

SECTION 02668

WATER TRANSMISSION AND DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe and fittings for culinary water line.
- B. Valves, fire hydrants and water meters.

1.02 RELATED SECTIONS

- A. Section 02205: Common Fill.
- B. Section 02206: Select Fill.
- C. Section 02225: Excavating and Backfill Operations.
- D. Section 02250: Soil Compaction.
- E. Section 02660: Pipeline Testing.
- F. Section 02675: Disinfection.
- G. Section 03300: Cast-in-Place Concrete: Concrete for thrust restraints.

1.03 REFERENCES

- A. ASME B16.18: Cast Copper Alloy Solder Joint Pressure Fittings.
- B. ASME B16.22: Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- C. ASTM B88: Seamless Copper Water Tube.
- D. ASTM D2241: Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
- E. ASTM D2855: Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and fittings.
- F. AWWA C104: Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
- G. AWWA C105: Polyethylene Encasement for Ductile Iron Piping for Water and Other liquids.
- H. AWWA C110: American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids.
- I. AWWA C111: Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings.
- J. AWWA C151: Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- K. AWWA C500: Gate Valves, 3 through 48 in NPS, for Water and Sewage Systems.

- L. AWWA C502: Dry Barrel Fire Hydrants.
- M. AWWA C504: Rubber Seated Butterfly Valves.
- N. AWWA C600: Installation of Ductile-Iron Water Mains and Appurtenances.
- O. AWWA C900: Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch, for Water.
- P. AWWA C906: Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 63 In. for Water Distribution and Transmission
- Q. UL 246: Hydrants for Fire - Protection Service.

1.04 SUBMITTALS

- A. Prior to construction, submit 6 copies of the manufacturers specification for all products to the engineer for approval.

1.05 SUBMITTALS AT PROJECT CLOSEOUT

- A. Record and submit actual locations of piping, valves, connections, thrust restraints, and invert elevations.
- B. Identify and describe unexpected variations in subsoil conditions or utilities.

1.06 SPECIAL REQUIREMENTS & CONSIDERATIONS

- A. All materials which may contact drinking water, including pipes, gaskets, lubricants, and O-Rings, shall be ANSI-certified as meeting the requirements of ANSI/NSF Standard 61, Drinking Water System Components – Health Effects. To permit field-verification of this certification, all components shall be appropriately stamped with the NSF logo.
- B. Pipe, joints, fittings, valves, and fire hydrants shall conform to applicable sections of AWWA Standards C104-A21.4-08 through C550-05 and C900-07 through C950-07.
- C. All pipe materials and fittings shall be “lead free” in accordance with Section 1417 of the Federal Safe Drinking Water Act. They shall be certified as meeting ANSI/NSF 372 or Annex G of ANSI/SNF 61.
- D. The standard horizontal distance between water lines and sanitary sewer lines shall be at least 10 feet. Where a water main and sewer line must cross, the water main shall be at least 18 inches above the sewer line. Separation distances shall be measured from pipe edge to pipe edge. Adherence to all separation requirements included in Sections R309-550-7 and R309-550-12 shall be required unless a written variance is requested and granted from the Utah Division of Drinking Water and Heber City.
- E. Special design and construction considerations in accordance with Section R309-550-5(6) of the Utah Administrative Code shall be required for water mains located in areas of geologic hazard (e.g., slide zones, fault zones, river crossings, etc.)
- F. Surface water crossings are generally prohibited and will only be allowed when no other practical alternatives exist and when specifically approved in writing by the City Engineer. If allowed, surface water crossings shall be designed and constructed in accordance with Section R309-550-8(8) of the Utah Administrative Code.

- G. To provide increased reliability of service and reduce head loss, dead ends shall be minimized by making appropriate tie-ins and “looping” of the water system whenever practical. Where dead-end mains do occur (permanent or temporary), a fire hydrant or approved blow-off assembly shall be installed for flushing purposes as directed by the City Engineer. Flushing devices must have the minimum sizes shown on Heber City Standard Drawing “Water-8”, but must also be sized to provide a minimum velocity of 2.5 fps in the water main.

