test results to Engineer.

- C. Materials Source: Submit name and WSDOT Pit Identification Number of imported material suppliers. Provide materials from same source throughout the Work. Change of source requires Engineer's approval.
- D. *LEED certification product data as specified in Division 1, Section 01 81 13 - Sustainable Design Requirements. Complete the Material Buyout Form for the following LEED credits:*
 - 1. *Credit MR 4.1 & 4.2, Recycled Content*
 - 2. *Credit MR 5.1, Regional Materials, Manufactured Locally*
 - 3. *Credit MR 5.2, Regional Materials, Harvested / Extracted Locally*

1.05 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.06 COORDINATION

- A. Section 01 31 00 - Administrative Requirements: Coordination and Project conditions.
- B. Verify location and depths of existing utilities. Notify Engineer immediately of any conflict with existing utilities.
- C. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 - PRODUCTS

2.01 FILL MATERIALS

- A. Back Fill: Acceptable materials excavated from the trench in accordance with Section 7-08.3(3) of the WSDOT Standard Specifications. Material exceeding the optimum moisture content shall be considered as unacceptable for backfill within the pipe trench zone.
- B. Imported Back Fill: Common Borrow, Pit run gravel, 2 inch minus, with less than 5 percent passing the No. 200 screen, free of roots, organic material and other deleterious materials and meeting the requirements of structural fill Section 31 05 13, 2.1C.

PART 3 - EXECUTION

3.01 LINES AND GRADES

- A. Grades:
 - 1. Lay pipes to lines and grades indicated on Drawings.
 - 2. Maintain grade alignment of pipe using laser-beam instrument with qualified operator to establish lines and grades.
- B. Location of Pipe Lines:
 - 1. Location and approximate depths of proposed pipe lines are shown on Drawings.

2. Architect/Engineer reserves right to make changes in lines, grades, and depths of pipe lines and manholes when changes are required for Project conditions.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Protect plant life, lawns, and other features remaining as portion of final landscaping.
- C. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- D. Maintain and protect above and below grade utilities indicated to remain.

3.03 TRENCHING

- A. Trench excavation: In accordance with Section 7-08.3(1)A of the WSDOT Standard Specifications.
- B. Dewatering: Provide and maintain sufficient pumping equipment for removal of groundwater when encountered during trench excavation. Associated costs for dewatering to be included in the Contract Price. Lay no pipe in standing water.
- C. Hand trim excavation: Hand trim for bell and spigot pipe joints. Remove loose matter.
- D. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Architect/Engineer.
- E. Protect open trench to prevent danger to the public and construction traffic.

3.04 SHORING AND TRENCH SAFETY SYSTEMS

- A. Shoring to be in accordance with Section 7-08.3(1)B of the WSDOT Standard Specifications.
- B. Shoring and Trench Safety Systems shall meet the requirements of Washington State Industrial Safety and Health Act, Chapter 49.17 RCW.
- C. Repair damage caused by failure of the shoring, bracing or trench safety systems and for settlement of filled excavations or adjacent soil.
- D. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate shoring, bracing or trench safety systems.

3.05 BACKFILLING

- A. Backfill in accordance with Section 7-08.3(3) of the WSDOT Standard Specification.
- B. Backfill trenches to contours and elevations indicated on the Drawings.
- C. Protect open trench to prevent danger to the public.
- D. Remove surplus fill materials from site.
- E. Leave fill material stockpile areas completely free of excess fill materials.

3.06 TOLERANCES

- A. Section 01 45 16.13 – Contractor Quality Control.
- B. Top Surface of General Backfilling: Plus or minus 0.10 feet from required elevations.

3.07 FIELD QUALITY CONTROL

- A. Section 01 45 23 - Testing and Inspection Services.
- B. Compaction Testing: In accordance with ASTM D1556, ASTM D1557, ASTM D2167, ASTM D2922 and ASTM D3017.
- C. Compaction: Compaction shall meet the requirements of Section 7-08.3(3) of the WSDOT Standard Specifications.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.
- E. Frequency of Tests: Tests shall be taken every 100 linear feet of trench at the following depths:
 - 1. 2-foot above the top of pipe.
 - 2. Increments of 2 feet vertical depth thereafter or finished subgrade whichever is lower.

3.08 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution Requirements: Protecting finished Work.
- B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes aggregate base course.

1.02 REFERENCES

- A. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and an 18-inch Drop.
- B. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- C. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- D. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.
- E. Washington State Department of Transportation and American Public Works Association Standard Specifications for Road, Bridge and Municipal Construction 2008 and amendments to date, English edition (WSDOT Standard Specifications).
- F. Latest edition of the City of Richland Standard Drawings and Specifications.
- G. Geotechnical report prepared by Shannon and Wilson dated March 2008.
- H. *US Green Building Council (USGBC), www.usgbc.org*
- I. *Related references per reference guide (e.g. Forest Stewardship Council, www.fscus.org)*
- J. *Local resources (e.g. Metro Recycling Toolkit, www.metro-region.org)*

1.03 SUBMITTALS

- A. *LEED certification product data as specified in Division 1, Section 01 81 13 - Sustainable Design Requirements. Complete the Material Buyout Form for the following LEED credits:*
 - 1. *Credit MR 4.1 & 4.2, Recycled Content*
 - 2. *Credit MR 5.1, Regional Materials, Manufactured Locally*
 - 3. *Credit MR 5.2, Regional Materials, Harvested / Extracted Locally*

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Coarse Aggregate Crushed Surfacing Top Course and Base Course: As specified in Section 31 05 16.
- B. Soil Residual Herbicide: Type for use under asphalt concrete pavement and currently on the WSDOT Qualified Products List (QPL) or as approved by Engineer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Section 01 31 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify subgrade has been inspected, gradients and elevations are correct and has been compacted to the required density.

3.02 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place fill on soft, muddy, or frozen surfaces.

