

SECTION 33 10 00
WATER UTILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

Contractor shall provide all work to furnish and install the underground water distribution system complete, ready for operation, including all appurtenant structures, and connections to both new building service lines and to existing potable water supply.

1.2 RELATED WORK

- A. Maintenance of Existing Utilities: Section 01 00 00, GENERAL REQUIREMENTS.
- B. Excavation, trench widths, pipe bedding, backfill, shoring, sheeting, bracing: Section 31 20 00, EARTH MOVING.
- C. Concrete: Section 03 30 10, CAST-IN-PLACE CONCRETE.
- D. Building Plumbing starting 1500 mm (5 feet) outside of the building: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

1.3 DEFINITIONS

- A. Water Distribution: Pipelines and appurtenances which are part of the distribution system. The distribution system comprises the network of piping located throughout the site, as applicable, and in the building areas that provides water from the potable water supply source for the project, including hydrants, valves, and other appurtenances used to supply water for domestic and fire-fighting/fire protection purposes only when required due to Life Safety issues.
- B. Water Service Line: Pipe line connecting building piping to water distribution lines.

1.4 QUALITY ASSURANCE

- A. Products Criteria:
 - 1. Multiple Units: When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.
 - 2. Nameplate: Nameplate bearing manufacturer's name or identifiable trademark securely affixed in a conspicuous place on equipment or name or trademark cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.
- B. Comply with the rules and regulations of the Public Utility having jurisdiction over the connection to Public Water lines and the extension, and/or modifications to Public Utility systems. All watermain construction shall comply with City of Eagle Point and Medford Water

Commission Standard Specifications, including inspection & testing at contractor's expense.

- C. Comply with all rules and regulations of Federal, State, and Local Department of Environmental Quality having jurisdiction over the design, construction, and operation of potable water systems.
- D. All material surfaces in contact with potable water shall comply with NSF 61.

1.5 SUBMITTALS

- 2. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers' Literature and Data (Submit all items as one package):
(Ductile Iron Pipe and Polyvinyl Chloride (PVC) shall be in accordance with AWWA C600 and C605 respectively.)
 - 1. Piping.
 - 2. Fittings
 - 3. Gaskets.
 - 4. Valves.
 - 5. Fire hydrants.
 - 6. Meter.
 - 7. Vaults, frames and covers.
 - 8. Steps.
 - 9. Backflow Preventer
 - 10. Casing pipe and insulators.
 - 11. Valve boxes.
 - 12. Corporation and curb stops.
 - 13. Curb stop boxes.
 - 14. Joint restraint.
 - 15. Disinfection products.
 - 16. Warning Tape
 - 17. Link/sleeve seals.
- C. Testing Certifications:
 - 1. Certification of Backflow Devices.
 - 2. Hydrostatic Testing.
 - 3. Certification of Disinfection, including free chlorine residuals, and bacteriological examinations.
 - 4. Other tests required by the City of Eagle Point Standard Specifications.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American National Standards Institute (ANSI/ASME):
- B16.1-2005.....Cast Iron Pipe Flanges and Flanged Fittings,
Class 25, 125, 250 and 800
 - B16.18-2001.....Cast Copper Alloy Solder Joint Pressure Fittings
 - B16.26-2006.....Cast Copper Alloy Fittings for Flared Copper
Tubes
 - B40.100-2005.....Pressure Gauges and Gauge Attachments
- C. American Society of Mechanical Engineers (ASME):
- B18.5.2.1M - 2006 Metric Round Head Short Square Neck Bolts
 - B18.5.2.2M - 1982 Metric Round Head Square Neck Bolts
 - B18.2.2 - 1987 Square and Hex Nuts
- D. American Society for Testing and Materials (ASTM):
- A47/A47M - 99(2004)Standard Specification for Ferritic Malleable Iron
Castings
 - A48/A48M - 03(2008)Standard Specification for Gray Iron Castings
 - A123/A123M-08.....Zinc (Hot-Dip Galvanized) Coatings on Iron and
Steel Products
 - A148M/A148M-08.....Standard Specifications for Steel Castings
 - A242/A242M-04e1.....Standard Specifications for High Strength Low
Alloy Structural Steel AASHTO No. M161
 - A307/A307-07b.....Standard Specifications for Carbon Steel Bolts
and Studs, 415 MPa (60,000 psi) Tensile Strength
 - A536-84(2004)e1.....Standard Specifications for Ductile Iron
Castings
 - A563M - 07.....Standard Specification for Carbon and Alloy
Steel Nuts [Metric]
 - B42-02e1.....Standard Specification for Seamless Copper Pipe,
Standard Sizes
 - B61-08.....Standard Specifications for Steam or Valve
Bronze Castings
 - B62-02.....Standard Specifications for Composition Bronze
or Ounce Metal Castings
 - B88-03.....Standard Specifications for Seamless Copper
Water Tube
 - B117-07a.....Standard Practice for Operating Salt Spray (Fog)
Apparatus

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B-633-07.....Standard Specification for Electrodeposited
Coatings of Zinc on Iron and Steel

B828-02.....Standard Practice for Making Capillary Joints by
Soldering of Copper and Copper Alloy Tube and
Fittings

C32-05.....Sewer and Manhole Brick (Made from Clay or
Shale)