PART 2 PRODUCTS

2.01 DUCTILE IRON WATER PIPE

- A. Ductile Iron Water pipe shall be Class 50 for slip-on joint piping (Class 51 for 4-inch size) and Class 53 for mechanical joint and flanged joint piping.
- B. All piping shall conform to AWWA Specification C151 of the latest revision.
- C. Pipe joints shall be the push-on rubber gasket type of mechanical joint type with rubber gaskets conforming to AWWA C111 of latest revision or flanged connections conforming to AWWA C115 of latest revision.
- D. All Ductile Iron Pipe wall thickness shall conform to AWWA C150.
- E. Fittings: Fittings shall conform to AWWA Specification C110, or C153 and shall have mechanical, flanged or push-on rubber gasket joints.
- F. Coatings and Linings for Ductile Iron Pipe:
 - 1. All exterior surfaces of pipe and fittings shall be coated with hot coal tar approximately 1 mil thick or polyethylene encasement (AWWA C105) when soils conditions require additional protection.
 - 2. All interior surfaces of pipe and fittings shall be coated with the standard thickness cement mortar lining in conformity with the requirements of AWWA C104
- G. Markings:
 - 1. Pipe markings shall include the following, marked continuously down the length:
 - a. Manufacturer’s Name.
 - b. Nominal Size.
 - c. Class Pressure Rating.
 - d. NSF Logo.
 - e. Identification Code.
- H. Minimum water main size is 8 inches for culinary and 6 inches for secondary irrigation.

2.02 POLYVINYL CHLORIDE PIPE (PVC)

- A. All PVC pipe used for transmission lines shall be AWWA C900, DR-18 or as determined by the City Engineer. All PVC pipe used for secondary irrigation lines shall be AWWA C900, DR-18 Purple pipe or as determined by the City Engineer.
- B. Conformance: All PVC pipe shall conform to the latest revisions of the following specifications.
 - 1. AWWA Spec. C900 (PVC pressure pipe for water).
 - 2. ASTM Spec. D-2241 (Dimensions, Class, SDR, and tolerances).

3. National Sanitation Foundation Testing Laboratories (NFS).
 4. Rubber Gasketing shall conform to ASTM F477.
 5. Joints in compliance with ASTM D3139.
- C. Pipe Dimensions:
1. Standard lengths shall be 20 feet.
 2. Wall thickness shall be in accordance with ASTM d-2241.
 3. Pipe ends shall be beveled to accept the gasketed coupling (4" and larger).
 4. Minimum water main size is 8 inches for culinary and 6 inches for secondary irrigation.
- D. Couplings and Fittings:
1. For pipelines over 2 inches in diameter, ductile iron fittings in conformance with AWWA C110 or C153 shall be used on PVC pipelines and shall have mechanical, flanged or push-on rubber gasket joints.
 2. Where PVC fittings or couplings are used, they shall be furnished by the pipe manufacturer and shall accommodate the pipe for which they are to be used.
 3. They shall have a minimum pressure rating of 200 psi.
 4. Insertion depth of the pipe in the coupling shall be controlled by a gauge mark or mechanical stop in the coupling which will allow for a thermal expansion and contraction.
- E. Lubrication: Lubrication shall be water soluble, non-toxic, be non-objectionable in taste and odor imparted to the fluid, be non-supporting of bacteria growth, and have no deteriorating effect on the PVC or rubber gaskets.
- F. Concrete Blocking:
1. All fittings at bends and branches in water pipe lines shall be provided with concrete thrust blocking as shown on the Standard Drawings.
 2. All bolts shall be greased and bends will be wrapped with 8 mil plastic.
 3. Blocking shall be of concrete specified in Section 03300, poured in place and shall bear against solid undisturbed earth at the sides and bottom of the trench excavation and shall be shaped so as to not obstruct access to the joints of the pipe or fitting.

2.03 HIGH-DENSITY POLYETHYLENE (HDPE)

- A. HDPE pipe shall only be used under certain design conditions with prior approval from City Engineer. All HDPE pipe used for culinary water transmission lines shall be AWWA C906, DR-11 with blue stripe or as determined by the City Engineer. All HDPE pipe used for secondary irrigation lines shall be AWWA C906, DR-11 with purple pipe or as determined by the City Engineer.
- B. Conformance: All HDPE pipe shall conform to the latest revisions of the following specifications.

1. AWWA Spec. C906 (Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 63 In., for Water Distribution and Transmission).
 2. ASTM D-2239 (Standard Spec for Polyethylene (PE) Plastic Pipe), ASTM D2737, ASTM D3035, and F714 (PVC plastic pipe SDR-PR and Class T).
- G. Pipe Dimensions:
1. D.I.P.S shall be used unless otherwise stated.
 2. Standard lengths shall be 40 or 50 feet.
 3. Minimum water main size is 8 inches I.D. for culinary and 6 inches I.D. for secondary irrigation.