3.03 AGGREGATE PLACEMENT

- A. Spread aggregate over prepared subgrade to total compacted thicknesses as indicated on the Drawings.
- B. Place aggregate in maximum 4-inch layers and compact to specified density.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- E. Re-grade and compact areas disturbed prior to placement asphalt concrete pavement.

3.04 TOLERANCES

- A. Section 01 45 16.13 – Contractor Quality Control.
- B. Flatness: Maximum variation of $\frac{1}{4}$ inch measured with 10-foot straight edge.
- C. Scheduled Compacted Thickness: Within $\frac{1}{2}$ inch.
- D. Variation from Design Elevation: Within $\frac{1}{2}$ inch.

3.05 HERBICIDE

- A. Apply soil residual herbicide on finished aggregate areas no sooner than 24 hours prior to placement of hot mix asphalt. Apply uniformly in accordance with the manufacture's recommendations for 3-inch penetration.
- B. Soil residual herbicide to be applied by applicator licensed in the State of Washington.

3.06 FIELD QUALITY CONTROL

- A. Section 01 45 23 - Testing and Inspection Services.
- B. Compaction testing will be performed in accordance with ASTM D1556, ASTM D1557, ASTM D2167, ASTM D2922, and ASTM D3017.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

- D. Frequency of Tests: 1 test per 250 square yards, per layer of crushed aggregate surfacing.

3.07 SCHEDULES

- A. Under Asphalt Pavement:

- 1. Compact placed aggregate materials to achieve dry density compaction of 95 percent.

END OF SECTION

SECTION 32 12 16

ASPHALT PAVEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes asphaltic concrete paving and associated items.

1.02 REFERENCES

- A. Washington State Department of Transportation and American Public Works Association Standard Specifications for Road, Bridge and Municipal Construction 2008 and amendments to date, English edition (WSDOT Standard Specifications).
- B. Geotechnical report prepared by Shannon and Wilson dated March 2008.
- C. *US Green Building Council (USGBC), www.usgbc.org*
- D. *Related references per reference guide (e.g. Forest Stewardship Council, www.fscus.org)*
- E. *Local resources (e.g. Metro Recycling Toolkit, www.metro-region.org)*

1.03 PERFORMANCE REQUIREMENTS

- A. Hot Mix Asphalt: WSDOT Commercial HMA Cl. ½ in.

1.04 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit product information and mix design.
- C. Certificate: Certify Products meet or exceed specified requirements.
- D. Mix design prepared In accordance with WSDOT mix design specification within the past twelve months of commencing paving.
- E. *LEED certification product data as specified in Division 1, Section 01 81 13 - Sustainable Design Requirements. Complete the Material Buyout Form for the following LEED credits*
 - 1. *Credit MR 5.1, Regional Materials, Manufactured Locally*
 - 2. *Credit MR 5.2, Regional Materials, Harvested / Extracted Locally*

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with WSDOT Standard Specifications.
- B. Mixing Plant: Conform to WSDOT Standard Specifications.
- C. Obtain materials from same source throughout.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not place asphalt when ambient air or base surface temperature is less than in accordance with Section 5-04.3(16) of WSDOT Standard Specifications. Or when surface is wet or frozen.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Asphalt Cement: Performance Grade *PG64-28* or *PG 70-28*. Supplier to be the same as shown on Mix Design.
- B. Aggregate for Mix: Gradation to meet requirements of the WSDOT Mix Design; HMA Cl. ½ in.
- C. Anti-Strip: As required in Mix Design. Supplier to be the same as shown on Mix Design.
- D. Tack Coat: Emulsified asphalt CSS-1 or STE-1 meeting the requirements of WSDOT Standard Specifications.
- E. Reclaimed Asphalt Pavement (RAP): Processed material obtained by milling or removal of existing asphalt concrete pavements.

2.02 ASPHALT PAVING MIX

- A. Hot Mix Asphalt: WSDOT Commercial HMA Cl. ½ in.

2.03 SOURCE QUALITY CONTROL AND TESTS

- A. Section 01 45 23 – Testing and Inspection Services.
- B. Submit proposed mix design for review prior to beginning of Work.
- C. Test samples in accordance with WSDOT Standard Specifications.

2.04 ACCESSORIES

- A. Wheel stops shall be pre-cast cement concrete Class 3000 after 28 days and shall be 72-inches wide by 5 inches in height and shall be anchored to the asphalt with two #8 rebar a minimum of 2 feet into the ground.
- B. Concrete barrier curb shall be Class 3000 psi after 28 days five sack mix cement concrete and shall be 6 inches in height and per the detail in the Drawings.
- C. Concrete curb and gutter shall be Class 3000 psi after 28 days five sack mix cement concrete and shall be 6 inches in height and per the detail in the Drawings.
- D. Paint for pavement markings shall be either Low VOC Solvent Base or Low VOC Waterborne meeting the requirements of WSDOT Standard Specifications Section 9-34.
- E. Sign post shall consist of a two part, breakaway system made of a 2" X 2", 12 gage,

galvanized square steel tube post with a one-piece anchor base made of 2.25" X 2.25", 12 gauge, 36" long, galvanized square tube steel by TELSPAR® or approved equal unless otherwise noted.

- F. All signage shall be in accordance with the latest edition of the MUTCD and the Washington State Sign Fabrication Manual. Type and size of signs are noted in the plans.
- G. All detectable warning patterns shall be yellow and in accordance with the City of Richland Standard Specifications.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Section 01 11 00 - Administrative Requirements: Verification of existing conditions before starting Work.
- B. Verify compacted aggregate subbase is dry and ready to support paving and imposed loads.
- C. Verify gradients and elevations of base are correct.

3.02 SUBBASE

- A. Section 32 11 23 - Aggregate Base Course forms subbase construction for Work of this Section.

3.03 PREPARATION - TACK COAT

- A. Prepare existing paved surfaces and apply tack coat in accordance with Section 5-04.3(5)A of WSDOT Standard Specifications. Apply at rate of 0.02 to 0.08 of retained asphalt.
- B. Coat cement concrete surfaces that will be in contact pavement. Protect cement concrete surfaces from exposed cement concrete surfaces form tack application method. Clean excess tack from exposed cement concrete surfaces.

