

SECTION 33 0550 – TRENCHING

PART I - GENERAL

I.I RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Excavate trenches for utilities from outside building to municipal utilities.
2. Compacted bedding under fill over utilities to subgrade elevations.
3. Backfilling and compaction.

- B. Related Sections:

1. Division 1 Section “Quality Control: Testing Fill Compaction”
2. Division 1 Section “Construction Facilities and Temporary Controls”.
3. Division 31 Section “Excavating, Backfilling, and Compacting”, Fill Materials.
4. Division 31 Section “Erosion Control”.

1.3 REFERENCES

- A. ASTM D1557 - Test methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures.
- B. ASTM D1556 - Test Method for Density in Soil in Place by the Sand-Cone Method.
- C. ASTM D2922 - Standard Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).

1.5 FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the Work are shown in Drawings.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

- A. Fill materials as specified in Section 31 2350.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify fill materials to be reused are acceptable.

3.2 PREPARATION

- A. Identify required lines, levels contours, and datum.
- B. Maintain and protect existing utilities remaining, which pass through Work area.
- C. Protect plant life, lawns and other features remaining as a portion of final landscaping.
- D. Protect bench marks, existing structures, subgrade, sidewalks, paving and curbs from excavation equipment and vehicular traffic.
- E. Protect above and below grade utilities which are to remain.
- F. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with 1 ½”-0” crushed rock and compact to density equal to or greater than requirements for subsequent backfill material.

3.3 EXCAVATION

- A. Excavate subsoil required for all utilities including water, gas, sewer, storm drainage, electrical piping, etc. to municipal or private utilities.
- B. Cut trenches sufficiently wide to enable installation of utilities and allow inspection. Maximum trench width is 36 inches.
- C. Excavation shall not interfere with normal 45 degree bearing splay of foundations unless indicated otherwise.
- D. Hand trim excavation. Remove loose matter.
- E. Remove lumped subsoil. Remove boulders larger than 1/4 cubic yards, using air-operated hammer when necessary.
- F. Provide temporary shoring of trenching as required to prevent all cave-in or sloughing of material and to protect workers from injury.

- G. Maximum allowed total length of un-backfilled trenching during working hours is 200 feet. Maximum allowed total length of un-backfilled trenching during off-work hours is 20 feet. Barricade and cover unbackfilled trenches. Provide steel plate covers in areas subject to traffic.
- H. Correct unauthorized excavation at no cost to Owner.
- I. Correct areas over-excavated or disturbed by error in accordance with Section 31 2350.
- J. Stockpile excavated material in area designated on-site and remove from site excess material not being use.

3.4 BEDDING

- A. Support pipe and conduit during placement and compaction of bedding fill.

3.5 BACKFILLING

- A. Backfill trenches to contours and elevation with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Place and compact fill materials in continuous layers not exceeding 8 inch compacted depth.
- D. Employ a placement method that does not disturb or damage other work.
- E. Maintain optimum moisture content of backfill materials to attain required compaction density.
- F. Remove surplus backfill materials from site.
- G. Leave fill material stockpile areas completely free of excess fill materials.

3.6 TOLERANCES

- A. Top Surface of Backfilling Under Paved Areas: Plus or minus 1/2 inch from required elevations.
- B. Top Surface of General Backfilling: Plus or minus 1/2 inch from required elevations.

3.7 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Division 01. Do not backfill until utility has been observed, tested and approved by appropriate jurisdictional authorities and independent testing agencies. Notify all agencies in time to observe/test work.
- B. Compaction testing will be performed in accordance with ASTM D1556, ASTM D1557,

ASTM D1922, AASHTO T180, and Division 01.

- C. If tests indicated Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
- D. Frequency of Compaction Tests: Every 40 cubic yards of backfill.

3.8 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Division 01.
- B. Recompact fills subjected to vehicular traffic or remove and replace in accordance with Section 31 2350.
- C. Damage to other portions of work due to new work shall be repaired at no additional cost to Owner. On new work, damage shall be repaired by original installer.

END OF TRENCHING

SECTION 33 1120 - WATER DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To

1. Perform excavation and backfill required for installation of work of this Section.
2. Furnish and install water system including public water lines, domestic lines and fire suppression water lines and appurtenances.
3. Furnish and install connections to public water main.
4. Furnish and install new fire hydrants, fire department connections, meters, back flow prevention and pressure reducing devices, vaults and appurtenances.
5. Coordinate with electrical and fire alarm systems and provide power, control conduits and wiring to and from vaults and buildings.

B. Related Sections

1. Section 31 0501 - General Site Construction Requirements
2. Section 31 2350 - Excavation and Filling

1.2 REFERENCES

A. American National Standards Institute / American Water Works Association

1. ANSI A21.10 / AWWA C 110-93, 'Fittings, 3 inch through 48 inch, for Water and Other Liquids, Gray-Iron and Ductile-Iron'
2. ANSI A21.11 / AWWA C 111-90, 'Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings'
3. ANSI A21.50 / AWWA C 150-91, 'Thickness Design of Ductile-Iron Pipe'
4. ANSI A21.51 / AWWA C 151-91, 'Ductile-Iron Pipe, Centrifugally Cast, in Metal Molds or Sand-Lined Molds for Water or Other Liquids'