2.04 GATE VALVES

- A. Gate valves shall be used for all applications. In cases where there is limited vertical clearance or when the operating nut of the gate valve would be less than three (3) feet from the surface, horizontal gate valves shall be used.
- B. Furnish gate valves that conform to the requirements of AWWA C509 for applications less than 14" diameter and AWWA C515 for applications 14" diameter and greater, with cast iron body, bronze mounted, resilient wedge, parallel seat, non-rising stem design with "O" ring seals.
- C. Operating Direction: Open counterclockwise.
- D. Buried Valves: Unless otherwise shown or specified, in line valves shall be of Mechanical Joint connection design for buried service. Flange connections shall be used connecting valves to tees or crosses for buried service.
- E. Buried Valves shall have 2" operation nuts.
- F. Horizontal gate valves shall have 2:1 beveled gear reduction, unless otherwise approved by the City Engineer.

2.05 BUTTERFLY VALVES (PROHIBITED UNLESS APPROVED BY THE CITY ENGINEER IN SPECIFIC CASES.)

- A. Butterfly valves, if approved, are used when application are 14-inch diameter or greater.
- B. Material, in accordance with AWWA C504.
- C. Body Type:
 1. Valves shall be high strength cast iron ASTM A-126, Class B with 18-8 Type 304 stainless steel body seat.
 2. Valve vane shall be mechanically secured with an integral 18-8 stainless steel clamp ring and 18-8 stainless steel nylon locked screws.
 3. If mechanical joints are used, the installation shall be per AWWA Specification C111 and accessories (bolts, glands, and gaskets) shall be included.
 4. All butterfly valves shall be of the rubber-seated tight-closing type. The rubber seat shall be a full circle 360° seat not penetrated by the valve shaft.

- D. Valve Shafts:
 - 1. The valve shaft shall be one piece extending full size through the entire valve and operator with no neckdown, keyways, or holes to weaken it.
 - 2. The valve shaft shall have 304 stainless steel journals rotating in reinforced Teflon bearings.
 - 3. Valves shall have permanently set two-way thrust bearing.
 - 4. Packing shall be "triple-seal" rubber designed for permanent duty in underground service.
- E. All valves shall have stainless bolts and zinc coated stainless steel nuts.
- F. Flange connections shall be used connecting valves to tees or crosses for buried service.

2.06 VALVE BOXES

- A. All buried valves shall be installed with cast iron, 2 piece, sleeve type, with an expanded bell base, 5 1/4 inch shaft valve boxes.

2.07 TAPPING SADDLES

- A. For tapping saddles used for service connections to plastic pipe, provide full circle saddles. For all other pipe provide double strap bronze alloy, ductile iron, or stainless steel saddles.
- B. Provide tapping saddles that have a minimum rated working pressure of 300 psi, neoprene Buna N gaskets, and bronze tapered threads.

2.08 SERVICE CONNECTIONS

- A. Provide and install according to standard drawings.
- B. Service Pipe:
 - 1. Provide single length Polyethylene pipe (copper tube size) with compression fittings. Copper services are not allowed.
 - 2. Locate service taps in the upper quadrant of the main line, approximately at 45 degrees. The minimum distance between taps is 24", with a 5 degree stager. Do not make service taps within 24" of the end of the main line.
 - 3. Service saddles are required on all taps unless indicated otherwise. All water main saddles must be installed with a torque wrench to the torque setting found on the informational tags attached to the saddle body.
 - 4. In subdivision developments, the contractor shall be responsible to furnish and install the corporation type stop and laterals to a point on private property 10 feet past the street right-of-way line.
 - 5. No splices in water services for new service and relocation unless approved by City Engineer.
- C. New Meter Boxes: Mueller / Hunt Thermal-Coil Meter Assembly
Existing Meter Box Repairs: Double walled plastic can with ring and cover of sufficient strength to withstand H-20 loadings without damage.

Meter Boxes are allowed within the driveway “zone” with prior approval from the Public Works Department. The driveway “zone” shall include the flared driveway approach including five feet either side from the top of the flare. All retrofit of meter boxes within the driveway “zone” shall include shear support at the bottom of the meter box and shall be flush with the concrete surface.

- D. Meter Setters: Series 70 manufactured by Ford or Mueller.
- E. Service connections greater in size than 2” shall follow the Compound Meter with 2” Bypass details in the latest version of the APWA Standard Plans & Specifications published under the direction of the Utah Chapter of the American Public Works Association. For details on specific meter requirements, contact the Heber City Public Works Department.
- F. All materials to be supplied by the Contractor, except for the meter.