3.04 PLACING ASPHALT PAVEMENT

- A. Apply soil residual herbicide prior to paving in accordance with Section 32 11 23.
- B. Install Work in accordance with Section 5-04 of WSDOT Standard Specifications.
- C. Place to compacted depths identified in schedule at end of Section.
- D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

3.05 TOLERANCES

- A. Section 01 45 16.13 – Contractor Quality Control.
- B. Surface Smoothness: Maximum variation of 1/8 inch measured with 10-foot straight edge parallel to the direction of paving and ¼ inch measured with a 10-inch edge perpendicular to the direction of paving.

C. Scheduled Compacted Thickness: Within 1/8 inch.

D. Variation from Indicated Elevation: Within ¼ inch.

3.06 FIELD QUALITY CONTROL

A. Section 01 45 23 – Testing and Inspection Services.

B. Samples taken and test performed in accordance with WSDOT Standard Specifications.

3.07 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution Requirements: Protecting finished Work.

B. Protect pavement unnecessary traffic.

3.08 SCHEDULES

A. Standard Duty Asphalt Section: Single course of 2-inch compacted thickness. Compact course to 91 percent of maximum theoretical (Rice) density.

B. Heavy Duty Asphalt Section: Single course of 3-inch compacted thickness. Compact course to 91 percent of maximum theoretical (Rice) density.

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Cement Concrete sidewalks.
2. Cement Concrete integral curbs and gutters.
3. Cement Concrete median barriers.
4. Cement Concrete parking areas and roads.
5. Aggregate base course.

1.02 REFERENCES

A. American Concrete Institute:

1. ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications for Structural Concrete.
3. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
4. ACI 347 – Guide to Formwork for Concrete.

B. ASTM International:

1. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
2. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
3. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
4. ASTM C33 - Standard Specification for Concrete Aggregates.
5. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
6. ASTM C150 - Standard Specification for Portland Cement.
7. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
8. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
9. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.

10. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
 11. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 12. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- C. Washington State Department of Transportation and American Public Works Association Standard Specifications for Road, Bridge and Municipal Construction 2008 and Amendments to Date, English Edition.
1. Section 5-05 – Cement Concrete Pavement
- D. Latest edition of the City of Richland Standard Drawings and Specifications.
- E. *US Green Building Council (USGBC), www.usgbc.org*
- F. *Related references per reference guide (e.g. Forest Stewardship Council, www.fscus.org)*
- G. *Local resources (e.g. Metro Recycling Toolkit, www.metro-region.org)*

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit product information, materials and design mix.
- C. Shop Drawings: Submit joint layout plan and Drawings showing reinforcement fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 showing bar schedules, stirrup spacing, diagrams of bent bars and arrangement of concrete reinforcement.
- D. Cement concrete mix design: Submit a minimum of 10 working days prior to start of any placement.
- E. *LEED certification product data as specified in Division 1, Section 01 81 13 - Sustainable Design Requirements. Complete the Material Buyout Form for the following LEED credits:*
 1. *Credit MR 4.1 & 4.2, Recycled Content*
 2. *Credit MR 5.1, Regional Materials, Manufactured Locally*
 3. *Credit MR 5.2, Regional Materials, Harvested / Extracted Locally*

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301 and the requirements of Section 03 30 00 and Section 5-05 of the WSDOT Standard Specifications.
- B. Maintain one copy of each document on site.
- C. Obtain cementitious materials from same source throughout.

- D. Conform to ACI 305 when concreting during hot weather.
- E. Conform to ACI 306.1 when concreting during cold weather.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

- A. Form Materials: Conform to ACI 301 and as specified in Section 03 30 00.
- B. Bituminous Joint Filler per ASTM D1751.

2.02 REINFORCEMENT

- A. Reinforcing Steel as specified in Section 03 30 00 and per Section 5-05.2 Materials of the WSDOT Standard Specifications.
- B. Dowels per ASTM A615/A615M and per Section 5-05.2 Materials of the WSDOT Standard Specifications.

2.03 CONCRETE MATERIALS

- A. Concrete Materials: As specified in Section 03 30 00 and Section 5-05-.2 Materials of the WSDOT Standard Specifications.

2.04 ACCESSORIES

- A. Curing Materials: As specified in Section 03 30 00 and per Section 5-05.2 Materials of the WSDOT Standard Specifications.
- B. Expansion and Isolation Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- C. Bonding Agent: ASTM 1059, Type II, non redispersible, acrylic emulsion or styrene butadiene.
- D. Joint Sealers: As specified in Section 03 30 00.

2.05 CONCRETE MIX

- A. Mix and deliver concrete in accordance with ASTM C94/C94M.
- B. Select proportions for normal weight concrete in accordance with ACI 301.
- C. Provide concrete to the following criteria:
 - 1. Compressive Strength: 4000 **psi** at 28 days.
 - 2. Slump: 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
 - 3. Minimum Cement Content: 6 sacks per cubic yard.
 - 4. Maximum Water/Cement Ratio: 0.42 (non-air entrained), 0.35 (air entrained).

- 5. Air Entrained: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2 inch nominal maximum aggregate size. 6 percent, plus or minus 1.5 percent at point of delivery for 1 inch or 3/4 inch nominal maximum aggregate size.
- D. Use accelerating admixtures in cold weather only when approved by the Architect/Engineer in writing. Use of admixtures will not relax cold weather placement requirements.
- E. Use calcium chloride only when approved by the Architect/Engineer in writing.
- F. Use set retarding admixtures during hot weather only when approved by the Architect/Engineer in writing.

2.06 SOURCE QUALITY CONTROL AND TESTS

- A. Section 01 45 23 - Testing and Inspection Services: Provide mix design for cement concrete.
- B. Submit proposed mix design of each class of concrete to appointed firm for review prior to commencement of Work.
- C. Tests on cement, aggregates, and mixes will be performed to ensure conformance with specified requirements.
- D. Test samples in accordance with ACI 301.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Section 01 11 00 - Administrative Requirements: Verification of existing conditions before starting Work.
- B. Verify compacted subgrade and granular base and/or top courses are acceptable and ready to support paving and imposed loads.
- C. Verify gradients and elevations of base are correct.