B. American Society For Testing And Materials

1. ASTM A 126-95, 'Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings'
2. ASTM A 197-87 (1992), 'Standard Specification for Cupola Malleable Iron'
3. ASTM A 307-97, 'Standard Specification for Carbon Steel Bolts and Studs 60 000 psi Tensile Strength'

4. ASTM A 506-93, 'Standard Specification for Steel, Sheet and Strip, Alloy, Hot-Rolled and Cold-Rolled, Regular Quality and Structural Quality'
 5. ASTM A 575-96, 'Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades'
- C. American Water Works Association
1. AWWA C 502-85, 'Specification for Dry Barrel Fire Hydrants'
- D. National Fire Protection Association
1. NFPA 24-1992, 'Standard for the Installation of Private Fire Service Mains and Their Appurtenances'
- E. City of The Dalles Building Department.
- F. American Public Works Association, Oregon Chapter, Standard Specifications for Public Works Construction.
- G. ASTM D3139 - Joints for Plastic Pressure pipes using Flexible Elastomeric Seals.
- H. AWWA C500 - Gate Valves, 3 Through 48 in NPS, For Water and Sewage Systems.
- I. AWWA C508 - Swing Check Valves For Waterworks Service 2 Through 24 in NPS.
- J. AWWA C509 - Resilient Seated Gate Valves 3 Through 12 in NPS, For Water and Sewage.
- K. AWWA C600 - Installation of Ductile-Iron Water Mains and Appurtenances.
- L. AWWA C606 - Grooved and Shouldered Type Joints.
- M. AWWA C900 - Standard For Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch Through 12 Inch For Water.
- N. UL 246 - Hydrants For Fire Protection Service.

1.3 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies
1. Install exterior fire water system according to NFPA 13, NFPA 24, and Cast Iron Pipe Research Institute Procedures unless specified otherwise below.
 2. Install hydrant in accordance with AWWA C 502.
 3. Install exterior fire water system up to and including pipe flange 12 inches above floor inside building.
 4. Install water system in accordance with State of Oregon, Chenoweth Peoples Water District and City of The Dalles Fire Department requirements.

- B. Pre-Installation Conference - Participate in pre-installation conference specified in Section 03313.
- C. Provide for system installation and testing as required by City of The Dalles Building Department and Fire Department.
 - 1. Provide for and test the double check backflow preventer and fire department connection riser system in accordance with the Chenoweth Peoples Water District and Fire Department.

1.4 SUBMITTALS FOR REVIEW

- A. Submit under provisions of Division 01.
- B. Project Data: Provide data on pipe materials, all pipe fittings, valves, vaults, F.D.C. and accessories.

1.5 SUBMITTALS FOR CLOSEOUT

- A. Submit under provisions of Division 01 - Contract Closeout.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.6 SUBMITTAL AT PROJECT CLOSEOUT

- A. Submit under provisions of Division 1- Contract Closeout.
- B. Record actual locations of piping mains, valves, connection, thrust restraints and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.7 QUALITY ASSURANCE

- A. Perform work in accordance with Oregon State Plumbing Code, Oregon State Health Division Rules and Chenoweth Peoples Water District and Fire Departments, as noted on the Drawings and per product manufacturer's and referenced written recommendations.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 01.
- B. Deliver and store valves, meters and backflow prevention devices in shipping containers with labeling in place.

1.9 COORDINATION

- A. Coordinate work of this Section with related work.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

A. 4" to 12" PVC Pipe:AWWA C900, Class 200:

Fittings: AWWA C111, cast iron.

Joints: ASTM D3139, compression gasket ring. Gaskets shall conform to ASTM F477 and ASTM D1869. EBAA Iron, Inc joint restraining devices.
Trace Wire: Magnetic detectable conductor, clear brightly colored plastic covering, imprinted with "Water Service" in large letters.

B. Hydrants

1. Unless otherwise required by the Fire Department, provide dry-barrel fire hydrant (base valve type) complying with AWWA C 502, with 200 psi working pressure with two 2-1/2 inch hose connections and one 4-1/2 inch pumper connection with caps and chains. Nozzle cap nuts to match operating stem nuts.
2. Acceptable Manufacturers -
 - a. Hydrants accepted by authority having jurisdiction.
3. Paint as required by authority having jurisdiction

D. Gate Valves

1. Cast iron body with bolted bonnet in accordance with AWWA C500.
2. Indicator post pattern.
3. Non-rising stem.
4. 200 psi working pressure.
5. Approved Manufacturers -
 - a. Nibco -
 - 1) Model M-609 with mechanical connection.
 - 2) Model F-609 with flanged connection.
 - b. Mueller -
 - 1) Model A-2052-5 with mechanical connection.
 - 2) Model A-2052-6 with flanged connection.

E. Waterline Valves Larger than 10 inch size:

1. Waterline valves, larger than 10 inch shall be butterfly valves.
2. Butterfly valves shall be rubber seated type, suitable for direct-burial service and suitable for 200 psi working pressure and 200 psi pressure differential across valve.
 - a. Valve ends shall be mechanical joint, unless otherwise specified.
 - b. Furnish joint accessories with valve.
 - c. Valve shall be equipped with iron body and either 304 stainless circular shaft or high-tensile steel hexagon shaft with 304 stainless steel journals.