C94/C94M-09.....Standard Specification for Ready-Mixed Concrete

C139-05.....Concrete Masonry Units for Construction of Catch
Basins and Manholes

C443-05a.....Standard Specification for Joints for Concrete
Pipe and Manholes, Using Rubber Gaskets

D1784-08.....Standard Specifications for Rigid PVC Compounds
and CPVC Compounds

D1785-06.....Standard Specification for Poly(Vinyl Chloride)
(PVC) Plastic Pipe, Schedules 40, 80, and 120

D1869-95(2005)e1.....Standard Specifications for Rubber Rings for
Asbestos Cement Pipe

D2000-08.....Standard Classification System for Rubber
Products in Automotive Applications

D2241-05.....Standard Specification for Poly(Vinyl Chloride)
(PVC) Pressure-Rated Pipe (SDR Series)

D2464-06.....Standard Specifications for Threaded PVC Pipe
Fittings, Schedule 80

D2466-06.....Standard Specification for Poly(Vinyl Chloride)
(PVC) Plastic Pipe Fittings, Schedule 40

D2467-06.....Standard Specifications for Poly (Vinyl
Chloride) (PVC) Plastic Pipe Fittings, Schedule
80

D2564-04e1.....Standard Specification for Solvent Cements for
Poly(Vinyl Chloride) (PVC) Plastic Piping
Systems

D2855-96(2002).....Standard Practice for Making Solvent-Cemented
Joints with Poly(Vinyl Chloride) (PVC) Pipe and
Fittings

D3139-98(2005).....Joints for Plastic Pressure Pipes Using Flexible
Elastomeric Seals

D4101-08.....Standard Specification for Polypropylene
Injection and Extrusion Materials

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- F441/F441M-02(2008).....Standard Specification for Chlorinated
Poly(Vinyl Chloride) (CPVC) Plastic Pipe,
Schedules 40 and 80
- F477-08.....Standard Specification for Elastomeric Seals
(Gaskets) for Joining Plastic Pipe
- F593-02(2008).....Standard Specification for Stainless Steel
Bolts, Hex Cap Screws, and Studs
- F1674-05.....Standard Test Method for Joint Restraint
Products for Use With PVC Pipe
- E. American Water Works Association (AWWA):
- B300-04.....Hypochlorites
- B301-04.....Liquid Chlorine
- C104/A21.4-08.....Cement Mortar Lining for Ductile Iron Pipe and
Fittings for Water
- C105/A21.5-05.....Polyethylene Encasement for Gray and Ductile
C.I. Piping for Water and Other Liquids
- C110/A21.10-08.....Ductile-Iron and Gray-Iron Fittings, 80 mm
Through 1200 mm (3 Inches Through 48 Inches) for
Water and Other Liquids
- C111/A21.11-07.....Rubber-Gasket Joints for Ductile-Iron and
Gray-Iron Pressure Pipe and Fittings
- C115/A21.15-05.....Flanged Ductile-Iron and Gray-Iron Pipe with
Threaded Flanges
- C150/A21.50-08.....American National Standard for Thickness Design
of Ductile Iron Pipe
- C151/A21.51-02.....Ductile-Iron Pipe, Centrifugally Cast in Metal
Molds or Sand-Lined Molds, for Water or Other
Liquids
- C153/A21.53-06.....Ductile-Iron Compact Fittings, 80 mm Through
300 mm (3 inches Through 12 inches) for Water
and Other Liquids
- C200-05.....Steel Water Pipe - 150 mm (6 in.) and Larger
- C203-02.....Coal-Tar Protective Coatings and Linings for
Steel Water Pipelines - Enamel and Tape - Hot-
Applied
- C205-07.....Cement-Mortar Protective Lining and Coating for
Steel Water Pipe - 100 mm (4 in.) and Larger -
Shop Applied
- C206-03.....Field Welding of Steel Water Pipe

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C207-07.....Standard for Steel Pipe Flanges for Waterworks
Service-Sizes 100 mm Through 3600 mm (4 in.
through 144 in.)

C208-07.....Standard for Dimensions for Fabricated Steel
Water Pipe Fittings

C209-06.....Cold-Applied Tape Coatings for the Exterior of
Special Sections, Connections and Fitting for
Steel Water Pipe

C210-07.....Standard for Liquid Epoxy Coating Systems for
the Interior and Exterior of Steel Water
Pipelines

C500-02.....Metal-Seated Gate Valves for Water Supply
Service

C502-05.....Dry-Barrel Fire Hydrants

C503-05.....Wet-Barrel Fire Hydrants

C504-06.....Standard for Rubber-Seated Butterfly Valves

C508-01.....Swing-Check Valves for Waterworks Service, 50 mm
thru 600 mm (2 inches through 24 inches) NPS

C509-01.....Resilient Seated Gate Valve for Water
SupplyService

C510-07.....Double Check Valve Back-Flow Prevention Assembly

C511-07.....Reduced Pressure Principle Back-Flow Prevention
Assembly

C550-05.....Standard for Protective Interior Coatings for
Valves and HydrantsC600-05 Installation of
Ductile-Iron Water Mains and Their Appurtenances

C605-05.....Underground Installation of Polyvinyl Chloride
(PVC) Pressure Pipe and Fittings for Water

C651-05.....Standard for Disinfecting Water Mains

C700-02.....Standard for Cold-Water Meters - Displacement
Type, Bronze Main Case

C701-07.....Standard for Cold-Water Meters - Turbine Type
for Customer Service

C702-01.....Cold-Water Meters - Compound Type

C706-96(R05).....Direct-Reading, Remote-Registration Systems for
Cold-Water Meters

C707-05.....Encoder-Type Remote-Registration Systems for
Cold-Water Meters

C800-05.....Underground Service Line Valves and Fittings

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- C900-07.....Polyvinyl Chloride (PVC) Pressure Pipe, and
Fabricated Fittings, 100 mm Through 300mm (4
inches Through 12 inches), for Water
Distribution
- C901-02.....Polyethylene (PE) Pressure Pipe and Tubing, 13mm
Through 76mm (1/2 inch Through 3 inch.), for
Water ServiceC905-97 Polyvinyl Chloride (PVC)
Pressure Pipe and Fabricated Fittings 350mm
Through 900 mm (14 Inches Through 36 Inches)
- C906-07.....Polyethylene (PE) Pressure Pipe and Fittings,
100 mm (4 inches)through 1,600 mm (63 inches)
for Water Distribution and Transmission
- D2000-08.....Standard Classification System for Rubber
Products in Automotive Applications
- F593-02(2008).....Standard Specification for Stainless Steel
Bolts, Hex Cap Screws, and Studs
- M11-04.....Manual: Steel Pipe: A Guide for Design and
Installation
- M23-02.....Manual: PVC Pipe - Design and Installation
- F. National Fire Protection Association (NFPA):
- 24-06.....Installation of Private Fire Service Mains and
Their Appurtenances
- 291-01.....Fire Flow Testing and Marking of Hydrants
- 1141-98.....Fire Protection in Planned Building Groups
- G. NSF International:
- 14-03.....Plastics Piping Components and Related Materials
- 61-02.....Drinking Water System Components-Health Effects
(Sections 1-9)
- H. American Welding Society (AWS):
- A5.8-04.....Braze Filler Metal
- I. UNI-BELL PVC PIPE ASSOCIATION (UBPPA)
- UNI-B-8(2000).....Recommended Practice for the Direct Tapping of
Polyvinyl Chloride (PVC) Pressure Water Pipe
(Nominal Diameters 150 mm - 300 mm (6-12 Inch)
- J. Foundation for Cross-Connection Control and Hydraulic Research-2009
- K. Copper Development Association's Copper Tube Handbook-2009

PART 2 - PRODUCTS

All materials shall be in compliance with City of Eagle Point & Medford Water Commission Standards.

2.1 DUCTILE IRON PIPE AND FITTINGS

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A. Ductile iron pipe, direct buried:

1. Provide ductile iron pipe conforming to the requirements of AWWA C151, Pressure Class 350 for Pipe 100 mm through 300 mm (4 inches through 12 inches) in diameter with double thickness cement mortar lining interior, and interior asphaltic seal coat and exterior asphaltic coating, in accordance with AWWA and ANSI Standards.
2. Below Grade: Supply pipe in lengths not in excess of a nominal 6 m (20 feet) with rubber ring type push-on joints, mechanical joint or approved restrained joint. Provide mechanical and restrained joint pipe with sufficient quantities of accessories as required for each joint. Install thrust blocks as indicated on plan.
3. When a polyethylene encasement over pipe, fittings, and valves is a requirement as indicated on the drawings, the material, installation and workmanship shall conform to applicable sections of AWWA C105. Make provisions to keep the polyethylene from direct exposure to sunlight prior to installation. Backfill following installation without delay to avoid exposure to sunlight.

B. Ductile Iron Pipe Above Grade or in Below Ground Concrete Pits:

1. Flanged ductile iron pipe, AWWA C115, with factory applied screwed long hub flanges except as otherwise specified hereinafter. Face and drill flanges after being screwed on the pipe, with flanges true to 90 degrees with the pipe axis and flush with end of pipe, ANSI B16.1, 850 kPa (125 psi) or 1725 kPa (250 psi) standard, for the purpose intended.
2. Wall Sleeve Castings: Size and types shown on the drawings and as herein specified in the paragraph on Link/Sleeve Seals .
3. Pipe Thickness Class: Minimum of Class 53 as defined in AWWA C150 for all sizes of flanged pipe.
4. Rubber Ring Gaskets: Full face type, AWWA C111, 2 mm (1/16 inch) rubber ring gaskets and of approved composition suitable for the required service.
5. Pipe and fittings exposed to view in the finished work are to be painted in accordance with Section 09 91 00, PAINTING. Pipe shall not receive the standard tar or asphalt coat on the outside surfaces but shall be shop primed on the outside with one coat of the pipe manufacturer standard color of rust inhibitive primer or equal. Finished paint color shall match the wall color.
6. Bolts and Nuts on Flanged Fittings: Grade B, ASTM A307. Low alloy, high strength steel in accordance with AWWA C111. Assemble stainless steel bolts and nuts using anti-seize compound to prevent galling.

- C. All Pipe Fittings: Ductile iron with a minimum pressure rating of 2400 kPa (350 psi). Fittings shall meet the requirements of ANSI and AWWA specifications as applicable. Rubber gasket joints shall conform to AWWA C111 for mechanical and push-on type joints. Ball joints shall conform to AWWA C151 with a separately cast ductile iron bell conforming to ASTM A148. Flanged fittings shall conform to AWWA C115 and be furnished flat faced and drilled to 850 kPa (125 psi) or 1725 kPa (250 psi) template in accordance with ANSI B16.1 with full faced gaskets.
- D. Provide cement mortar lining and bituminous seal coat on the inside of the pipe and fittings in accordance with AWWA C104. Provide standard asphaltic coating on the exterior.
- E. Provide a factory hydrostatic test of not less than 3.5 MPa (500 psi) for all pipe in accordance with AWWA C151.
- F. Provide non-detectable adhesive backed identification tape on top and sides of all buried ductile iron pipe, extended from joint to joint along the length of the pipe and have black lettering identifying the pipe service at no more than 300 mm (12 inch) intervals. According to service, the tape background color shall be as follows: force main/sanitary-green; potable water-blue; reclaimed water-lavender.

2.2 POLYVINYL CHLORIDE PIPE AND FITTINGS

- A. Class-Rated Polyvinyl Chloride (PVC) Pipe: Pipe and accessories shall bear the NSF mark indicating pipe size, manufacturer's name, AWWA and/or ASTM Specification number, working pressure and production code.
 - 1. PVC pipe and accessories 100 mm to 350 mm (4 inches-14 inches) in diameter, AWWA C900 "Polyvinyl Chloride (PVC) Pressure Pipe", Class 200, DR 14, cast iron outside diameters, unless otherwise shown or specified.
 - 2. PVC Pipe and Accessories Smaller than 100 mm (4 inches): Schedule 80, meeting the requirements of ASTM D-1785, Type 1, Grade 1. All exposed piping shall be CPVC meeting requirements of ASTM F441.
- B. Joints:
 - 1. Pipe 75 mm (3 inches) and Greater in Diameter: Push-on type with factory installed solid cross section elastomeric ring meeting the requirements of ASTM F-477.
 - 2. Pipe Less Than 75 mm (3 inches) in Diameter: Threaded (ASTM D-2464) or solvent welded (ASTM 2467). Use Teflon tape or liquid Teflon thread lubricant approved for use on plastic on all threaded joints.
- C. Fittings:
 - 1. Class-Rated Pipe 75 mm (3 inches) in Diameter and Greater: Ductile iron with mechanical joints conforming to the requirements of AWWA

C153. Mechanical joint fittings shall include retainer glands, unless otherwise noted.

2. For Schedule 80 Pipe less than 75 mm (3 inches) in Diameter: Threaded or solvent weld. Threaded PVC fittings shall conform to ASTM D2464. CPVC fittings shall conform to ASTM F437 for threaded fittings and ASTM F439 for solvent weld fittings.

2.3 MECHANICAL JOINT RETAINER GLANDS

- A. Restraint devices for mechanical joint fittings and appurtenances conforming to either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53, shall conform to the following:
 1. Restraint devices for nominal pipe sizes 75 mm (3 inch) through 900 mm (36 inch) shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.
 2. The devices shall have a working pressure rating equal to that of the pipe on which it is used. Ratings are for water pressure and must include a minimum safety factor of 2:1 in all sizes.
 3. Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536. Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 BHN.
 4. An identification number consisting of year, day, plant and shift (YYDDD) (plant designation) (Shift number), shall be cast into each gland body. All physical and chemical test results shall be recorded such that they can be accessed via the identification number on the casting. All components shall be manufactured in the United States.
 5. Mechanical Joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly. Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts.
 6. MJ restraints shall be listed by Underwriters Laboratories, and approved by Factory Mutual in the 75 mm (3 inch) through 300 mm (12 inch) sizes.
 7. All casting bodies shall be surface pretreated with a phosphate wash, rinse and sealer before drying. The coating shall be electrostatically applied and heat cured. The coating shall be a polyester based powder to provide corrosion, impact and UV resistance.

2.4 COPPER PIPE AND TUBING

Copper Piping: ASTM B88, Type K with flared fittings in accordance with AWWA C800, with sweat cast brass fittings per ANSI B16.18. Use brazing alloy, AWS A5.8, Classification BCuP. Fittings for compression-type joint, ASME B16.26, flared tube type.

2.5 VALVES

A. Gate:

1. Unless otherwise specified, valves shall conform to AWWA C509 with mechanical-joint ends. Valves 75 mm (3 inches) and larger shall be resilient seated, ductile iron body, bronze mounted inclined seats, non-rising stem type, turning counter-clockwise to open, with a minimum 1375 kPa (200 pound) WOG. The resilient seat shall be fastened to the gate with stainless steel fasteners or vulcanizing methods. The interior and exterior shall be coated with thermo-setting or fusion epoxy coating in accordance with AWWA C550. Stuffing boxes shall have O-ring stem seals. Stuffing boxes shall be bolted and constructed so as to permit easy removal of parts for repair. Asbestos packing is not allowed.
2. Operator:
 - a. Underground: Except for use with post indicators, furnish valves with 50 mm (2 inch) nut for socket wrench operation.
 - b. Above Ground and in Pits: Hand wheels.
3. Joints: Ends of valves shall accommodate, or be adapted to, pipe installed.

B. Check Valve: Check valves shall be designed for a minimum working pressure of 150 psi or as indicated. Valves shall have a clear waterway equal to the full nominal diameter of the valve. Valves shall open to permit flow when inlet pressure is greater than the discharge pressure, and shall close tightly to prevent return flow when discharge pressure exceeds inlet pressure. The size of the valve, working pressure, manufacturer's name, initials, or trademark shall be cast on the body of each valve. Valves 2 inches and larger shall be outside lever and spring type.

1. Smaller than 100 mm (4 inches): Bronze body and bonnet, ASTM B61 or B62, 1375 kPa (200 pound) WOG.
2. 100 mm (4 inches) and Larger: Iron body, bronze trim, swing type, vertical or horizontal installation, flange connection, 1375 kPa (200 pound) WOG. Check valves for fire lines shall conform to AWWA C508 and shall be epoxy coated and lined per AWWA C550.

- C. Corporation stops and saddles - Ground key type; bronze, ASTM B 61 or ASTM B 62; and suitable for the working pressure of the system. Ends shall be suitable for solder-joint, or flared tube compression type joint. Threaded ends for inlet and outlet of corporation stops, AWWA C800; coupling nut for connection to flared copper tubing, ASME B16.26.
- D. Curb or Service Stops - Ground key, round way, inverted key type; made of bronze, ASTM B 61 or ASTM B 62; and suitable for the working pressure of the system. Ends shall be as appropriate for connection to the service piping. Arrow shall be cast into body of the curb or service stop indicating direction of flow. Smaller than 75 mm (3 inches). Waterworks standard for Type "K" copper, single piece cast bronze body with tee top operated plug sealed with O-ring gaskets, 1375 kPa (200 pound) WOG per AWWA C800.

2.6 WARNING TAPE

Standard, 4-Mil polyethylene 75 mm (3 inch) wide tape, detectable type, blue with black letters, and imprinted with "CAUTION BURIED WATER LINE BELOW".

2.7 CURB STOP BOX

Cast iron extension box with screw or slide type adjustment and flared base. Box shall be adapted, without full extension, to depth of cover required over pipe at stop location. Cast the word "WATER" in cover and set cover flush with finished grade. Curb stop shut-off rod shall extend 600 mm (2 feet) above top of deepest stop box.

2.8 VALVE BOX

Cast iron extension box with screw or slide-type adjustment and flared base. Minimum thickness of metal shall be 5 mm (3/16 inch). Box shall be adapted, without full extension, to depth of cover required over pipe at valve location. Cast the word "WATER" in cover. Provide 2 "T" handle socket wrenches of 16 mm (5/8 inch) round stock long enough to extend 600 mm (2 feet) above top of deepest valve box. The least diameter of the shaft of the box shall be 133 mm (5 1/4 inches). Cast-iron box shall have a heavy coat of bituminous paint. Valve box and cover shall be installed where indicated on the drawings to be utilized as access points for the tracer wire or detectable warning tape.

2.9 FIRE HYDRANTS

- A. Size of main valve opening of each hydrant shall be 125 mm (5 inches), minimum. Hose thread, size of fire apparatus connection, and shape, size and direction of rotation of operating head of hydrant shall be identical with present local fire department and/or water department standards.

B. Hydrant shall be type AWWA C502, heavy construction, of proper length to connect pipe without extra fittings, and shall be the traffic type with safety flange on barrel and safety couplings on the valve stem with the following features:

1. Interior removable without digging up hydrant; can be packed under pressure; 150 mm (6 inch) bell connection; one steamer nozzle and two hose nozzles with nozzle caps securely chained to barrel; suitable drainage device; single rubber or leather-faced valve in base; nozzles, stuffing boxes, wedge nuts, seat rings, clamp plates, etc. Threaded joints or spindles shall be bronze. Upper and lower barrels shall be of equal diameters. Upper barrel shall be of sufficient length to permit setting hydrant with barrel flange not more than 50 mm (2 inches) above finished grade. All fire hydrants shall have 150 mm (6 inch) bottom connection.
2. Provide fire hydrants with a finish paint identical to the existing fire hydrants. If there are no existing hydrants, contact the nearest fire department responder (fire department) for appropriate color.

C. Provide 2 wrenches with handles not less than 350 mm (14 inches) long.

2.10 PIPE SLEEVES

Ductile iron or zinc coated steel.

2.11 BACKFLOW PREVENTER

- A. Potable Water and Irrigation Water Service: Reduced Pressure Principle Type AWWA C511, except pressure drop at rated flow shall not exceed 100 kPa (15 psi). Gate valves installed on the assembly shall be resilient seated valve conforming to AWWA C509.
- B. Fire Service: Double detector check valve. AWWA C510 and NFPA 14.
- C. In cold climate areas, backflow assemblies and devices shall be protected from freezing by a method acceptable to local jurisdiction.
- D. Backflow preventers shall be approved by the Foundation for Cross-Connection Control and Hydraulic Research per current edition of the Manual of Cross-Connection Control.
- E. Backflow preventer shall not be located in any area containing fumes that are toxic, poisonous or corrosive.
- F. Direct connections between potable water piping and sewer connected wastes shall not exist under any condition with or without backflow protection.
- G. Backflow preventer shall be accessed and have clearance for the required testing, maintenance and repair. Access and clearance shall require a minimum of 300 mm (one foot) between the lowest portion of the assembly

and grade, floor or platform. Installations elevated more than 1500 mm (5 feet) above the floor or grade shall be provided with a permanent platform capable of supporting a tester or maintenance person.

2.12 WATER METER

Furnish and install meter approved by Water Service Utility. Coordinate & assist with installation of water meter supplied by water service utility in contractor installed vault. Pay connection fees as per notes on plan.

2.13 VAULTS (METER)

- A Meter assemblies to be installed underground shall be installed in precast reinforced concrete vaults manufactured and installed in accordance with the details shown on the drawings. The precast supplier shall design vault for H20 wheel loading. Provide design certified by Oregon Licensed structural engineer, together with shop fabrication drawings for review. Provide aluminum access doors, 48" by 48" Bilco JD-2AL-H20, or equal.

2.14 CAST IRON FRAME AND COVER

Frames and covers - shall be cast iron or ductile iron. Cast iron frames and covers shall be as indicated or shall be of type suitable for the application, circular, without vent holes. The frames and covers shall have a combined weight of not less than 180 Kg (400 lbs.). The word "Water" shall be stamped or cast into covers so that it is plainly visible. Frames and covers shall comply with ODOT standards.

2.15 POTABLE WATER

Water used for filling, flushing, and disinfection of water mains and appurtenances shall conform to Safe Drinking Water Act.

2.16 DISINFECTION CHLORINE

- A. Liquid chlorine shall conform to AWWA B301 and AWWA C651.
B. Sodium hypochlorite shall conform to AWWA B300 with 5 percent to 15 percent available chlorine.
C. Calcium hypochlorite shall conform to AWWA B300 supplied in granular form or 5.g tablets, and shall contain 65 percent chlorine by weight.

PART 3 - EXECUTION

3.1 BUILDING SERVICE LINES

Install water service lines to point of connection within approximately 1500 mm (5 feet) outside of buildings to which such service is to be connected and make connections thereto. If building services have not been installed provide temporary caps.

3.2 REGRADING

Raise or lower existing valve and curb stop boxes or any other applicable water system facilities to finish grade in areas being graded.

3.3 PIPE LAYING, GENERAL

- A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as recommended by the manufacturer to maintain the product performance as if it were undamaged.
- B. All pipe and fittings shall be subjected to a careful inspection just prior to being laid or installed. If any defective piping is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Government. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when installed or laid, shall conform to the lines and grades required.
- C. All buried piping shall be installed to the lines and grades as shown on the drawings. All underground piping shall slope uniformly between joints where elevations are shown.
- D. Contractor shall exercise extreme care when installing piping to shore up and protect from damage all existing underground water line and power lines, and all existing structures.
- E. Do not lay pipe on unstable material, in wet trench, or when trench or weather conditions are unsuitable.
- F. Do not lay pipe in same trench with other pipes or utilities unless shown otherwise on drawings.
- G. Hold pipe securely in place while joint is being made.
- H. Do not walk on pipes in trenches until covered by layers of earth well tamped in place to a depth of 300 mm (12 inches) over pipe.
- I. Full length of each section of pipe shall rest solidly upon pipe bed with recesses excavated to accommodate bells or joints. Do not lay pipes on wood blocking.
- J. Tees, plugs, caps, bends and hydrants installed on underground pipe shall be anchored. See Section 3.8 "PIPE SUPPORTS".
- K. Close pipe openings with caps or plugs during installation. Tightly cover and protect equipment against dirt, water and chemical, or mechanical injury. At completion of all work, thoroughly clean exposed materials and equipment.

- L. Good alignment shall be preserved in laying. The deflection at joints shall not exceed that recommended by the manufacturer.
- M. Warning tape shall be continuously placed 300 mm (12 inches) below finish grade above buried water pipes, or at bottom of subbase where roadways exist, whichever is deeper with overall depth not exceeding 24 inches. Detectable warning tape shall be locatable by the NCA staff and/or local water utility from the finish grade above the pipe. Ends of detectable warning tape shall be terminated in a curb stop box for locating.

3.4 DUCTILE IRON PIPE

- A. Installing Pipe: Lay pipe in accordance with AWWA C600. Provide a firm even bearing throughout the length of the pipe by tamping selected material at the sides of the pipe up to the spring line.
- B. All pipe shall be sound and clean before laying. When laying is not in progress, the open ends of the pipe shall be closed by watertight plug or other approved means.
- C. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Bevel cut ends of pipe to be used with push-on bell to conform to the manufactured spigot end. Cement lining shall be undamaged.
- D. Jointing Ductile-Iron Pipe:
 - 1. Push-on joints shall be made in strict accordance with the manufacturer's instruction. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe is to be aligned with the bell of the pipe to which it is joined, and pushed home following industry standard procedures or manufacturer's approved means.
 - 2. Mechanical Joints at Valves, Fittings: Install in strict accordance with AWWA C111. To assemble the joints in the field, thoroughly clean the joint surfaces and rubber gaskets with soapy water before tightening the bolts. Bolts shall be tightened to the specified torque. For new construction, all mechanical joints at valves and fittings shall be secured with an approved mechanical joint retainer glands suitable for the pipe.
 - 3. Ball Joints: Install in strict accordance with the manufacturer's instructions. Where ball joint assemblies occur at the face of structures, the socket end shall be at the structure and ball end assembled to the socket.

4. Flanged joints shall be in accordance with AWWA C115. Flanged joints shall be fitted so that the contact faces bear uniformly on the gasket and then are made up with relatively uniform bolt stress.

3.5 PVC PIPE.

- A. PVC piping shall be installed in strict accordance with the manufacturer's instructions and AWWA 605. Place selected material and thoroughly compacted to one foot above the top of the pipe and thereafter back filled as specified in Section 31 20 00, EARTH MOVING.
- B. Copper Tracer Wire: Copper tracer wire consisting of No. 14 AWG solid, single conductor, insulated copper wire shall be installed in the trench with all piping to permit location of the pipe with electronic detectors. The wire shall not be spiraled around the pipe nor taped to the pipe. Wire connections are to be made by stripping the insulations from the wire and soldering with rosin core solder. Solder joints shall be wrapped with rubber tape and electrical tape. At least every 300 m (1000 feet), provide a 2.3 kg (5 pound) magnesium anode attached to the main tracer wire by solder. The solder joint shall be wrapped with rubber tape and electrical tape. An anode shall be attached at the end of each line.

3.6 COPPER PIPE

Copper piping shall be installed per City of Eagle Point Specifications and in accordance with the Copper Development Association's Copper Tube Handbook and manufacturer's recommendations. Copper piping shall be bedded in 150 mm (6 inches) of sand and then back filled as specified in Section 31 20 00, EARTH MOVING.

3.7 PIPE SUPPORTS

- A. Supports:
 1. All piping shall be properly and adequately supported. Hangers, supports, base elbows and tees, and concrete piers and pads shall be provided as indicated on the drawings. If the method of support is not indicated on the drawings, exposed piping shall be supported by hangers wherever the structure is suitable and adequate to carry the superimposed load. Supports shall be placed approximately 2.4 m (8 feet) on centers and at each fitting.
 2. Hangers shall be heavy malleable iron of the adjustable swivel type, split ring type, or the adjustable-swivel, pipe-roll type for horizontal piping and adjustable, wrought iron, clamp type for vertical piping. Flat steel strap or chain hangers are not acceptable unless indicated on the drawings.

3. Hangers shall be attached to the structure, where possible, by beam clamps and approved concrete inserts set in the forms before concrete is poured. Where this method is impractical, anchor bolts with expanding lead shields, rawl drives, or malleable iron expansion shields will be permitted.
4. Where hangers cannot be used, the Contractor shall provide pipe saddle supports with pipe column and floor flange.

3.8 RESTRAINED JOINTS

- A. Sections of piping requiring restrained joints shall be constructed using pipe and fittings with restrained "locked-type" joints and the joints shall be capable of holding against withdrawal for line pressures 50 percent above the normal working pressure but not less than 1375 kPa (200 psi). The pipe and fittings shall be restrained push-on joints or restrained mechanical joints.
- B. The minimum number of restrained joints required for resisting force at fittings and changes in direction of pipe shall be determined from the length of retained pipe on each side of fittings and changes in direction necessary to develop adequate resisting friction with the soil. Restrained pipe length shall be as shown on the drawings.
- C. Restrained joint assemblies with ductile iron mechanical joint pipe shall be as specified herein in Paragraph 2.3 or approved equal.
- D. Thrust blocks shall be required, unless otherwise noted..
- E. Where ductile iron pipe manufactured with restrained joints is utilized, all restrained joints shall be fully extended and engaged prior to back filling the trench and pressurizing the pipe.
- F. Ductile iron mechanical joint fittings used with PVC pipe shall be restrained with the specified Mechanical Joint Restrainer Gland, or approved equal.

3.9 PIPE SEPARATION

- A. Horizontal Separation-Water Mains and Sewers:
 1. Water mains shall be located at least 3 m (10 feet) horizontally from any proposed drain, storm sewer, sanitary or sewer service connection.
 2. Water mains may be located closer than 3 m (10 feet) to a sewer line when:
 - a. Local conditions prevent a lateral separation of 3 m (10 feet); and
 - b. The water main invert is at least 450 mm (18 inches) above the crown of the sewer; and

- c. The water main is either in a separate trench or in the same trench on an undisturbed earth shelf located one side of the sewer.
 3. When it is impossible to meet (1) or (2) above, both the water main and drain or sewer shall be constructed to watermain standards. The drain or sewer shall be pressure tested to the maximum expected surcharge head before back filling.
- B. Vertical Separation-Water Mains and Sewers:
1. A water main shall be separated from a sewer so that its invert is a minimum of 450 mm (18 inches) above the crown of the drain or sewer whenever water mains cross storm sewers, sanitary sewers or sewer service connections. The vertical separation shall be maintained for that portion of the water main located within 10 feet horizontally of any sewer or drain crossed. A length of water main pipe shall be centered over the sewer to be crossed with joints equidistant from the sewer or drain.
 2. Both the water main and sewer shall be constructed of slip-on or mechanical joint ductile iron pipe or PVC pipe equivalent to water main standards of construction when:
 - a. It is impossible to obtain the proper vertical separations described in (1) above; or
 - b. The water main passes under a sewer or drain.
 3. A vertical separation of 450 mm (18 inches) between the invert of the sewer or drain and the crown of the water main shall be maintained where a water main crosses under a sewer. Support the sewer or drain lines to prevent settling and breaking the water main.
 4. Construction shall extend on each side of the crossing until the perpendicular distance from the water main to the sewer or drain line is at least 3 m (10 feet).

3.10 SETTING OF VALVES AND BOXES

- A. Provide a surface concrete pad 450 by 450 by 150 mm (18 by 18 by 6 inches) to protect valve box when valve is not located below pavement.
- B. Clean valve and curb stops interior before installation.
- C. Set valve and curb stop box cover flush with finished grade.
- D. Set curb stop box and cover for access to identification wire and/or detectable warning tape with a 300 by 300 by 75 mm (12 by 12 by 3 inches) at approximately the depth of the warning tape and bring the tape and/or identification wire into the box and coil extra length sufficient to allow the tape or wire to be uncoiled and extended 1500 mm (5 feet) above finish grade at the location.

- E. Valves shall be installed plumb and level and in accordance with manufacturer's recommendations.

3.11 SETTING OF FIRE HYDRANTS

- A. Set center of each hydrant not less than 600 mm (2 feet) nor more than 1800 mm (6 feet) back of edge of road or face of curb. Fire apparatus connection shall face road with center of nozzle 450 mm (18 inches) above finished grade. Set barrel flange not more than 50 mm (2 inches) above finished grade.
- B. Set each hydrant on a slab of stone or concrete not less than 100 mm (4 inches) thick and 375 mm (15 inches) square. The service line to the hydrant, between the tee and the shoe of the hydrant, shall be fully restrained.
- C. Set bases in not less than 0.4 cubic meter (1/2 cubic yard) of crushed rock or gravel placed entirely below hydrant drainage device.
- D. Clean interiors of hydrants of all foreign matter before installation.

3.12 PIPE SLEEVES

Install where water lines pass through retaining walls, building foundations and floors. Seal with modular mechanical type link seal. Install piping so that no joint occurs within a sleeve. Split sleeves may be installed where existing lines pass through new construction.

3.13 FLUSHING AND DISINFECTING

- A. Flush and disinfect new water lines in accordance with AWWA C651.
- B. Initial flushing shall obtain a minimum velocity in the main of 0.75 m/sec (2.5 feet per second) at 275kPa (40 psi) residual pressure in water main. The duration of the flushing shall be adequate to remove all particles from the line.

Pipe Diameter		Flow Required to Produce 76 cm/sec (2.5 ft/sec)(approx.) Velocity in Main		Number of Hydrant Outlets			
				Size of Tap. mm (in.)			
				25(1)	38 (1 ½)	51(2)	64 (2 1/2-in)
mm	(In)	L/sec	(gpm)	Number of taps on pipe			
100	(4)	6.3	(100)	1	--	--	1
150	(6)	12.6	(200)	--	1	--	1
200	(8)	25.2	(400)	--	2	1	1
250	(10)	37.9	(600)	--	3	2	1
300	(12)	56.8	(900)	--	--	3	2
400	(16)	100.9	(1600)	--	--	4	2

The backflow preventers shall not be in place during the flushing.

- C. The Contractor shall be responsible to provide the water source for filling, flushing, and disinfecting the lines. Only potable water shall be used, and the Contractor shall provide all required temporary pumps, storage facilities required to complete the specified flushing, and disinfection operations.
- D. The Contractor shall be responsible for the disposal of all water used to flush and disinfect the system in accordance with all governing rules and regulations. The discharge water shall not be allowed to create a nuisance for activities occurring on or adjacent to the site.
- E. The bacteriological test specified in AWWA C651 shall be performed by a laboratory approved by the Department of Environmental Quality of the State. The cost of sampling, transportation, and testing shall be the responsibility of the Contractor.
- F. Re-disinfection and bacteriological testing of failed sections of the system shall be the sole responsibility of the Contractor.
- G. Before backflow preventers are installed, all upstream piping shall be thoroughly flushed.

3.14 HYDROSTATIC TESTING

- A. Hydrostatic testing of the system shall occur prior to disinfecting the system.
- B. After new system is installed, except for connections to existing system and building, backfill at least 300 mm (12 inches) above pipe barrel, leaving joints exposed. The depth of the backfill shall be adequate to prevent the horizontal and vertical movement of the pipe during testing.
- C. Prior to pressurizing the line, all joint restraints shall be completely installed and inspected.
- D. If the system is tested in sections, and at the temporary caps at connections to the existing system and buildings, the Contractor shall provide and install all required temporary thrust restraints required to safely conduct the test.
- E. The Contractor shall install corporation stops in the line as required to purge the air out of the system. At the completion of the test, all corporation stops shall be capped.
- F. The Contractor shall perform pressure and leakage tests for the new system for 2 hours to 1375 kPa (200 psi). Leakage shall not exceed the following requirements.
 - 1. Copper Tubing: No leaks.
 - 2. Ductile Iron Pipe: AWWA C600. Provide to COTR office.
 - 3. Polyvinyl Chloride (PVC) AWWA C605. Provide to COTR office.

3.15 BACKFLOW PREVENTOR TESTING

WATER UTILITIES

- A. All backflow preventers shall be installed, tested and certified for proper operation, prior to being placed in operation.
- B. Original copies of the certification shall be submitted to the COTR.

3.16 LOCAL AGENCY CONNECTION & PERMIT FEES:

The Contractor shall pay, on behalf of the VA, connection, inspection, and meter installation fees as listed on the plan or in Section 01 00 00. The cost of these fees shall be included in the base bid. The contract price will be adjusted for overage or underage to actual fees after exact fees are determined during construction.

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