3.02 SUBBASE

- A. Aggregate Subbase: Install as specified in Section 32 11 23.

3.03 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Coat surfaces of manholes, catch basins and all other structures to be adjusted to finished grade with oil to prevent bond with concrete pavement.
- C. Notify Owner and/or Owner's Representative a minimum 24 hours prior to commencement of concreting operations.

3.04 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.05 REINFORCEMENT

- A. Place reinforcement as detailed.
- B. Interrupt reinforcement as detailed.
- C. Place dowels and reinforcement to achieve pavement and curb alignment as detailed.
- D. Provide doweled joints as indicated with one end of dowel set in capped sleeve to allow longitudinal movement.

3.06 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301 and as specified in Section 03 30 00.
- B. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.
- C. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

3.07 JOINTS

- A. Place expansion and contraction joints. Align curb, gutter, and sidewalk joints.
- B. Place joint filler between paving components and building or other appurtenances.
- C. Saw cut contraction joints at an optimum time after finishing.

3.08 FINISHING

- A. Concrete Paving: Light broom.
- B. Sidewalk Paving: Light broom and trowel joint edges.
- C. Median Barrier: Light broom and trowel joint edges.
- D. Curbs and Gutters: Light broom.
- E. Direction of Texturing: Transverse to pavement direction.
- F. Place curing compound and sealer on exposed concrete surfaces immediately after finishing.

3.09 JOINT SEALING

- A. Separate pavement from vertical surfaces with ½ inch thick joint filler.
- B. Place joint filler in pavement pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- C. Extend joint filler from bottom of pavement to within 1/4 inch finished surface. Conform to Section 03 30 00 for finish joint sealer requirements.

3.10 TOLERANCES

- A. Section 01 45 16.13 – Contractor Quality Control.

3.11 FIELD QUALITY CONTROL

- A. Section 01 45 23 - Testing and Inspection Services.
- B. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301. Take cylinders for every 50 cubic yards of cement concrete placed.
- C. One additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.
- D. One slump and air test will be taken for each set of test cylinders taken.
- E. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.12 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit pedestrian and vehicular traffic over pavement until minimum strength is achieved.

END OF SECTION

SECTION 33 05 16

UTILITY STRUCTURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Modular precast concrete manhole sections, catch basins, utility vaults and water meter boxes and all associated accessories.

1.02 REFERENCES

- A. ACI (American Concrete Institute) 318 - Building Code Requirements for Reinforced Concrete.
- B. ASTM A48 - Gray Iron Castings.
- C. ASTM C478 - Precast Reinforced Concrete Manhole Sections.
- D. ASTM C497 - Test Method for Concrete Pipe, Manhole Sections, or Tile.
- E. Washington State Department of Transportation and American Public Works Association Standard Specifications for Road, Bridge and Municipal Construction 2008 and amendments to date, English edition (WSDOT Standard Specifications).
- F. Latest edition of the City of Richland Standard Drawings and Specifications.

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate manhole, catch basin, vault and box size, elevations, piping sizes and elevations of penetrations.
- C. Product Data: Submit manhole covers, component construction, features, configuration, dimensions and accessories.
- D. Manufacturer's Certificate: Submit Certificate of Compliance for manholes, catch basins, vaults, boxes and accessories meet the requirements.
- E. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Comply with precast concrete manufacturer's instructions for unloading, storing and moving precast manholes and drainage structures.
- C. Store precast concrete structures to prevent damage to Owner's property or other public or private property. Repair property damaged from materials storage.

PART 2 - PRODUCTS

2.01 MANHOLES AND CATCH BASINS

- A. Storm Drain Manhole 48 inch diameter as shown on Drawings.
- B. Sanitary Sewer and Sampling Process Water Manhole: 48 inch diameter per City of Richland Standard Plans.
- C. Catch Basins: Catch Basins Type 1 as shown on Drawings.

2.02 FRAMES, COVERS, AND COMPONENTS

- A. Manhole Lid and Frame: ASTM A48, Class 30B cast iron construction, solid cover surface, removable lid, with identifying lettering: "STORM", or "SEWER.
- B. Catch Basin Cover and Frame: ASTM A536-84 Grade 80-55-06.
- C. Manhole Steps: Formed, ½-inch deformed reinforcing bar polypropylene covered rung or approved equal. Formed integral with manhole sections.
- D. Base Pad: Cast-in-place concrete or precast.
- E. Adjustment Rings: Concrete adjustment rings commercially available.
- F. Utility Vaults: In accordance with the manufacture's guidelines and recommendations.
- G. Water Meter Boxes: In accordance with the City of Richland Standard Plans.

2.03 PRECAST UTILITY VAULTS AND WATER METER BOXES

- A. Utility Vaults and Water Meter Boxes: Per City of Richland Standard Plans.

2.04 EXAMINATION

- A. Section 01 31 00 - Administrative Requirements: Coordination and Project Conditions.
- B. Verify items provided by other sections of Work are properly sized and located.
- C. Verify built-in items are in proper location, and ready for roughing into Work.
- D. Verify excavation for manholes, catch basins, vaults and boxes are correct.

2.05 PREPARATION

- A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.
- B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.
- C. Inspect precast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

2.06 INSTALLATION

- A. Excavation and Backfill:
 - 1. Excavate for manholes, catch basins, vaults and boxes in accordance with Section 31 23 17 in location and to depth shown.
 - 2. Backfill and compact to contours shown on Drawings. Back fill material in accordance with Section 31 23 17.
 - 3. When groundwater is encountered, prevent accumulation of water in excavations. Provide and maintain sufficient pumping equipment for removal of groundwater when encountered during excavation. Place manholes or drainage structures in dry trench.
- B. Place base pad, trowel top surface level.
- C. Install manholes, catch basins, vaults and boxes supported at proper grade and alignment on compacted base.
- D. Backfill and compact excavations and imported fill for manholes and catch basins in accordance with Section 31 23 17.
- E. Install manholes, catch basin, vaults and boxes plumb and level, to correct dimensions and elevations.
- F. Verify manholes, catch basins, vaults and boxes installed satisfy required alignment and grade.
- G. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with mortar.
- H. Cut pipe to finish flush with interior of structure.
- I. Set cover frames and covers level without tipping.