2.09 HYDRANT

- A. In accordance with AWWA C502 and pattern approved by Owner.
- B. 6-inch cast iron hydrant as manufactured by Muller Centurion 250, or Waterous – Model # WB-67-250.
- C. Cast-Iron Body Fire Hydrant: Compression type, opening against pressure and closing with pressure, base valve design, 150 psi working pressure, with 1/4" diameter minimum tapping and bronze plug in standpipe.
 - 1. Size: Minimum 5 1/4" valve opening.
 - 2. Direction to Open Hydrant: Left.
 - 3. Size and Shape of Operating and Cap Nuts: Pentagon 1-1/2" point to flat.
 - 4. Hose Nozzles: Two 2-1/2" National Standard Thread, cap, gasket and chain.
 - 5. Pumper Nozzles: One 4-1/2" National Standard Thread, cap, gasket and chain.
 - 6. Depth of Cover: 5'-0" to top of pipe unless indicated otherwise.
 - 7. Connection to Main: O-ring seals and a 6" ASA 125 pound flanged inlet.
 - 8. Pressure: Designed for a working pressure of 175 psi and a hydrostatic pressure of 350 psi.
 - 9. Bottom connection: 6" flanged. Designed to allow the flanges at the sidewalk level to separate when hydrant is sheared off.
 - 10. Automatic drain: Opens as the hydrant is closed.
 - 11. Hydrants shall be provided by the manufacturer with a factory applied red coating. Field painting of hydrants shall not be allowed.
- D. Mechanical joint or flanged in accordance with AWWA C110 and AWWA C111.
- E. Hydrant spacing shall not exceed 500-feet.

2.10 FIRE SERVICE

- A. All fire service shall be a minimum 3” ductile iron pipe.
- B. All fire services are required to install a gate valve at the main line connection and a RP double check backflow valve immediately inside the building. Tracer wire shall be installed along entire length of fire service.

2.11 AIR RELEASE STATIONS

- A. Air Releases shall be installed at all peaks and sharp changes in gradient with a difference of elevation greater than 15 feet. If the waterline has service connections within the location of the peak or change in the gradient, the air release station may be eliminated at the City Engineers discretion.

2.12 BACK FLOW PREVENTORS

- A. All irrigation lines connected to culinary system shall have RP backflow devices with 3 chambers, and above ground air release with an air gap.
- B. All backflow preventers shall be tested by a certified backflow technician, and a passing test report will need to be provided to the City.

2.13 HARDWARE, ACCESSORIES & BOLT PACKS

- A. All hardware, bolt packs, etc. to be buried shall be greased with food grade FM grease and wrapped in 8 mil (min) plastic secured in place using heavy duty adhesive tape.
- B. All hardware, piloting, bolt packs, etc. to be exposed (including in manholes and vaults) shall be Stainless Steel unless otherwise approved by the City Engineer.

PART 3 EXECUTION

3.01 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.

3.02 BEDDING

Refer to Section 02225

3.03 INSTALLATION – PIPE & FITTINGS

- A. The bottom of the trench shall be cut flat, true and even to provide uniform bearing for the full length of the pipe barrel.
- B. Under no circumstances shall pipe or accessories be dropped into the trench.
- C. Each pipe shall be laid true to line and grade and in such manner as to form a close concentric joint with adjoining pipe to prevent sudden offsets.
- D. Pipe bedding and trench backfill shall be as defined in the previous sections.

- E. Install fittings, valves, etc., without the use of repair sleeves unless otherwise approved by the Public Works Director. Cut-in fittings, valves, etc., shall be installed with the use of Mechanical Joint by Flange adapters (or other means as necessary) to eliminate the need for repair sleeves.
- F. As work progresses, interior of pipe shall be cleared of dirt and other superfluous materials.
- G. Trenches shall be kept free from water until pipe jointing has been completed. Pipe shall not be laid when condition or trench or weather is unsuitable for such work.
- H. At all times when work is not in progress, all open ends of pipe and fittings shall be securely closed so that no water, earth, or other substance will enter pipe or fittings.
- I. Maintain separation of water main and services from sewer piping in accordance with Utah State Code.
- J. Install pipe to indicated elevation to within tolerance of 5/8 inches.
- K. Install ductile iron piping and fittings to AWWA C600.
- L. Route pipe in straight line.
- M. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- N. Install access fittings to permit disinfection of water system performed under Section 02675.
- O. Slope secondary irrigation water pipe and position drains at low points. Drains shall discharge into storm drain system or other stream course that will not adversely impact adjacent properties.
- P. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.
- Q. Establish elevations of buried culinary piping to ensure not less than 5 feet of cover.
- R. Establish elevations of buried irrigation piping to ensure not less than 2 feet of cover. Elevation of buried irrigation piping shall be set to match the design elevations and slopes identified in the plans. Survey cut stakes shall be utilized and followed when installing irrigation piping.
- S. Install metallic tape continuous over top of pipe buried 12 inches above pipe line.
- T. Backfill trench in accordance with Section 02250.
- U. Handling Ductile Iron Pipe:
 - 1. Pipe and fittings shall be handled in such a manner as to insure installations in sound, undamaged condition.
 - 2. Particular care shall be taken not to injure the pipe coating and lining. Cement lining in pipe or fittings which is broken or loosened shall be cause for rejection of pipe or fittings.
 - 3. All damaged pipe coating shall be repaired, prior to laying pipe or placing backfill.
 - 4. Repair shall be accomplished by removing all damaged coating, wire-brushing to exposed metal, and applying two coats of coal tar coating of a type and quality to that originally in coating the pipe.
- V. Cutting, Cleaning and Inspection:
 - 1. Cutting of pipe for closure pieces or for other reasons shall be done in a neat and workmanlike manner by a method which will not damage the pipe.