- d. Shaft and disc seals shall be designed for a bottle-tight seal.
 - e. Valve disc shall be either cast iron alloy conforming to Type 1 or chrome edge cast iron with rubber disc seat and 304 stainless steel body seat integrally cast into valve body.
 - f. Valve operator shall be as specified below.
 - g. Except as herein noted, butterfly valve shall conform to AWWA C504-70 for Class 150B.
3. Butterfly valve shall be furnished with totally enclosed, integral valve operator design to withstand a minimum of 300 foot-pound input torque without damage to valve or operator.
 - a. Operators shall be fully gasketed and greased packed and designed to withstand submersion in water to a pressure of 10 psi.
 - b. Valves shall open with a counterclockwise rotation of an AWWA nut.
 - c. Minimum of 30 turns of operating nut shall be required to move disc from a fully opened position to a fully closed position.
 - d. Operators shall have two-inch square wrench nut.
 4. Joint materials for mechanical joint or push-on joint for cast iron pipe shall conform to AWWA C111. Joint materials for flanged joints shall consist of 1/8 inch thick, full-faced, one-piece, cloth inserted, rubber gaskets conforming to Section 7 of AWWA C207. Bolts and nuts shall conform to Section 8 of AWWA C207.

F. Tamper Switches

1. UL / FM Approved.
2. Weather and tamper resistant.
3. Single Pole Double Throw Switch.
4. Approved Manufacturer -
 - a. Potter Electric Signal - Model PCVS.

G. Anchorages

1. Provide anchorages for tees, plugs, caps, bends, and hydrants in accordance with NFPA 24.
2. Miscellaneous Fittings -
 - a. Clamps, Straps, And Washers - Steel, meeting requirements of ASTM A 506.
 - b. Rods - Steel, meeting requirements of ASTM A 575.
 - c. Rod Couplings - Malleable iron, meeting requirements of ASTM A 197.
 - d. Bolts - Steel, meeting requirements of ASTM A 307.
 - e. Cast Iron Washers - Meeting requirements of ASTM A 126, Class A.
 - f. Thrust Block - 3000 psi concrete.

H. Accessories

1. Concrete for Thrust Restraints: Concrete type specified in 03-3000.
2. Backflow Preventers: As approved by State of Oregon and Chenoweth Peoples Water District.

3. Meters: Per Chenoweth Peoples Water District.
4. Joint restraining devices: EBAA iron, Inc.

I. Copper Pipe

1. 2" and smaller: Annealed soft drawn copper tubing, Type K, ASTM B88 and wrought copper solder joint fittings.
2. 2-1/2" and larger: Hard drawn copper tubing, Type K, ASTM B88.
3. Fittings: Wrought copper with brazed fittings, Type K, hard drawn, 200 psi rated. Do not use brazing rods with Cadmium.

J. PVC Pipe – 3" and smaller: ASTM D2241, 200 psi pressure rated pipe.

1. Fittings: Solvent welded joints conforming to ASTM D2672 with same or greater pressure rating than pipe.
2. Solvent cement shall conform to ASTM D2564.

2.2 MANUFACTURERS

- A. Mueller Company, Decatur, IL (800) 423-1323 or (217) 423-4471 www.muellerflo.com
- B. Nibco Inc, Elkhart, IN (800) 234-0227 or (219) 295-3000 www.nibco.com
- C. Potter Electric Signal Company, St Louis, MO (800) 325-3936 or (314) 878-4321 www.pottersignal.com

2.3 PRESSURE TEST EQUIPMENT

- A. Provide necessary equipment and materials including mainline taps and stops required to perform pressure test.
- B. This item is considered incidental to work and there will be no specific compensation for pressure testing.
- C. Equipment will include but not be limited to following:
 1. Clean barrel or similar container for test make-up water.
 2. Pressure gauges for proper range.
 3. Hydraulic force pump, suitable hose and suction pipe as required.

2.4 DISINFECTION

- A. Provide equipment, material and labor necessary to properly disinfect and test completed work.
- B. This item is considered incidental to work and there will be no specific compensation for disinfection.
- C. Provide work in accordance with ANSI/AWWA C651 and C601 standards.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Before installation, inspect pipe for defects and cracks. Do not use defective, damaged, or unsound pipe.
- B. Verify that building service connection and municipal utility water main size, location and invert are as indicated.

3.2 PREPARATION

- A. Excavate and backfill as specified in Section 33 0550 with following additional requirements
 - 1. Runs shall be as close as possible to those shown on Drawings.
 - 2. Excavate to required depth.
 - 3. Grade to obtain fall required.
 - 4. Bottom of trenches shall be hard. Tamp as required.
 - 5. Remove debris from trench prior to laying of pipe.
 - 6. Do not cut trenches near footings without consulting Architect.
 - 7. Excavate trenches so outside pipe will be 12 inches minimum below frost line or 36 inches minimum below finish grade, whichever is deeper.
 - 8. Cover pipe only after testing is complete and accepted by governing jurisdiction and Architect.
- B. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
- C. Remove scale and dirt on inside and outside before assembly.
- D. Prepare pipe connections to equipment with flanges or unions.

3.3 INSTALLATION

A. General

1. When work is not in progress, close open ends of pipe and fittings so no trench water, soil, or other substances will enter pipes or fittings.
2. Keep trenches free from water until pipe jointing material has set. Do not lay pipe when condition of trench or weather is unsuitable for such work.