2.07 CASTINGS INSTALLATION

- A. Set frame and cover in accordance with the City of Richland Standard Specifications minimum and maximum height adjustments.

2.08 FIELD QUALITY CONTROL

- A. Section 01 45 23 - Testing and Inspection Services.
- B. Request inspection prior to placing manholes, catch basins and backfill against structure and over pipe.
- C. Compaction Testing: In accordance with ASTM D1557, ASTM D2922, and ASTM D3017.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- E. Frequency of Tests: Test shall be taken per each structure at the following increments:
 - 1. At base of each structure.

2. Increments of 2 feet vertical depth thereafter or finished subgrade whichever is lower.

END OF SECTION

SECTION 33 11 16

SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes pipe and fittings for site water line including domestic water lines, fire water line, valves, fire hydrants and water services.
- B. Section also includes excavation and backfill requirements for well injection piping.

1.02 REFERENCES

- A. ASTM B 88M - Seamless Copper Water Tube Type K.
- B. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.
- C. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- D. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.
- E. AWWA C104 (American Water Works Association) - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
- F. AWWA C111 - Rubber- Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings.
- G. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- H. AWWA C500 (American Water Works Association) - Gate Valves, 3 through 48 in NPS, for Water and Sewage Systems.
- I. AWWA C502 - Dry Barrel Fire Hydrants.
- J. AWWA C504 - Rubber Seated Butterfly Valves.
- K. AWWA C509 - Resilient Seated Gate Valves 3 in through 12 in NPS, for Water and Sewage Systems.
- L. AWWA C600 - Installation of Ductile-Iron Water Mains and Appurtenances.
- M. Washington Stand Department of Transportation and American Public Works Association Standard Specifications for Road, Bridge, and Municipal Construction, 2008, English edition and amendments to date (WSDOT Standard Specifications).
- N. Latest edition of the City of Richland Standard Drawings and Specifications.

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories.

- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 QUALITY ASSURANCE

- A. Install pipe, fittings, and accessories in accordance with Section 7-08.3(2) of the WSDOT Standard Specifications and Section 7 of the City of Richland Standard Specifications. Where Specifications conflict; City of Richland Standard Specifications shall prevail. Perform Work in accordance with ASTM, AASTHO and local governing procedure standards.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.01 WATER PIPE

- A. Ductile Iron Pipe: AWWA C151: Class 50:
 - 1. Fittings and Joints: In accordance with the requirements of the City of Richland Standard Specifications.
- B. Copper Tubing: ASTM B88, Type K, annealed:
 - 1. Fittings and Joints: In accordance with the requirements of the City of Richland Standard Specifications.

2.02 GATE VALVES – 2 INCH THROUGH 8 INCH

- A. AWWA C509, resilient wedge type meeting the Requirements of City of Richland Standard Specifications. Accepted manufactures in accordance with the City of Richland Standard Specifications.
- B. Fittings and Joint Material: Meeting the requirements of City of Richland Standard Specifications.

2.03 WATER SERVICES AND WATER METERS

- A. Cut-In-Tees: Meeting the requirements of City of Richland Standard Specifications.
- B. Water Service Line and Assembly: Meeting the requirements of City of Richland Standard Specifications.

- C. 3 Inch Commercial Water Meter Assembly and Box: Meeting the requirements of City of Richland Standard Specifications.

2.04 REDUCED PRESSURE BACKFLOW ASSEMBLY

- A. Must be on the latest Department of Health approved list of backflow assemblies.
- B. Must be installed 12-inches above grade.
- C. A City of Richland Cross Connection Specialist must be present during installation.
- D. Risers and all pipe shall be galvanized steel.
- E. Freeze protection shall be provided. Contractor shall submit freeze protection device to Owner and/or Owner's representative for approval prior to installation.

2.05 DOUBLE CHECK VALVE ASSEMBLY

- A. Double check valve assembly: Meeting the requirements of City of Richland Standard Specifications.

2.06 FIRE HYDRANT ASSEMBLY

- A. Hydrant Assembly: Meeting the requirements of City of Richland Standard Specifications.

2.07 MISCELLANEOUS ACCESSORIES AND MATERIALS

- A. Water Valve Box and Lid: Meeting the requirements of City of Richland Standard Specifications.
- B. Cement Concrete for Thrust Blocks: Commercially available; class 3000 meeting the requirements of the City of Richland Standard Specifications.
- C. Double Check Valve Box and Lid: Meeting the requirements of the City of Richland Standard Specifications.
- D. Post Indicator Valve: Meeting the requirements of the City of Richland Standard Specifications.
- E. Restraint Joint Devices: Meeting the requirements of the City of Richland Standard Specifications.
- F. Irrigation Riser Removal: Pipe materials and accessories to be same as existing pipe material type.

2.08 BEDDING AND COVER MATERIALS

- A. Bedding: Trench excavated materials as approved by Engineer meeting the requirements of Section 2.3.2 of the City of Richland Standard Specifications. All imported pipe bedding to meet the requirements of Section 2.3.2 of the City of Richland Standard Specifications or as approved by the Engineer.
- B. Cover: Backfill, as specified in Section 31 23 17.

PART 3 - EXECUTION

3.01 - EXAMINATION

- A. Section 01 31 00 - Administrative Requirements: Coordination and Project conditions.
- B. Verify building service connection and municipal utility water main size, location, and invert are as indicated on Drawings.