2. Before installation, each pipe shall be inspected for defects.
3. All defective, damaged or unsound pipe shall be rejected.

W. Location of Stub Pipes:

1. The location of each stub shall be marked by placing a 2 x 4 marker at the end of the pipe and extending vertically from the end of the pipe to approximately 15 inches above the ground surface.
2. The portion of the 2 x 4 extending above ground, shall be painted as follows:
 - a. Green - indicating sewer stub.
 - b. Blue - indicating water.

3.04 INSTALLATION - VALVES AND HYDRANTS

- A. Set valves on solid bearing.
- B. Locate valves on property lines, at each intersection, and not more than 500 feet between.
- C. Center and plumb valve box over valve. Set box cover flush with finished grade with concrete collar as per standard drawings.
- D. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.
- E. Valves located next to fittings shall be connected via flange x flange joints.
- F. Anchorages: Provide anchorages for tees, wyes, crosses, plugs, caps, bends, valves, and hydrants. After installation, apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of ferrous anchorages.
- G. On private building fire services, a gate valve must be installed at the property line to isolate the fire service and a detector check valve must be installed where the fire line first enters the building.

3.05 INSTALLATION - SERVICE CONNECTIONS

- A. The contractor or home owner must provide and install all parts according to the standard drawings.
- B. The Engineer or Public Works Department must inspect the installation before burying or backfilling. The Contractor shall conform to the following requirements before a water meter shall be installed by Heber City:
 1. Notify the Water Department at least five working days prior to the time the meter is to be installed and before backfilling.
 2. The water lateral should be exposed in the street right-of-way one foot outside the property line, even if the lateral extends onto the property.
 3. The end of the house lateral should be within 2 feet of the service lateral.
 4. Both laterals should be exposed freely in the center of the excavation.
 5. To prevent damage from possible freezing, the water lateral may be covered with materials such as sand, light gravel, straw, insulation, or similar light materials.

- 6. To establish the correct street right-of-way line, the property line pins or the sidewalk must be in place.
 - C. All of the above requirements must be complied with to the satisfaction of the City before the water meter will be installed.
 - D. A service charge will be assessed for crew time when prerequisites are not met before setting a meter. This fee must be paid before the meter installation will be rescheduled.
 - E. Any required re-setting of the water meter following initial installation shall be done by the City at the expense of the Developer or Contractor.
 - F. Place meter can in park strip or 1 foot behind sidewalk or on city side of property line, as directed by City Engineer.
 - G. Install setter no closer than 24" of ground surface.
 - H. Lids shall be flush with top of sidewalk elevation.
- 3.06 DISINFECTION OF CULINARY WATER PIPING SYSTEM
- A. Flush and disinfect system in accordance with Section 02675.
- 3.07 TESTING OF WATER PIPING SYSTEMS
- A. Test pipeline system in accordance with Section 02660.
- 3.08 TRACER WIRE INSTALLATION
- A. Copper tracer wire to be installed the total length of pipeline with a branch to each tee, cross, and fire hydrant. (See Standard Drawing):
 - 1. Copper wire should be #12 gauge single strand jacketed wire, manufactured for underground service.
 - 2. Wire shall be continuous without breaks. Splices shall be made with petroleum filled wire nut caps.
 - 3. Tracer Wire to be secured to top of pipe at a minimum of every Ten feet, by means other than metallic.
 - 4. Tracer Wire should be brought up in all fire hydrants in culinary water lines, and in the first lateral of each street for pressurized irrigation (not to exceed 500 feet).
 - B. Perform a continuity test in the presence of the City Inspector prior to paving.
- 3.09 FIELD QUALITY CONTROL
- A. Compaction testing will be performed in accordance with section 02250.
 - B. If tests indicate Work does not meet specified requirements, remove work, replace, and retest.

END OF SECTION