B. Placing And Laying of Underground Pipe

1. Deflections from straight line or grade, as required by vertical curves, horizontal curves, or offsets, shall not exceed $6/D$ inches per linear foot of pipe where D represents nominal diameter of pipe expressed in inches.
2. Deflections to be determined between center lines extended of two connecting pipes.
3. If alignment requires deflection in excess of these limitations, provide special bends or sufficient number of shorter lengths of pipe to provide angular deflections within limits approved by governing jurisdiction and Architect.
4. Laying -
 - a. Shape trench bottom to give substantially uniform circumferential support to lower third of each pipe.
 - b. Pipe laying shall proceed up-grade with spigot ends of bell-and-spigot pipe pointing in direction of flow.
 - c. Lay each pipe true to line and grade and in such manner as to form close concentric joint with adjoining pipe and to prevent sudden offsets of flow line.
 - d. Support fittings at bends in pipe line by concrete thrust blocks firmly wedged against vertical face of trench. Blocks shall be at least two cu ft in size.
 - e. As work progresses, clear interior of pipe of dirt and superfluous materials. Where cleaning after laying is difficult because of small pipe, keep suitable swab or drag in pipe and pull forward past each joint immediately after jointing has been completed.

C. Make joints between ductile iron and cast iron pipe and other types of pipe with standard manufactured cast-iron adapters and fittings.

D. Incidental Items of Work

1. Valve, plug, or cap, as directed by Architect, where pipe ends are left for future connections.
2. Make key for unlocking valve handle identical to key used to open doors to building.

E. Maintain separation of water main from sewer piping in accordance with Oregon Department of Environmental Quality.

F. Group piping with other site piping work whenever practical.

G. Install pipe to indicated elevation to within tolerance of $5/8$ inch.

- H. Install ductile iron piping and fittings to AWWA C600. Install PVC pipe in accordance with manufacturer's recommendations.
- I. Route pipe in straight line.
- J. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- K. Install access fittings to permit disinfection of water system performed under this Section.
- L. Slope water pipe and position drains at low points.
- M. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.
- N. Establish elevations of buried piping to ensure not less than 36 inches of cover.
- O. Install trace wire continuous over top of pipe; coordinate with Section 33 0550.
- P. Backfill trench in accordance with Section 33 0550.

3.4 BEDDING

- A. Excavate pipe trench in accordance with Section 33 0550 for Work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Form and place concrete for pipe thrust restraints at any change of pipe directions. Place concrete to permit full access to pipe and pipe accessories. Provide thrust restraint bearing on subsoil. Comply with table on Drawings for thrust block area.
- C. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth, compact to 95 percent.
- D. Backfill around sides and to top of pipe zone with approved backfill, tamp in place and compact to 95 percent.
- E. Maintain optimum moisture content of bedding material to attain required compaction density.

3.5 PIPING JOINTS:

- A. Pipe and fittings shall be joined using methods and materials recommended by manufacturer in conformance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc. shall be done with proper tools and equipment. Hacksaw pipe cutting prohibited. Peening of welds to stop leaks is not permitted.

3.6 INSTALLATION - VALVES AND HYDRANTS

- A. Set valves on solid bearing.
- B. Center and plumb valve box over valve. Set box cover flush with finished grade.

- C. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.
- D. Set hydrants to grade, in accordance with Chenoweth Peoples Water District and Fire Department requirements and AWWA C502 requirements.
- E. Locate control valve 30 inches away from hydrant or as required by Chenoweth Peoples Water District and Fire Department requirements.
- F. Provide a drainage pit 36 inches square by 24 inches deep, filled with 6 inches washed gravel. Encase elbow of hydrant in gravel to 6 inches (150 mm) above drain opening. Do not connect drain opening to sewer.
- G. Paint hydrants in accordance with Chenoweth Peoples Water District Fire Department requirements.
- H. Install check valves, ball drip valves and Fire Department connection as recommended by manufacturer and as required by governing local Fire Department.

3.7 DISINFECTION OF WATER PIPING SYSTEM

- A. Flush and disinfect system in accordance with AWWA C601 "Standard for Disinfecting Water Mains," unless otherwise required by City of the Dalles Building Department or Chenoweth Peoples Water District.

3.8 SERVICE CONNECTIONS

- A. Provide water service to utility company requirements with reduced pressure backflow preventer as necessary and water meter with by-pass valves and plumbing.
- B. Provide work, materials, and equipment necessary to complete service connection from existing main line, including connection, to the new work.
 - 1. Work shall include furnishing and installation of mainline taps or saddles, corporation stops, curb stops, meter with by-pass valves and plumbing, valve or meter boxes/vaults as required, and necessary service pipe and couplings to connect to user provided service line.
 - 3. Excavation, bedding and backfill shall be as specified.
 - 4. Provide water service in accordance with district provider standards including reduced pressure and pressure reducing devices and their vaults.
- C. Work shall be performed in accordance with manufacturer's recommendations using proper tools in good repair.
 - 1. Saddles or pipe taps shall not be placed within one foot of a pipe joint or other tap.
 - 2. Service lines or materials damaged before acceptance shall be removed and replaced by and at expense of Contractor.
- D. Valve and meter boxes shall be installed in accordance with standard details.
 - 1. Top of box shall be flush with finish grade.

2. Box shall be plumb and centered and firmly supported independent of pipe.
- E. Corporation stops, if specified, shall be in open position and curb stops or meter stops shall be closed before line is backfilled.
- F. Four foot length of two by four wood stake shall be placed two feet in ground adjacent to valve or meter box, or end of service line.
 1. Two by four shall be painted green and bear letters "WS" for water service.

3.9 REACTION OR THRUST BLOCKING

- A. Reaction or thrust blocking shall be applied at bends crosses, valves, caps, tees, etc., and where changes in pipe diameter occur at reducers or in fittings.
 1. Design of concrete thrust blocking is shown in thrust blocking details and requirements on drawings or standard detail sheets.
 2. Concrete for thrust blocking shall meet requirements given hereinbefore.
 3. Other types of joint restraint or reaction devices shall be as shown on drawings.
- B. Thrust blocking shall be placed between solid undisturbed ground and fitting to be anchored.

3.10 VALVE BOXES

- A. Valve boxes as described hereinbefore shall be installed on valves as shown on standard details or drawings.
 1. Valve boxes shall be permanently supported independent of pipe.
 2. Valve boxes shall be centered and plumb over valve operator with box cover flush with finished surface.

3.11 PLUGGING DEAD ENDS

- A. Standard manufactured plugs or caps shall be used for plugging dead end fittings.
- B. Plugs and caps shall be properly installed and a thrust block provided.
- C. Design of thrust block shall be in accordance with standard details.

3.12 BACKFLOW PREVENTER

- A. Furnish and install backflow prevention assembly in accordance with current standards of Oregon Health Division and Chenoweth Peoples Water District.
 1. Provide backflow preventer device, including valves, piping, supports, vault, vault drain, etc. as required to provide a complete, connected and operational system.
 2. Contractor shall complete Oregon Health Division standard performance test.

- 3. Test shall be completed by an Oregon Certified Tester.

3.13 PRESSURE TESTING OF NEW SYSTEM

- A. Pressure and leakage tests shall be made on newly laid pipe and/or appurtenances.
 - 1. Furnish necessary equipment and material, make taps in pipe as required, and conduct tests.
- B. Test shall be conducted after trench has been partially backfilled with joints left exposed for inspection, or when completely backfilled, as permitted by the water district having authority.
 - 1. Where any section of pipe is provided with concrete reaction blocking, test shall not be conducted until at least seven days have elapsed after concrete thrust blocking is installed.
 - 2. If high-early cement is used for concrete thrust blocking, time may be cut to two days.
- C. Final pressure and leakage tests shall be delayed until trench excavation for other utilities, etc., included in contract and within limits of test, has been completed.
- D. Hydrostatic pressure test shall be conducted in following manner unless otherwise approved by Engineer in accordance with ANSI/AWWA C600 standard:
 - 1. After trench has been backfilled or partially backfilled as specified, air shall be expelled from system by slowly filling pipe with water.
 - a. Pipe shall be filled a minimum of 24 hours prior to conducting test.
 - 2. Pump shall be connected to pipe in a manner satisfactory to Engineer, and pressure in system raised to 150 psi at lowest point in each valved section.
 - a. Pump shall be valved off and pressure held for a period of two hours.
 - 3. At end of test period, pump shall be operated until test pressure is again attained.
 - a. Pump suction shall be in a barrel or similar device, or metered so that amount of water required to restore test pressure may be measured accurately.
 - 4. Leakage shall be defined as quantity of water necessary to restore specified test pressure at end of test period.
 - a. No pipe installation will be accepted if leakage is greater than number of gallons per hour determined by following formula:

$$L = \frac{ND(P)^2}{5,500}$$

in which:

- L ‘ allowable leakage in gallons per hour
- N ‘ number of joints in length of pipe tested
- D ‘ nominal diameter of pipe in inches

P average test pressure during leakage test in pounds per square inch

5. Should any test of pipe laid disclose leakage greater than that allowed, defective joints or pipe shall be located, repaired, and retested at Contractor's expense, until leakage is within specified allowance.

3.14 FIELD QUALITY CONTROL

- A. Test system according to 'Contractor's Material & Test Certification for Underground Piping' NFPA 13.
- B. Division 01 - Quality Assurance: Field Inspection and Testing.
- C. Compaction testing will be performed in accordance with ASTM D1557 and D2922.
- D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

END OF WATER DISTRIBUTION

SECTION 334050 – STORM AND SANITARY SEWERAGE

PART I - GENERAL

I.I RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Storm drainage piping, sanitary sewer piping, fittings and accessories, public and private.
2. Connection of building sanitary sewer system to municipal sewers.
3. Connection of building storm water drainage.
4. Catch basins, paved area drainage, and site surface drainage.

- B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section “Excavating, Backfilling and Compacting”.
2. Division 2 Section “Trenching”.
3. Division 2 Section “Water Distribution”.

1.3 REFERENCES

- A. CISPI 301 - Cast Iron Soil Pipe and Fittings (hubless).
- B. City of The Dalles Construction Standards for Public Works.
- C. American Public Works Association Standard Specifications for Public Works Construction.
- D. ASTM C478 - Precast Reinforced Concrete Manhole Sections.
- E. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- F. ASTM C891 - Installation of Underground Precast Concrete Utility Structures
- G. ASTM D2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
- H. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

1.4 DEFINITIONS

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

1.5 REGULATORY REQUIREMENTS

- A. Conform to Oregon State Plumbing Code and City of The Dalles standards and specifications for materials, installation and testing of the Work of the Section.

1.6 FIELD MEASUREMENTS

- A. Verify that field measurements and elevations are as indicated.

1.7 SUBMITTALS FOR REVIEW

- A. Submit under provisions of Division 01.
- B. Product Data: Provide data on pipe materials, all pipe fittings and accessories.

1.8 SUBMITTALS FOR CLOSEOUT

- A. Submit under provisions of Division 01 - Contract Closeout.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.9 SUBMITTALS AT PROJECT CLOSEOUT

- A. Submit under provisions of Division 01 - Contract Closeout.
- B. Record actual locations of piping mains, clean-outs, connections and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.10 QUALITY ASSURANCE

- A. Perform Work in accordance with Oregon State Health Division Rules and City of The Dalles Public Works Department, as noted on the drawings and per product manufacturer's and referenced written recommendations.
- B. Valves: Manufacturer's name and pressure rating marked on valve body. Pre-approved by City Public Works or Plumbing Department.

1.11 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 01.
- B. Deliver and store accessories in shipping containers with labeling in place.

1.12 COORDINATION

- A. Coordinate Work of this Section with related Work.

PART 2 - PRODUCTS

2.1 PIPE MATERIALS

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
- B. PVC Sanitary Pipe: ASTM D3034, SDR 35, Type PSM, Poly (Vinyl Chloride) (PVC) material; bell and spigot style rubber gasket joint end.
- C. PVC Storm Drain Pipe: IPS Pressure rated PVC, Schedule 80 per ASTM 1784 and ASTM 1785 with Schedule 80 couplings, wyes and bends.
- D. Perforated PVC Drain Pipe: Perforated PVC drain pipe with continuous filter fabric sock shall be Per ASTM D2729.
- E. ABS Schedule 40 solid wall plastic pipe and fittings meeting requirements of ASTM D 2661 joined with pipe cement meeting requirements of ASTM 2235.

2.2 PIPE ACCESSORIES

- A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, reducers, traps and other configurations required to provide watertight joints.
- B. Identification: Plastic underground warning tape for metal pipe and metallic-lined plastic underground warning type for plastic pipe.

2.3 CATCH BASINS

- A. Lid and Frame: Cast iron construction Bike proof heavy-duty lid.
 - 1. Lid Design: Linear grill
 - 2. Nominal Lid and Frame. Size: See Drawings.
- B. Box Construction for On-Site Units: 7 gauge steel, asphalt coated, joints continuously welded. Size: See Drawings.
- C. Manufacturer:
 - 1. On-Site: Gibson Steel Co., Lynch or approved equal.

2.4 CLEANOUTS

- A. Exterior cleanouts in walkways shall be J.R. Smith 4023-U with heavy duty nickel bronze top, taper head, ABS plug and top secured with vandal proof screws.
- B. See cleanout detail on drawings for cast iron body and top at all other locations.

2.5 AREA DRAINS

- A. Area drains in landscape areas shall be 15 inches by 15 inches Turf & Landscape Area Drains manufactured by the "Lynch Co." with 4 inch diameter trapped no-hub connection, outlets, extensions and grates with bars at 1-1/4 inches on center for complete assembly.
- B. Exterior drains in pavement areas shall be "Smith" floor drains with 12 inch diameter tops, deep body sediment buckets and 4 inch diameter trapped no-hub connection outlets.

2.6 MANHOLES

- A. Precast Concrete Manholes: ASTM C478: Precast reinforced concrete of depth indicated with tongue-and-groove gasketed joints in accordance with APWA, Oregon Chapter and City of Portland Public Works Standards.
- B. Base Section: 6 inch minimum thickness for floor slab and 4 inch minimum thickness for walls and base riser section, having a separate base slab or base section with integral floor. Increase base section thickness to prevent floatation. Channels shall be poured-in-place in accordance with APWA, Oregon Chapter and City of Portland Public Works Standards.
- C. Riser Sections: 4 inch minimum thickness, 48 inch diameter, lengths to provide depth indicated.
- D. Top Section: Eccentric cone type, unless concentric cone or flat-slab-to-type is indicated. Top of cone to match grade rings.
- E. Grade Rings: Provide 2 or 3 reinforced concrete rings of 3 to 9 inches total thickness, match in 24 inch diameter frame and cover.
- F. Gaskets: ASTM C443 rubber.
- G. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12 to 15 inch intervals. Omit steps for manholes less than 60 inches deep.
- H. Pipe Connectors: ASTM C923, resilient, of size required, for each pipe connecting to base section.

2.7 BEDDING MATERIALS

- A. Bedding: ¾"-0" crushed rock as specified in Section 31 2350.

2.8 BACKWATER VALVES

- A. ABS Backwater valves: Similar to ASME A112.14.1, horizontal type; with ABS body, ABS removable cover and ABS swing check valve with gasket.

2.9 PRECAST CONCRETE UTILITY VAULTS

- A. Reinforced precast concrete utility vaults approved by the Oregon State Plumbing Board. Provide complete assemblies for installation including inlet and outlet PVC piping, watertight "bolt-down" access and inspection hole frames and lids and their accessories.

- B. Grade Rings: Provide standard precast concrete grade rings for adjusting 24 inch diameter cast iron frames and covers.

C. Vault Structural Requirements:

1. Concrete: 28 day compressive strength $f'c = 4500$ psi
2. Rebar: ASTM A615 Grade 60.
3. Mesh: ASTM A-185 Grade 65.
4. Steel: ASTM A-36 Grade 36
5. Galvanizing: ASTM A-123-89 and A-153-87 (Hot Dipped)
6. Steel Design: AISC manual of Steel Construction, 9th Edition
7. Concrete Design: ACI-318-89 Building Code.
ASTM C-857 minimum structural design. Loading for underground precast concrete utility structures.
8. Loads: AASHTO H-20 16 KIP wheel load with 30% impact (10"x 20" footprint)
AASHTO Live load surcharge (2' soil) to 8' depth.
Effective soil pressure below water table - 80 p.c.f.
Effective soil pressure above water table - 45 p.c.f.
9. Soil Cover: 1'-6" minimum with water valve 3'-0" below finished grade.
5'-0" maximum with water table 3'-0" below finished grade.
0' minimum with water table below bottom of vault.
5'-0" maximum with water table below bottom of vault.

D. Acceptable Manufacturers:

1. CONTECH Utility Vault Co., Wilsonville, Oregon

2. Engineer pre-approved equal meeting same or better requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that trench cut and excavation base is ready to receive Work and excavations.

3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over-excavation in accordance with Section 31 2350.
- B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 33 0550 for Work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 8 inches compacted depth, compact to ninety-five percent (95%).
- C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

- A. Install pipe, fittings and accessories in accordance with ASTM D2321 and manufacturer's instructions. Seal joints watertight.
- B. Lay pipe to slope gradients noted on Drawings, with maximum variation from true slope of 1/8 inch in 10 feet.
- C. Install bedding at sides and over top of pipe to minimum compacted thickness of 12 inches, compacted to ninety-five percent (95%).
- D. Refer to Section 02225 and Drawings for trenching requirements. Do not displace or damage pipe when compacting.
- E. Cast Iron Hubless: Joints in accordance with Cast Iron Soil Pipe Institute Specification No. 310. Install clamp-all, 24 gauge type 304 stainless steel shield joints and Neoprene gaskets tightened to 100-125 inch-pounds of torque or Huskey approved. Couples and shields to bear the manufacturer's registered insignia. Install in accordance with manufacturer's recommendations.
- F. Install foundation drain pipe between the filter fabric and impervious backing of the

geocomposite drainage material.

3.5 INSTALLATION - CATCH BASINS, AREA DRAINS AND BACKWATER VALVES

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Establish elevations and pipe inverts for inlets and outlets as indicated.
- C. Provide and install accessible concrete box with lid for backwater valve maintenance access.
- D. Set rim of box flush with finish grade.

3.6 INSTALLATION - MANHOLES

- A. Install manholes complete with accessories as indicated. Form continuous concrete or split pipe section channel and benches between manhole inlets and outlet. Set tops of frames and covers flush with finish surface where manholes occur in pavements. Elsewhere, set tops 3 inches above finish surface in unpaved areas unless otherwise indicated.
- B. Place precast concrete manhole and drywell sections as indicated, and install in accordance with ASTM C891.
- C. Provide rubber joint gasket complying with ASTM C443 at joints of sections.

3.6.1 DECOMMISSION EXISTING MANHOLES

- A. Cap existing sanitary and storm pipes to manholes.
- B. Remove upper section of manhole to at least 30 inches below grade.
- C. Backfill manhole with sand and compact.
- D. City forces to inspect and approve prior to backfill.

3.7 INSTALLATION - CLEANOUTS

- A. At walkways, install flush with finish grades.
- B. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated. Set cleanout frame and cover in concrete block 24 x 24 x 12 inches deep, except where location is in concrete paving. Set top of cleanout 1 inch above surrounding earth grade or flush with grade when installed in paving unless otherwise indicated.

3.8 INSTALLATION - PRECAST CONCRETE VAULTS

- A. Install vaults complete with accessories and in accordance with manufacturer's recommendations and Oregon State Plumbing Code.
- B. Install bases plumb and level over 6 inch minimum thickness of compacted 3/4 inch - 0 inch

crushed rock backfill.

- C. Provide manhole adjusting rings to set tops of frames and covers flush with finish surface in pavement.
- D. Provide risers and shims under lid of units as required to set lid flush in finish sloping pavement. Provide non-shrink grout and sealant between base, risers and lid.

3.9 PROTECTION

- A. Protect finished installation under provisions of Division 1.
- B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

3.10 FIELD QUALITY CONTROL

- A. Failure to install joints properly shall be cause for rejection and replacement of piping system.
- B. Provide for all inspections and tests as required by state and local jurisdictions. See Drawings for additional construction notes. Provide the following tests as minimum:
 - 1. Mandrel all plastic pipe for roundness per APWA Oregon Chapter.
 - 2. Hydrostatic/Low Pressure air testing of sanitary pipes and joints per APWA, Oregon Chapter.
 - 3. Seal and vacuum test of sanitary manholes, provide grouted flow channels.

END OF STORM SEWERAGE AND SANITARY SEWERAGE SYSTEM

SECTION 33 4615 - FOUNDATION DRAINAGE SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To

1. Perform excavating and backfilling for work of this Section.
2. Furnish and install foundation drainage system as described in Contract Documents.

B. Related Sections

1. Section 31 0501 - General Site Construction Requirements
2. Section 31 2350 - Excavation, Backfill and Compaction

1.2 REFERENCES

A. American Society For Testing And Materials

1. ASTM C 478-97, 'Standard Specification for Precast Reinforced Concrete Manhole Sections'

1.3 SUBMITTALS

- A. Provide submittals on all products of this section.

PART 2 PRODUCTS

2.1 MATERIALS

A. Drainage Gravel

1. Clean 3/8 inch pea gravel

B. Smooth wall perforated PVC Pipe and Fittings

1. Meet pipe requirements of ASTM D2729
 - a. Fully perforated for foundation drain.
 - b. Non-perforated for piping from foundation to disposal area.
 - c. Fully surrounded in manufacturer's filter fabric sock.

C. Drains And Appurtenances - Meet requirements of ASTM C 478.

D. Filter Fabric: "Mirifi 140 NC" Filter Fabric or Geotechnical Engineer pre-approved equal.

PART 3 EXECUTION

3.1 PREPARATION

- A. Moisten and tamp fill under pipe as needed to form firm bottom.

3.2 INSTALLATION

A. Site Tolerances

1. Low point of drain pipe shall be at the backwater valves. Perforated drain pipe shall never be lower than bottom of footings.
2. Lay pipe with uniform slope of 6 inches in 100 linear ft. Use laser level in checking.

- B. Form sharp turns or angles, branch connections, and joints to drain lines with pipe fittings.

- C. Protect lines from entrance of dirt.

- D. Provide cleanouts at every other bend or 100 feet minimum on center spacing using long sweep elbow fittings and heavy extra long cast brass ferrule with threaded heavy cast brass countersunk cleanout plug set into 6 inch thick x 20 inch round concrete slab finished flush with finish grade.

- F. Before placing filter fabric, remove caved-in or loose earth. Pre-place continuous filter fabric in trench prior to drain rock backfill. Provide filter fabric wrap around pipe and entire drain rock section. Extend drain rock backfill from bottom of excavation up to within 6 inches of finish grade. Width of backfill at bottom shall be 12 inches minimum and full width of trench above. Fold layer of filter fabric over drain rock backfill prior to topsoil placement. Refer to backwater valve details on construction documents.

- G. Foundation drain pipe to run continuous around exterior of buildings and connect to backwater valves shown on the construction documents.

3.3 FIELD QUALITY CONTROL

- A. Test system as required by Architect. Do not cover drain lines until approved by Architect.

END OF FOUNDATION DRAINAGE SYSTEMS

SECTION 33 5150 - GAS DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

A. Includes But Not Limited To

1. Perform excavation and backfill required for work of this Section. Provide all new gas service lines for extending service to new buildings.
2. Coordinate and provide for installation of gas piping and fittings as necessary from existing gas main to meter with utility provider.
3. Provide, make necessary arrangements for, and pay necessary fees to local gas utility company for gas service lines and proper size gas meter installation.

B. Related Sections

1. Section 31 0501 - General Site Construction Requirements
2. Section 31 2350 - Excavation, Backfill and Compaction

1.2 REFERENCES

A. American Society For Testing And Materials

1. ASTM A 53-98, 'Standard Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless'
2. ASTM A 234-97, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures'
3. ASTM D 2513-98a, 'Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings'

1.3 QUALITY ASSURANCE

A. Qualifications

1. Welders shall be certified and bear evidence of certification 30 days before commencing work on project. If there is doubt as to proficiency of welder, Owner's Representative may require welder to take another test. This shall be done at no cost to Owner. Certification shall be by Pittsburgh Testing Laboratories or other approved authority.
2. Polyethylene pipe installers shall be properly trained and certified in procedure for joining polyethylene pipe.

B. Requirements of Regulatory Agencies - Lay underground pipe in accordance with federal pipeline safety regulations and local gas utility company regulations and specifications.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Do not store polyethylene pipe so it is exposed to sunlight.

PART 2 PRODUCTS

2.1 COMPONENTS

- A. Above-Ground Pipe And Fittings - Black carbon steel, butt welded, Schedule 40 pipe meeting requirements of ASTM A 53. Welded forged steel fittings meeting requirements of ASTM A 234.
- B. Below-Ground Pipe And Fittings - Polyethylene pipe and fittings meeting requirements of ASTM D 2513 with No. 14 coated copper tracer wire.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Excavate and backfill as specified in Section 31 2350 with following additional requirements
 - 1. Excavate to required depth, coordinate all connection locations and pipe runs with gas service provider to provide service to all new buildings. Mark as-built locations on plans.
 - 2. Bottom of trenches shall be hard. Tamp as required.
 - 3. Remove debris from trench prior to laying of pipe.
 - 4. Do not cut trenches near footings without consulting Architect.
 - 5. Place 4 inches of sand around pipe before trench is backfilled.
 - 6. Bury outside pipe 12 inches minimum below frost line or 24 inches minimum below finish grade, whichever is deeper.
 - 7. Backfill only after pipe lines have been tested, inspected, and approved by Architect, Gas Service Provider and City Building Department.
- B. General installation shall be as specified by the Construction Documents.
 - 1. Steel pipe 2-1/2 inches and larger shall have welded fittings and joints.
 - 2. Provide 24 inch minimum steel pipe between vertical rise of riser and end of any polyethylene line if anode-less riser is not used. Use plastic-to-steel transition or compression fitting between end of service line and steel meter riser. Provide cathodic protection for steel riser or use anode-less riser.
 - 3. Place tracer wire along side of polyethylene pipe from meter to main.
- C. Set meters on concrete bases.
- D. Provide necessary protection against damage for meter.

END OF GAS DISTRIBUTION