3.02 PREPARATION

- A. Prepare all pipe and fitting in accordance with City of Richland Standard Specifications.
- B. Contractor to pay all City of Richland connection and Cut-in fees. Notify City of Richland a minimum of 10 working days to schedule water main cut-in.

3.03 BEDDING

- A. Excavate pipe trench in accordance with Section 31 23 17 and Section 7-09 of the WSDOT Standard Specifications.
- B. Place bedding material in accordance with Section 7-09.3(7) of the WSDOT Standard Specifications.
- C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact to 95 percent.
- D. Maintain optimum moisture content of fill material to attain required compaction density.

3.04 INSTALLATION - PIPE

- A. Maintain ten (10) feet horizontal separation of water main from sanitary sewer piping.
- B. Install pipe in accordance with Section 6 of the City of Richland Standard Specifications and Section 7-09 of WSDOT Standard Specifications. Where Specifications conflict City of Richland Standard Specifications shall prevail.
- C. Connect to existing waterline stubs as indicated on Drawings.
- D. Form and place concrete for thrust restraints in accordance with the requirements of City of Richland Standard Drawings and Specifications.
- E. Backfill trench in accordance with Section 31 23 17.

3.05 INSTALLATION - VALVES

- A. Install valves in accordance with City of Richland Standard Specifications.

3.06 INSTALLATION - REDUCED PRESSURE BACKFLOW ASSEMBLY

- A. Install in accordance with the City of Richland Standard Specifications.
- B. A City of Richland Cross Connection Specialist must be present during installation.
- C. Freeze protection shall be provided. Contractor shall submit freeze protection device to Owner and/or Owner's representative for approval prior to installation.

3.07 INSTALLATION - DOUBLE CHECK VALVE ASSEMBLY

- A. Install in accordance with the City of Richland Standard Specifications.

3.08 FIRE HYDRANT ASSEMBLY INSTALLATION

- A. Install hydrant assembly in accordance with City of Richland Standard Specifications.

3.09 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect and flush system in accordance with City of Richland Standard Specifications.

3.010 WATER MAIN TIE-INS

- A. City of Richland to install cut-in tee.
- B. Coordinate Work with City of Richland.
- C. Contractor to furnish to City Cut-in tee and valve or corporation stop.
- D. Contractor to excavate and expose water main at tie-in location.
- E. Contractor to construct thrust block and backfill and compact location after cut-in tee is installed.

3.011 SERVICE CONNECTIONS

- A. Install water service of size and type as indicated on Drawings and in accordance with City of Richland Standard Drawings and Specifications.

3.012 WELL INJECTION PIPING

- A. Excavate and backfill trench in accordance with Section 31 23 17.

3.13 FIELD QUALITY CONTROL

- A. Section 01 45 23 - Testing and Inspection Services.
- B. Compaction Testing: In accordance with ASTM D1557, ASTM D2922, and ASTM D3017.
- C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- D. Frequency of Tests: In accordance with Section 31 23 17.
- E. Bacteriological Tests: Tests to be performed in accordance with City of Richland Standard Specifications.
- F. Hydrostatic Tests: Conduct tests in accordance with City of Richland Standard Specifications. Repair defective joints or pipe until the leakage of a subsequent test is within the specified allowance.

END OF SECTION

SECTION 33 31 00

SANITARY UTILITY SEWERAGE PIPING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes sanitary sewerage drainage piping, process water piping, fittings, accessories and bedding; and connection of building sanitary drainage system to municipal sewers system.

1.02 REFERENCES

- A. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.
- B. ANSI/ASTM D2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
- C. ANSI/ASTM D3034 – Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.
- D. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- E. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.
- F. Washington Stand Department of Transportation and American Public Works Association Standard Specifications for Road, Bridge, and Municipal Construction, 2008, English edition and amendments to date (WSDOT Standard Specifications).
- G. Latest edition of the City of Richland Standard Drawings and Specifications.

1.03 DEFINITIONS

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data indicating pipe and pipe accessories.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.05 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution Requirements: Closeout procedures.
- B. Project Record Documents: Record location of pipe runs, connections, manholes cleanouts, and invert elevations.

- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 COORDINATION

- A. Section 01 31 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate the Work with termination of sanitary sewer connection outside building and connection to municipal sewer utility service.

PART 2 - PRODUCTS

2.01 SEWER AND PROCESS WATER PIPE MATERIALS

- A. Plastic Pipe: ANSI/ASTM D3034, SDR 35, size as shown on Drawings, bell and spigot style with rubber gasket.

2.02 PIPE ACCESSORIES

- A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.03 BEDDING AND COVER MATERIALS

- A. Bedding: Crushed surfacing base course meeting the requirements of Section 9-03.9(3) of the WSDOT Standard Specifications.
- B. Cover: Backfill as specified in Section 31 23 17.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Section 01 31 00 - Administrative Requirements: Coordination and Project conditions.
- B. Verify excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.02 PREPARATION

- A. Correct over excavation with fine aggregate.
- B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.03 BEDDING

- A. Excavate pipe trench in accordance with Section 31 23 17 for Work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material and compact in accordance with Section 7-08.3(1) of the WSDOT Standard Specifications.
- C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION - PIPE

- A. Install pipe, fittings, and accessories in accordance with Section 7-08.3(2) of the WSDOT Standard Specifications and Section 7 of the City of Richland Standard Specifications. Where Specifications conflict City of Richland Standard Specifications shall prevail.
- B. Lay pipe to slope gradients noted on drawings with maximum variation in accordance with the City of Richland Standard Specifications.
- C. Refer to Section 31 23 17 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.
- D. Refer to Section 33 05 16 for manhole requirements.
- E. Provide sewer to within 5 feet from building line and connect to municipal sewer system in accordance with City of Richland Standard Specifications.

3.05 FIELD QUALITY CONTROL

- A. Section 01 45 23 - Testing and Inspection Services.
- B. Request inspection prior to and immediately after placing bedding.
- C. Compaction Testing: In accordance with ANSI/ASTM D1557, ASTM D2922, and ASTM D3017.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- E. Frequency of Tests: In accordance with Section 31 23 17.
- F. Pressure Test: Test in accordance with Test in accordance with Section 7-17.3(2)F of WSDOT Standard Specifications.
- G. Infiltration Test: Test in accordance with Section 7-17.3(2)C of WSDOT Standard Specifications when required.
- H. Deflection Test: Test in accordance with Section 7-17.3(2)G of WSDOT Standard Specifications.

3.06 PROTECTION OF FINISHED INSTALLATION

- A. Section 01 70 00 - Execution Requirements: Protecting finished installation.
- B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 33 13

PROCESS WATER UTILITY SEWERAGE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes sampling and testing equipment for process water and associated fittings and accessories.

1.02 REFERENCES

- A. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.
- B. ANSI/ASTM D2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
- C. ANSI/ASTM D3034 – Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.
- D. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- E. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.
- F. Washington Stand Department of Transportation and American Public Works Association Standard Specifications for Road, Bridge, and Municipal Construction, 2008, English edition and amendments to date (WSDOT Standard Specifications).
- G. Latest edition of the City of Richland Standard Drawings and Specifications.

1.03 DEFINITIONS

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data indicating sampling and testing equipment and accessories.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified (Palmer-Bowlus Flume, ISCO 4700 Refrigerated Composite Sampler, ISCO 4230 Flow Meter).
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.05 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution Requirements: Closeout procedures.
- B. Project Record Documents: Record location of pipe runs, connections, manholes cleanouts, and invert elevations.

- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 COORDINATION

- A. Section 01 31 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate the Work with termination of process water connection outside building and connection to municipal sewer utility service.

PART 2 - PRODUCTS

2.01 PROCESS WATER PIPE MATERIALS

- A. Plastic Pipe: ANSI/ASTM D3034, SDR 35, size as shown on Drawings, bell and spigot style with rubber gasket.

2.02 PIPE ACCESSORIES

- A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.
- B. Fiberglass reinforced Palmer-Bowlus Flume Type 4D+1 with molded side cavity for bubble pipe. The flume shall include a built-in stainless steel bubble tube and a support bracket for an electronic capacitance probe. The inside surface shall be white gelcoat, smooth and free from irregularities. The outside surface shall be provided with clips suitable for anchoring to concrete. The entrance and exit ends shall be U-shaped and the flume shall have an inside radius the same as the inside radius of the pipeline in which it is installed. The flume shall be molded of isophthalic polyester resin and fiberglass to form a minimum wall thickness of 3/16-inch throughout. The Palmer-Bowlus Flume shall be manufactured by Plasti-Fab Inc., PO Box 100, Tualatin, Oregon 97062, or approved equal.

2.03 BEDDING AND COVER MATERIALS

- A. Bedding: Crushed surfacing base course meeting the requirements of Section 9-03.9(3) of the WSDOT Standard Specifications.
- B. Cover: Backfill as specified in Section 31 23 17.

2.04 SAMPLER

- A. Teledyne ISCO 4700 Refrigerated Composite Sampler with 1 bottle, 20 liter PE or glass option, suction line, and all associated parts and fittings. Sampler to provide power source for Flow Meter.
- B. Conduit shall be in accordance with WSDOT Standard Specification 9-29 Illumination, Signal, Electrical. Conduit shall have pull string.
- C. Concrete pad as shown on Drawings.

2.05 FLOW METER

- A. Teledyne ISCO 4230 Flow Meter with stainless steel extension tube for the bubble line, bubble line, ISCO Flowlink Software for data acquisition, storage and management. Flow meter to be connected and powered through the Sampler.

- B. Conduit shall be in accordance with WSDOT Standard Specification 9-29 Illumination, Signal, Electrical. Conduit shall have pull string.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Section 01 31 00 - Administrative Requirements: Coordination and Project conditions.
- B. Verify area is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.02 PREPARATION

- A. Correct over excavation with fine aggregate.
- B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.
- C. Conduit runs shall be as close as possible to those shown on the Drawings.

3.03 BEDDING

- A. Excavate pipe trench in accordance with Section 31 23 17 for Work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material and compact in accordance with Section 7-08.3(1) of the WSDOT Standard Specifications.
- C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION

- A. Install pipe, fittings, and accessories in accordance with Section 7-08.3(2) of the WSDOT Standard Specifications and Section 7 of the City of Richland Standard Specifications. Where Specifications conflict City of Richland Standard Specifications shall prevail.
- B. Lay pipe to slope gradients noted on drawings with maximum variation in accordance with the City of Richland Standard Specifications.
- C. Refer to Section 31 23 17 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.
- D. Refer to Section 33 05 16 for manhole requirements.
- E. Install Palmer-Bowlus Flume, ISCO 4230 Flow Meter and bubble line, and ISCO 4700 Refrigerated Composite Sampler and all associated parts and fittings in accordance with the manufactures recommendations and guidelines.
- F. Place Refrigerated Sampler on properly cured concrete pad as shown on the Drawings. Sampler shall be securely fastened to the concrete pad with stainless steel anchors.
- G. Placement of Refrigerated Sampler shall be adjacent to GFI exterior electrical outlet indicated on Drawing E7.01.
- H. Mount Flow Meter on face of building.

- I. Placement and location of conduit for bubbler and sampler to Sampling Process Water Manhole shall be field fitted as necessary for proper installation in accordance with manufactures recommendations and guidelines.

3.05 FIELD QUALITY CONTROL

- A. Section 01 45 23 - Testing and Inspection Services.
- B. Request inspection prior to and immediately after installation of equipment.
- C. Compaction Testing: In accordance with ANSI/ASTM D1557, ASTM D2922, and ASTM D3017.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- E. Frequency of Tests: In accordance with Section 31 23 17.
- F. Pressure Test: Test in accordance with Test in accordance with Section 7-17.3(2)F of WSDOT Standard Specifications.
- G. Infiltration Test: Test in accordance with Section 7-17.3(2)C of WSDOT Standard Specifications when required.
- H. Deflection Test: Test in accordance with Section 7-17.3(2)G of WSDOT Standard Specifications.
- I. After installation, demonstrate proper operation of the Flow Meter and the Refrigerated Sampler by introduction of a measured flow, greater than 10 gallons per minute, upstream of the equipment for a period of 4 hours. During the demonstration, all functions of the equipment shall be verified.

3.06 PROTECTION OF FINISHED INSTALLATION

- A. Section 01 70 00 - Execution Requirements: Protecting finished installation.
- B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
- C. Protect sampling and testing equipment from damage or displacement until project completion.

END OF SECTION

SECTION 33 41 00

STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes site storm utility drainage piping, fittings accessories, bedding and connection of drainage system to detention pond.

1.02 REFERENCES

- A. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop.
- B. ASTM D2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
- C. ASSHTO M294 Type S – Specification for Corrugated Polyethylene Pipe, 12 to 36 Inch Diameter and Fittings.
- D. ASSHTO M252 Type S – Specification for Corrugated Polyethylene Pipe, 3 to 10 inch Diameter and Fittings.
- E. ASTM D1758 – Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- F. ASTM D1248 – Standard Specification for Polyethylene Plastics Molding and Extrusion Material.
- G. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- H. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.
- I. Washington State Department of Transportation and American Public Works Association Standard Specifications for Road, Bridge and Municipal Construction 2008 and amendments to date, English edition (WSDOT Standard Specifications).
- J. Latest edition of the City of Richland Standard Drawings and Specifications.

1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data indicating pipe and pipe accessories.
- C. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.
- D. Manufacturer's Certificate: Submit Certificate of Compliance all pipe and pipe accessories meet the requirements.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution Requirements: Closeout procedures.

- B. Project Record Documents:
 - 1. Accurately record actual locations of pipe runs, connections, and invert elevations.
 - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 COORDINATION

- A. Section 01 31 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate the Work with Building Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Storm Sewer Pipe Materials:
 - 1. Polyvinyl Chloride PVC Pipe shall be Class 150, DR 18. Pipe shall be push on joint or coupled joint conforming to ASTM D1784 Class 12454-A or 12454-B. Pipe shall meet all the material, performance and test requirements of AWWA C900.
 - 2. *Corrugated Polyethylene Pipe: AASHTO M 252, Type S, smooth wall interior, size as shown on Drawings.*
 - 3. *PVC Plastic Pipe: ASTM 3034, SDR 35, size as shown on Drawings.*
- B. Roof Drain Pipe Material:
 - 1. Corrugated Polyethylene Pipe: AASHTO M 252, Type S, smooth wall interior, size as shown on Drawings.
 - 2. PVC Plastic Pipe: ASTM 3034, SDR 35, size as shown on Drawings.
- C. Percolation Trench
 - 1. Trench Filter System
 - a. Filtering Material: 2 to 3 inch washed drain rock.
 - b. Filter Fabric: Mirafi 140 N or approved equal.
 - 2. Pipe Systems:
 - a. Piping to comply with AASHTO M 294M Type S for NPS 12 to NPS 48. Include proprietary fittings, couplings, seals and filter fabric.
- D. **Outfall Pad**
 - 1. **Riprap shall be in accordance with WSDOT Standard Specification 9-13.1 Loose Riprap.**

2.02 ACCESSORIES

- A. Pipe Joints: Bell and spigot style rubber ringed sealed gasket joint.
- B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps, end caps, and other configurations required.
- C. Storm Sewer Line End Marker: 2 inch X 4 inch lumber, pressure treated.
- D. Trench drain shall be pre-sloped "PolyDrain" by ABT, Inc. or approved equal with perforated grate No. 504 or approved equal.

2.03 BEDDING AND COVER

- A. Bedding: Trench excavated materials as approved by Engineer meeting the requirements of Section 7-08.3(1) of the WSDOT Standard Specifications. All imported pipe bedding to meet the requirements of Section 9-03.12(3) of the WSDOT Standard Specifications.
- B. Cover: Backfill, as specified in Section 31 23 17.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify excavation base is ready to receive work and dimensions, and elevations are as indicated on Drawings.

3.02 PREPARATION

- A. Remove large stones or other hard matter that could damage piping or impede consistent backfilling or compaction.

3.03 BEDDING

- A. Excavate pipe trench in accordance with Section 31 23 17 for Work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material and compact in accordance with Section 7-08.3(1) of the WSDOT Standard Specifications.
- C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.04 INSTALLATION - PIPE

- A. Install pipe, fittings, and accessories in accordance with Section 7-08.3(2) of the WSDOT Standard Specifications. Seal joints watertight.
- B. Refer to Section 31 23 17 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.
- C. Refer to Section 33 05 16 for manhole requirements.
- D. End of pipe that is daylighted at storm drainage swales shall be cut to match slope of finished grade as shown on Drawings.

3.05 INSTALLATION – PERCOLATION TRENCH

- A. Install pipe, fittings, and accessories in accordance with Section 7-08.3(2) of the WSDOT Standard Specifications. Seal joints watertight.
- B. Refer to Section 31 23 17 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.
- C. Refer to Section 33 05 16 for manhole requirements.
- D. Protect washed drain rock from sediment contamination. No sediment allowed in washed drain rock.
- E. Install Filter Fabric in accordance with manufacture's guidelines and recommendations. Overlap fabric a minimum of 18-inches.

3.06 INSTALLATION – TRENCH DRAIN

- A. Install trench drain, fittings, and accessories in accordance with the manufacture's guidelines and recommendations.

3.07 FIELD QUALITY CONTROL

- A. Section 01 45 23 - Testing and Inspection Services.
- B. Request inspection prior to and immediately after placing aggregate cover over pipe.
- C. Compaction Testing: In accordance with ASTM D1557 ASTM D2922 and ASTM D3017.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- E. Frequency of Tests: In accordance with Section 31 23 17.

3.08 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution Requirements: Protecting finished Work.
- B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
 - 1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
 - 2. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION