WATERMAIN SPECIFICATIONS
W200

Rochester, MN

Section 1 GENERAL REQUIREMENTS

W200.101 Description

These specifications shall apply to the construction and repair of watermains utilizing plant fabricated pipe and other appurtenant materials, installed for conveyance of potable water. The work includes the relocation or adjustment of existing facilities as may be specified in the contract.

All references to cast iron material shall be construed to include Gray Iron and Ductile Iron products, except where one or the other is specified. All references to "structure" shall include any manmade object that is not otherwise accepted by special terminology or definition.

The City of Rochester reserves the right, at any time during the construction of any watermain embraced within the limits of a public contract, to issue a permit to a property owner to connect premises to the watermain. In the event such a permit is issued, the Contractor is not relieved of the responsibility to complete the contract according to Plans and Specifications. The issuance of a permit by the City to tap or connect to any part of a watermain embraced within the limits of a public contract shall in no sense be construed as acceptance of any part of the work.

W200.102 Reference Documentation

Provisions of the General Conditions and Trench Excavation & Backfill/Surface Restoration shall apply to this work. The Contractor shall abide by the applicable provisions of state, federal and local laws and ordinances.

All references to Mn/DOT Specifications shall mean the latest published edition of the Minnesota Department of Transportation Standard Specifications for Construction as modified by any Mn/DOT Supplemental Specifications issued before the date of advertisement for bids. All references to Specifications of AASHTO, ASTM, ANSI, AWWA, etc. shall mean the latest published edition available on the date of advertisement for bids.

The following American Water Works Association (AWWA) Standards are incorporated by reference in this Specification:

C104 Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
C105 Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
C111 Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
C150 Standard for Thickness Design of Ductile-Iron Pipe
C151 Standard for Ductile-Iron Pipe, Centrifugally Case, for Water or Other Liquids
C153 Standard for Ductile-Iron Compact Fittings, 3 In. Through 24 In. (76 mm Through 610 mm) and 54 In. Through 64 In. (1,400 mm Through 1,600 mm), for Water Service
C500 Standard for Metal-Seated Gate Valves for Water Supply Service (Includes addendum C500a-95.)
C502 Standard for Dry-Barrel Fire Hydrants (Includes addendum C502a-95.)
C515 Standard for Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
C600 Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances
C605 Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings
C651 Standard for Disinfecting Water Mains
C900 Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In.

The following additional standards from ASTM International (ASTM) and National Science Foundation (NSF) are incorporated by reference in this specification.

NSF/ANSI 61	Drinking Water System Components Health Effects
ASTM D1248	Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
ASTM D1784	Standard Specification for Rigid Poly (Vinyl Chloride)(PVC) Compounds and Chlorinated Poly (Vinyl Chloride)(CPVC) Compounds
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM D3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ISO 8179-1	Ductile Iron Pipes – External Zinc Based Coating

Section 2 MATERIALS

W200.201 General

The Engineer and Engineer's authorized representatives shall have free access to the manufacturing or processing plants for the purpose of making appropriate inspections and tests. The Contractor shall furnish an affidavit from the manufacturer to the effect that all tests have been made and that the pipe, fittings, and specials conform to the Specifications.

All pipe, fittings, and specials shall be subject to further inspection and approval by the Engineer before being used in the work. At the request of the Engineer, the Contractor shall furnish without charge [for test purposes] up to 0.5% of the number of pipe in each size of pipe furnished to be used for test purposes. In no case shall less than one full length of pipe or one complete fitting of each size be furnished.

W200.202 Ductile Iron Pipe (D.I.P.)

Ductile Iron Pipe shall meet the requirements of ANSI A-21.51 (AWWA C151) for "Ductile Iron Pipe Centrifugally Cast in Metal Molds or Sand-Lined Molds, for water or Other Liquids." Ductile Iron pipe for water service shall be manufactured in the United States of America

Wall thickness for Ductile Iron Pipe shall be determined in accordance with the ANSI A-21.50 (AWWA C150) "Thickness Design of Ductile Iron Pipe." In no case shall pipe wall thickness be less than Class 52.

Pipe shall be furnished with a cement-mortar lining produced in accordance with ANSI A-21.4 (AWWA C104) "Cement Mortar Lining for Cast Iron Pipe and Ductile-Iron Pipe and Fittings for Water." The exterior of the pipe shall be coated with a layer of arc-sprayed zinc per ISO 8179-1. The mass of the zinc applied shall be 200g/m2 of pipe surface area. A finishing layer top coat shall be applied to the zinc. The mean dry film thickness of the finishing layer shall not be less than 3 mils with a local minimum not less than 2 mils. The coating system shall confirm in every respect to ISO 8179-1 "Ductile Iron Pipes – External Zinc-Based Coating – Part 1" Metallic Zinc with Finishing Layer. Second Edition 2004-06-01"

Pipe joints shall meet the requirements of ANSI A-21.11 (AWWA C111) for "Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings."

Pipe joints shall be push-on type unless otherwise specified.

Pipe shall be installed so as to provide electrical conductivity through the use of either a copper strip conductor across each joint or a conductive gasket equal to the American Fastite conductive gasket or approved equal.

Pipe shall be furnished in nominal laying lengths. Cut pipe will be accepted; however, the total length of cut pipe incorporated into the job shall not exceed 10% of the estimated length of ductile iron watermain pipe as shown on the proposal. The nominal laying length of cut pipe shall be within $\pm$ 1' of the nominal laying length of pipe otherwise furnished. Installation of used pipe will not be permitted unless authorized by the Engineer in writing.

Each length of pipe shall be marked with the weight, thickness, class designation, manufacturer's mark and year in which the pipe was cast.

W200.202 Polyvinyl Chloride (PVC) Pressure Pipe

Polyvinyl chloride (PVC) pressure pipe shall be manufactured with compounds conforming to ASTM D1784 and shall conform to the requirements of AWWA C900 for the size, grade, and pressure class indicated on the plans. PVC pipe shall not be manufactured more than two years prior to the delivery date

to the job site. PVC pipe shall have a minimum dimension ratio (DR) of 18, corresponding to a pressure class of 235 psi in accordance with AWWA C900.

PVC pipe shall be supplied with integral bell and spigot joints with elastomeric gaskets conforming to ASTM F477. Joints shall meet the requirements of ASTM D3139 for push-on joints.

All fittings used with PVC water main pipe shall be zinc coated ductile iron conforming to W200.204 Ductile iron fittings. Injection-molded PVC pressure fittings are prohibited for water main installation.

Each segment of PVC pipe shall be marked with the manufacturer's name or trademark, nominal size and pressure class, AWWA C900 designation, date and location of manufacture, and NSF-61 certification for potable water. Pipe shall be delivered in standard laying lengths (typically 20 feet) and handled per manufacturer recommendations to prevent damage.

The use of PVC material for water main pipe is limited to open trench installations, pipe diameters of 8-inches or less, bury depths less than nine (9) feet below finished grades, areas with maximum static system pressures of 70 psi or less, and installation locations that maintain a minimum separation of 10 feet from parallel sanitary and storm sewers. No PVC water main shall be installed in the urban core, including downtown and within the DMC Boundary.

A. Tracer Wire for Non-Conductive Pipe

Tracer wire for use with all thermoplastic pipe types shall be Underwriters Laboratories (UL) listed for use in direct burial applications, color coated blue. Wire insulation shall be High Molecular Weight Polyethylene (HMWPE) meeting ASTM D1248, with designation identified on the outside of the wire casing.

Tracer wire shall meet the following additional criteria for the construction method specified:

1. Open Trench - Tracer wire shall be direct burial #12 AWG Solid (0.0808" diameter), 21% conductivity copper-clad hard drawn high carbon steel extra high strength horizontal tracer wire, 450-pound average tensile break load. The conductor insulator shall consist of a high molecular weight, high density blue polyethylene jacket complying with ASTM-D-1248, 30-volt rating, with minimum 30 mil HDPE insulation thickness. Copperhead #12 High Strength (1030-HS), Copperhead #12 Superflex 1030-SF, or approved equal.
2. Pipe Bursting/Slip Lining and Directional Drilling/Boring - In addition to the tracer wire requirements above for open trench, tracer wire shall be 7 x 7 Stranded Copper Clad Steel, Extreme Strength with 4,700 lb. break load, with minimum 50 mil HDPE insulation thickness. Copperhead SoloShot Extreme Strength (PBX-50) or approved equal.

All mainline tracer wires must be interconnected at tees and crosses, joined using a single 3-way or 4-way lockable connector for tees and crosses, respectively. Lockable connectors shall be for direct bury application and shall be dielectric silicon filled to seal out moisture and corrosion. Non-locking friction fit, twist on or taped connectors are prohibited. Copperhead 3-way locking connector (LCS 1230), Brundy type KS15, DryConn 3-way Direct Bury Lug #3WB-01, or approved equal.

The tracer wire termination box for in-ground tracer wire termination shall be an H20 rated utility box, Bingham &Taylor P525 or approved equal. The box covers for in-ground tracer wire termination boxes shall be cast iron with the legend "WATER". Tracer wire termination boxes for hydrants shall be Copperhead T3 Test station T3-75-F, or approved equal. The mounting bracket shall be a 14 gauge, stainless steel properly affixed to the hydrant grade flange (affixing with tape or plastic ties shall not be acceptable).

B. Tracer Wire Grounding Rod

Magnesium grounding anode rod with a minimum of 20 feet of #12 red HDPE insulated copper clad steel wire connected to the Anode (minimum 1.5 lb.) specifically manufactured for this purpose and buried at the same elevation as the utility. Copperhead (ANO-12) or approved equal.

C. Pipe Bedding Material

Pipe bedding and granular encasement materials shall meet the requirements of MnDOT Specifications 3149.2 B, Granular Material, except that one hundred percent (100%) by weight shall pass the one-inch (1") sieve.

W200.203 Polyethylene Encasement

Polyethylene encasement material shall conform to the requirements of AWWA C105 for tube type installation. Polyethylene encasement shall be V-Bio, or infinity plastics eco-wrap, and consist of three layers of co-extruded linear low density polyethylene (LLDPE), fused into a single thickness of not less than 8-mils.

W200.204 Ductile Iron Fittings and Specials

Ductile iron fittings and specials shall be zinc coated of the single gasket push-on joint, the Mechanical Joint (M.J.), or ALPHA restrained joint (furnished by American Flow Control, SIP Industries, Tyler Union, or Star Pipe Products) type conforming to AWWA C153 and ANSI A-21.53 covering ductile iron compact fittings for 350 psi water pressure plus water hammer. The single gasket push-on joint and mechanical joint shall conform to ANSI A-21.11. Cement mortar lining will not be required unless otherwise stated in the Special Provisions. Bolts and nuts shall be Cor-Blue T-Bolts with matching nuts, Flourocarbon coated bolts/nuts, Fluorokote Fastener, or Xylan 1424 Series coated fasteners.

W200.205 Isolation Valves

Unless otherwise specified in the Plans or Special Provisions, isolation valves shall be resilient seated gate valve type, with non-rising stem, ductile iron body and fusion-bonded epoxy coating on interior and exterior surfaces.

Resilient seated gate valves shall have mechanical joint ends or single gasket joint type ends, or include ALPHA ends (furnished by American Flow Control), and be designed to operate under 250 pounds working pressure and shall conform to the requirements of AWWA C-515. Valves are to open counter-clockwise. Valves are to be furnished with stainless steel bonnet bolts and nuts and shall not have test plugs.

W200.206 Tapping Sleeves and Valves

The tapping valve shall meet the same requirements as the previously described resilient seated gate valves except the inlet flange shall meet ANSI B-16.1 for Cast Iron Pipe Flanges, Class 125. The tapping sleeve shall have mechanical joint ends and ANSI Class 125 flange complying with AWWA C500.

W200.206 PVC Service Saddles for PVC Water Main

Service saddles are required for all taps made on PVC Water main. The saddles shall be Smith-Blair 372 or approved equal. Service taps shall be made a minimum of three (3) feet apart as measured from the tap location. Saddles shall be a full faced gasket.

W200.207 Cutting in Sleeves

Cutting-in sleeves are not permitted. Only mechanical joint solid sleeves and mechanical joint by plain end dual purpose sleeves with retainer glands, ALPHA restraint couplings, or Hy-Max Grip Couplings shall be used for pipe cut-ins (one per cut-in). Stainless steel repair sleeves shall not be used for this application.

W200.208 Valve Boxes and Gate Valve Adaptor

Valve boxes shall be domestic screw type, have a minimum inside shaft diameter of 5 1/4 inches, and have a cap with the word "WATER" plainly marked on top. In all respects the valve box shall be equal to Tyler 6860 Series.

The valve box assembly shall be furnished in such lengths of sections needed to satisfactorily complete the installation to the desired height without field cutting either the center or top section of the box.

All valve boxes shall be installed on the valve with the use of a properly sized gate valve adaptor as manufactured by Adaptor Inc. or an approved equal. A gate valve adaptor shall be shall be 1/4" steel with a UV polyurethane protective coating and a 3/4" rubber gasket, with polycoated wire ties attached.

W200.209 Hydrants

All hydrants shall be designed to safely hold a working pressure of 250 lbs per square-inch, and not cause "water hammer" with extraordinary usage. Hydrants shall be of the Non-Jacket Type and shall further be of such design that if the hydrant is broken off, the valve will remain closed.

Hydrants shall be Waterous (Pacer WB-67-250) meeting the following specifications:

1. Ductile iron body;
2. All bronze drain;
3. 5-1/4 inch valve opening;
4. 6 inch mechanical joint connection, or ALPHA end furnished by American Flow Control;
5. Two twist-in mechanically attached 2-1/2 inch bronze National Standard Thread hose connections;
6. One twist-in mechanically attached 5 inch bronze Storz Pumper Nozzle fitted with hard anodized extruded 6061-T6 aluminum Storz quick-connect coupling and cap meeting requirements of NFPA 1963 (Chapter 4), latest revision, except cap design to preclude removal without wrench;
7. 1-1/2 inch National Standard operating nut (Pentagon), counter-clockwise turn to open;
8. Twist-in mechanically attached nozzles;
9. Traffic break-off, 24 inch minimum distance from ground to centerline of nozzle;
10. Minimum working pressure – 250 psi;
11. Hydrostatic test pressure – 500 psi;
12. Bronze seat ring insert;
13. International Orange Epoxy Coating, 6.0 mil minimum total coating dry film thickness;
14. Compliance with AWWA C502, latest revision.

Unless otherwise specifically directed by the Engineer, the hydrant assembly shall be furnished in the length needed to satisfactorily complete the installation to the desired height without the use of "Bonds" or "Offsets." In cases deemed necessary and authorized by the Engineer, "Hydrant Extensions" may be used. No additional compensation will be allowed for furnishing and installing such fittings.

W200.210 Materials for Restraining Joints

A. Tie Rods (use only for restrained joints connecting to existing watermain)

Tie rods and clamping devices used for rodding at fittings shall be of the required size and adequate strength to secure the installation from movement. The rod size and clamping arrangement shall be as indicated on the Plans or Detail Plates for Watermain Tie Rods and Clamping Devices.

Tie rods shall be galvanized, and other clamping devices shall be epoxy-coated.

All such materials shall be approved by the Engineer before being used in the work.

B. Retainer Glands (use for restrained mechanical joints)

Mechanical joint retainer glands shall be Mega lug Retainer Glands as manufactured by EBAA Iron, Inc. or approved equal.

C. Single Gasket Restrained Joints

Single gasket restrained joints shall be American Fastite type with Amarillo Fast-Grip gaskets, US Pipe Field Lok 350 high visibility gasket or approved high-visibility equal. Electrical conductivity is to be maintained across all single gasket pipe joints.

W200.210-PVC Mechanical Joint Restraints for PVC Pipe

Mechanical joint restraints shall be used to transition from the plastic pipe to the fittings. Series 2000PV mechanical restraints as manufactured by EBAA Iron, Inc., Series 4000 PVC Stargrip as manufactured by Star Pipe Products, or approved equal.

W200.211 Galvanic Magnesium Anodes

Anodes shall be cast or extruded on a full length galvanized-steel core, shall conform to ASTM B843, and shall be composed of the following:

- Manganese 0.50-1.3%
- Silicon 0.05 max
- Iron 0.03% max
- Nickel: 0.001 % max
- Copper 0.02% max
- Aluminum 0.001% max
- Others each 0.05% max
- Magnesium remainder

Anodes shall be prepackaged in a water permeable cloth or paper bag containing a low resistivity backfill material, consisting of 75% hydrated Gypsum, 20% bentonite and 5% sodium sulfate. A minimum of 20 feet of unspliced AWG No. 10 THHN copper wire with TW insulation shall be attached to the anode. Anode lead wires shall be black in color.

W200.212 Miscellaneous Materials

Any other miscellaneous material required in the work, but which is not specifically mentioned in these specifications, shall be new material, approved by the Engineer prior to its use.

Section 3 CONSTRUCTION REQUIREMENTS

W200.301 General

A. Designation of Authority

The City Engineer or authorized representative shall be the designated authority for all watermain construction and inspection, except Hydrostatic bacterial and conductivity testing will be accomplished with oversight from Rochester Public Utilities.

B. Handling Pipe and Accessories

Pipe, fittings, valves, hydrants, and other watermain accessories shall be loaded, transported, unloaded, stored, handled, and installed by methods and in a manner that will insure their final installation in a sound and undamaged condition conforming in all respects to specified requirements.

Under no circumstances shall the pipe, fittings, valves, or hydrants be dropped to the ground, onto or against hard or solid objects or materials, or otherwise subjected to possible damage from impact or shock. Such materials shall be loaded and unloaded by lifting with hoists or by skidding. Pipe handled on skidways shall not be skidded or rolled against other pipe.

In distributing pipeline material at the site of the work, each piece shall be unloaded opposite, or as close as possible to, the point of installation in order to avoid unnecessary rehandling.

C. Work Schedule and General Requirements

When street grading is also under contract on the project, the Watermain Contractor shall install the main immediately after the rough grading is completed. Upon completion of the underground work the Watermain Contractor shall restore the roadway to the same condition as it was prior to trenching.

If the Watermain Contractor chooses to make the installation prior to the rough street grading, they shall place not less than 4 feet of earth fill over the watermain.

All supplies, tools, and equipment necessary to the proper construction and satisfactory completion of the work in accordance with the Specifications are to be furnished by the Contractor. It is understood that the whole work under this contract is to be done at the Contractor's risk, and are to assume the responsibility and risk of all damages to the work, or to the property on the line of the work, which may be occasioned by floods, backwater, caving of the street, settling of the foundations of buildings, or from any cause whatsoever. The Contractor shall not dig up or occupy with materials any more of the street than is absolutely necessary for the prosecution of work, and in no case shall the operations extend beyond the limits of the right-of-way or easement lines. Special care shall be taken to cause a minimum of inconvenience to persons residing along the line of improvement. The Contractor shall protect all excavations by barricades, lights, and other warning devices. The Contractor shall also provide for the flow of all watercourses, sewers, gutters, and drains, and provide for the protection of other utilities, both public and private.

W200.302 Placing Watermain and Appurtenances

A. General

Installation of piping and appurtenances shall be in compliance with AWWA C600 for Ductile Iron Pipe, AWWA C605 for Polyvinyl Chloride (PVC) Pressure Pipe, and the project Plans, Specifications, and Special Provisions. Piping and appurtenances shall be laid to the required line and grades as outlined below, each section having a firm and uniform bearing throughout its entire length.

At the time of pipe placement, the bedding conditions shall be such as to provide uniform and continuous support for the pipe between bell holes. Bell holes shall be excavated as necessary to make the joint connections, but they shall be no larger than would be adequate to support the pipe throughout its length.

No pipe material shall be laid in water nor when the trench or bedding conditions are otherwise unsuitable or improper.

Contractor to center a full 20'stick of water main pipe on all crossings & structures where practical. If not practical, Contractor shall adjust water main pipe joints and fittings to be as far away from the crossings & structures as possible.

All crossings with water main are required to be 18" min. vertical separation and 12" min. vertical separation with water services (18" min preferred). If 12"-24" vertical separation between water main / Water services and storm sewer, Contractor to F&I 64 SF (8' X 8") 4" polystyrene insulation centered on the crossing point and between the pipes.

PVC water main shall be bedded with MnDOT 3149.2 B Granular Material from a point eight (8) inches below the bottom of the pipe to twelve (12) inches above and around the sides of the pipe being installed. Extreme care must be taken in the bedding and the backfilling. Compaction of this material shall be to 95 percent of maximum density (ASTM N698). Furnishing, installing and compaction of granular materials around pipe shall be considered incidental to the installation of the pipe with no additional compensation. The trench shall be excavated and prepared to allow placement of the bedding materials specified. The bevel on the spigot end of the PVC water main pipe shall be cut off prior to installation.

B. Grading and Aligning Pipe

The Contractor is solely responsible for the correct transfer of the primary line and grade from the Engineer's stakes to all working points, and for construction of the work to the prescribed lines and grades

C. Installation of Pipe, Fittings, and Polyethylene Encasement

1. Care in Handling

All pipe, fittings, and specials shall be carefully lowered into the trench piece by piece by means of a derrick, ropes, or other suitable means, in such a manner as to prevent damage to the watermain materials or to the coating thereon. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

Before lowering and while suspended, the pipe shall be inspected for defects, and any defective, damaged, or unsound pipe shall be rejected.

Dropping, jolting, striking, or other such methods of manipulating pipe to proper grade and alignment will not be permitted.

2. Direction of Laying

Unless otherwise directed, pipe shall be laid with bell ends facing in the direction of laying.

3. Cleaning, Swabbing, and Chlorine Treatment

All foreign matter or dirt shall be thoroughly removed from the inside of the pipe before it is lowered into its position in the trench, and it shall be kept clean by approved means during and after laying.

A mechanical joint or slip-on joint plug shall be inserted into the bell of the last pipe laid when work is suspended overnight and for seasonal suspension of work.

Immediately before each length of pipe and each fitting is installed on the new watermain, the outside of the spigot end of the pipe, the inside of the pipe barrel and bell, and the interior surfaces of the fittings shall be thoroughly swabbed with a calcium hypochlorite solution containing not less than 200 parts per million of chlorine. "H.T.H." or an equivalent bactericidal agent may be used for this solution.

In addition, the "Dry Calcium Hypochlorite Method" of disinfecting the watermain, as described in AWWA C651, shall be used. Dry calcium hypochlorite (containing at least 65% available chlorine) shall be placed in the pipe during placing operations.

4. Joining Single Gasket, Slip-on Pipe

Immediately prior to assembling the joint, the rubber gasket and all surfaces of the bell and spigot shall be cleaned of dirt, rust or other foreign material. If a copper jumper strip is being installed instead of a conductive gasket, line up the jumper strip. Before drawing the pipe together, the spigot end of the gasket shall be coated with a light film of approved lubricant. If a copper jumper strip is being installed instead of a conductive gasket, after drawing the pipe together, connect the copper jumper strip.

5. Joining Mechanical Joint Pipe

Immediately prior to assembling the mechanical joint, the rubber gasket and all surfaces of the bell, spigot, and gland which will come in contact with the gasket shall be thoroughly cleaned of any dirt, rust or other foreign material. If a copper jumper strip is being installed instead of a conductive (armor tipped) gasket, line up the jumper strip. Where necessary, the gasket may be coated with a light film of an approved lubricant to facilitate slipping over the spigot end and into the bell.

After the gland has come in contact with the gasket, the bolts shall be inserted, and the nuts shall be tightened with the fingers until snug. Tightening of bolts shall be done carefully and evenly, alternately tightening opposite bolts in order to maintain approximately the same distance between the gland and the pipe flange at all points around the circumference of the joint.

Final tightening of the bolts shall be done with a ratchet torque wrench unless otherwise permitted by the Engineer. Torque requirements shall be in accordance with the following table:

Size of Bolt	Torque Foot-Pounds	*Length of Wrench
5/8"	40 – 60	8"
¾"	60 – 90	10"
1"	70 – 100	12"
1 ¼"	90 – 120	14"

* (The wrench lengths stipulated in this column are required lengths of non-torque wrenches to be used in the event that their use is permitted by the Engineer.)

After tightening the bolts, connect the copper jumper strip.

6. Joining Alpha End

Contractors shall take note Alpha restraining hardware and gasket(s) is pre-installed at the manufacturer and shall take practical care when handling American Flow Control valves, hydrants and couplings with Alpha ends. The standard of care expected shall keep all debris, rust and foreign matter from entering the water way of the joint prior to and during installation.

Immediately prior to joining the Alpha end, remove any scale or debris that could interfere with gripper engagement of the pipe. Clean the pipe surfaces wherever the gaskets will come in contact with the pipe, and check to see that the pipe surface is smooth (no dents, projections, gouges, etc.) where the gaskets seal against the pipe. Where necessary, the gasket and pipe surface may be coated with a light film of an approved lubricant to facilitate joining the pipe.

Set the maximum desired pipe deflection angle (4 degrees max each end, 2 degrees max each end for Alpha XL).

Tighten each nut until the gasket contacts the pipe and the end is snugly held in place. The final Alpha restraint joint bolting shall be tightened according to manufacturer's torque requirements for the correct diameter size of pipe shown in the table below.

Alpha End Diameter	Torque Foot-Pounds
4"	20
6"	20
8"	45
10"	45
12"	45

7. Cutting Pipe

Cutting of pipe for closure pieces, for installation of valves, hydrants, and fittings, or for any other reason shall be done in a neat and workmanlike manner without damage to the pipe or cement lining therein and so to leave a smooth cut end at right angles to the axis of the pipe. Unless otherwise approved by the Engineer, all cutting of pipe shall be done by means of mechanical pipe cutters of an approved type, except that the cutting of pipe already in place where the use of mechanical cutters would be difficult or impracticable, may be done with diamond point chisels or other hand tools which will cut the pipe without damaging impact or shock.

8. Polyethylene Encasement

All ductile iron watermain systems within RPU jurisdiction shall be fully encased in polyethylene film meeting the requirements of these Specifications and City Standard Detail Plate. The film shall be furnished in tube form for installation on pipe and all pipe-shaped appurtenances such as bends, reducers, offsets, etc. Sheet film shall be provided and used for encasing all odd-shaped appurtenances such as valves, tees, crosses, etc. PVC pipe is not required to be poly encased but DIP fittings are required to be poly encased.

The polyethylene tubing shall be installed on the pipe prior to being lowered into the trench. Tubing length shall be sufficient to provide a minimum overlap at all joints of one foot or more. Overlap may be accomplished with a separate sleeve tube placed over one end of the pipe prior to connecting another section of pipe, or by bunching extra overlap material at the pipe ends in accordion fashion. After completing the pipe jointing and positioning the overlap material, the overlap shall be secured in place with plastic adhesive tape wrapped circumferentially around the pipe not less than three turns.

After encasement, the circumferential slack in the tubing film shall be folded over at the top of the pipe to provide a snug fit along the barrel of the pipe. The fold shall be held in place with plastic adhesive tape applied at intervals of approximately three feet along the pipe length. Also, any rips, punctures, or other damage to the tubing shall be repaired as they are detected. These repairs shall be made with adhesive tape and overlapping patches cut from sheet or tubing material.

At odd-shaped appurtenances such as gate valves, the tubing shall overlap the joint and be secured with tape, after which the appurtenant piece shall be wrapped with a flat film sheet or split length of tubing by passing the sheet under the appurtenance and bringing it up around the body. Seams shall be made by bringing the edges together, folding over twice, and taping down. Wherever encasement is terminated, it shall extend for at least two feet beyond the joint area.

Openings in the tubing for branches, service taps, air valves and similar appurtenances shall be made by cutting an X-shaped slit and temporarily folding back the film. After installing the appurtenance, the cut tabs shall be secured with tape and the encasement shall be completed as necessary for an odd-shaped appurtenance.

Unless otherwise specified in the Plans, Specifications, and Special Provisions, hydrants encased in polyethylene tubing shall have tape applied circumferentially above and below the drainage holes in the hydrant riser and the film removed to allow the hydrant barrel to drain.

9. Setting Valves, Fittings and Valve Boxes

Gate valves and pipe fittings shall be set and jointed to the pipe in the manner heretofore specified for cleaning, laying and jointing pipe. Valve boxes shall be firmly supported and maintained, centered, and plumbed over the wrench nut of the gate valve, with the box cover at such elevation as directed by the Engineer.

All valves and fittings shall be installed with restrained joints conforming to the requirements of W200.210.

10. Setting Hydrants

Hydrants shall be placed as shown on the Plans or as directed by the Engineer. Each hydrant shall be connected to the main with a 6 inch ductile iron branch controlled by an independent 6 inch gate valve. Hydrants shall be installed on concrete support blocks as shown on the Standard Detail Plates, and shall be braced so as to remain plumb during backfill operations. Hydrants shall be thoroughly cleaned of dirt or foreign matter before setting. At locations where hydrant drains will be below the normal water table, the drain openings are to be permanently plugged.

The Contractor shall furnish and install the required number of hydrant protective posts at such special hydrant locations as may be designated by the Engineer. See City Standard Detail Plate for hydrant installation. Protective posts shall be placed as an incidental expense.

Hydrants shall be installed with restrained joints conforming to the requirements of W200.210.

11. Hydrant Drainage Pits

A drainage pit 2 feet in diameter and 18 inches deep shall be excavated below each hydrant and filled and compacted with coarsely graded gravel or crushed rock under and around the bowl of the hydrant and to a level 6 inches above the hydrant drainage opening. The stone fill shall be completely covered with an impermeable barrier to prevent backfill from filtering into the drainage pit.

The gravel or crushed rock used for this purpose shall conform to the requirements of City Standard T100.206 "Aggregate for Hydrant Drainage Pit".

12. Plugs

Mechanical joint or slip-on joint plugs shall be inserted into the bells of all dead ends of pipe, tees, and crosses. In all cases, and regardless of the type of plug used or specified, a 3/4 inch corporation stop shall be tapped into the plug. This Corporation Stop that complies with service standard specs shall serve to release any accumulated pressure prior to the future removal of the plug.

13. Blocking and Anchoring

Watermain, valves, fittings, plugs and hydrants shall be restrained as shown on the City Standard Detail Plates or as stated in the Special Provisions. As noted in Plate 6-05 (Restrained Joint Detail) tie-rods are only to be used for connections to existing watermains. Joint restraints for new watermains are to be provided by retainer glands, American Fast-Grip or US Pipe Tyton Field Lok gaskets (or approved equal restraining gaskets), or the restrained joint type specifically stated in the Special Provisions. Electrical conductivity is to be maintained across restrained pipe joints.

14. Watermain Within Steel Casings

Watermain installed within a steel casing shall be single gasket, restrained joint type **(DIP) or fused HDPE conforming to ASTM 3035 and AWWA C906, Polyethylene (PE) Pressure Pipe and Fittings, 4" through 63", for Water Distribution. Pipe furnished shall be approved for potable water and marked to indicate so with a continuous blue stripe. Pipe shall be PE4710 compound for potable water transmission, pressure class 200, SDR 11, and shall conform to ductile iron pipe equivalent outside diameters. The method of joining material shall be the Thermal Butt-Fusion Method in accordance with ASTM 3261,** Electrical conductivity is to be maintained across restrained pipe joints. The watermain shall be mounted on pressure treated wood blocks or plastic skids, two per length of pipe secured in place to support the pipe along the barrel rather than at the joints. The space between the pipe and casing shall be filled with dried sand blown or cellular grout injected into the space and the ends of the casing shall be sealed with concrete bulkheads at least one foot thick. A 2 inch PVC or copper drain shall extend through the bulkhead at the lower end of the casing.

D. Tracer Wire Installation, Grounding, and Terminations

1. Tracer Wire Installation

Installation of PVC water mains shall include placement of tracer wire firmly attached to the bottom half of the pipe and secured (taped/tied) at 5' intervals. Tracer wire installation shall be performed in such a manner that allows proper access for connection of line tracing equipment, proper locating of wire without loss or deterioration of low frequency (512Hz) signal for distances in excess of 1,000 linear feet, and without distortion of signal caused by multiple wires being installed in close proximity to one another.

Tracer wire systems must be installed as a single continuous wire, except where using approved connectors. No looping or coiling of wire is allowed. Any damage occurring during installation of the tracer wire must be immediately repaired by removing the damaged wire and installing a new section of wire with approved connectors. Taping and/or spray coating shall not be allowed.

Lay mainline tracer wire continuously, bypassing around the outside of valves and fittings on the North or East side.

All service lateral tracer wires shall be a single wire, connected to the mainline tracer wire using a mainline to lateral lug connector, installed without cutting/splicing the mainline tracer wire. In

occurrences where an existing tracer wire is encountered on an existing utility that is being extended or tied into, the new tracer wire and existing tracer wire shall be connected using approved splice connectors and shall be properly grounded at the splice location as specified. Mainline tracer wire for new PVC water main being connected to existing ductile iron pipe (DIP) watermain shall be connected to the existing DIP via exothermic welding.

2. Tracer Wire Grounding

The grounding of tracer wire shall be achieved by use of a drive-in magnesium grounding anode rod. When grounding the tracer wire at dead ends/stubs, the grounding anode shall be installed in a direction 180 degrees opposite of the tracer wire. When grounding the tracer wire in areas where the tracer wire is continuous and neither the mainline tracer wire or the grounding anode wire will be terminated at/above grade, install grounding anode directly beneath and in-line with the tracer wire. Do not coil excess wire from grounding anode. In this installation method, the grounding anode wire shall be trimmed to an appropriate length before connecting to tracer wire with a mainline to lateral lug connector.

Install grounding anodes and access boxes at each hydrant. Where the anode wire will be connected to a tracer wire access box, a minimum of 2 ft. of excess/slack wire is required after meeting final elevation.

3. Tracer Wire Terminations

All tracer wire termination points must utilize an approved tracer wire access box (above ground access box or grade level/in-ground access box as applicable), specifically manufactured for this purpose. All grade level/in-ground access boxes shall be appropriately identified with "water" cast into the cap and be color coded. A minimum of 2 ft. of excess/slack wire is required in all tracer wire access boxes after meeting final elevation.

All tracer wire access boxes must include a manually interruptible conductive/connective link between the terminal(s) for the tracer wire connection and the terminal for the grounding anode wire connection. Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes.

Termination at hydrants - Above-ground tracer wire access boxes shall be installed on all fire hydrants at an approved above-ground tracer wire access box, properly affixed to the hydrant grade flange. (affixing with tape or plastic ties shall not be acceptable)

Long-runs, in excess of 500 linear feet without hydrants - Tracer wire access must be provided utilizing an approved grade level/in-ground tracer wire access box, located at the edge of the road right-of-way, and out of the roadway. The grade level/inground tracer wire access box shall be delineated using a minimum 48" polyethylene marker post, color coded per APWA standard for the specific utility being marked.

E. Anode Installation

Galvanic magnesium anodes shall be installed along the lay length of new ductile iron pipe at maximum intervals of 800 feet and at termination ends of water main installation. Anodes shall also be installed at connection points between ductile/cast iron and PVC water main. When installing anodes, excavate a hole to a minimum of 3 inches larger than the anode diameter, and to a depth of one foot below the pipe or fittings to be protected prior to placement. Do not lift or support anode by the lead wire. Anodes shall be activated by applying a minimum of 2 gallons of water over the backfill material upon installation and prior to backfilling. Plastic packaging shall be removed from the anode prior to installation.

Anode connection to pipe shall be made with exothermic weld kit specifically designed by the manufacturer for welding the type of materials. Weld metal shall be type XF manufactured by Thermoweld or approved

equal. All welds shall be made with copper wire sleeves. All exposed wires and welds shall be protected with an adhesive rubber Thermite Weld Cap or approved equal.

W200.303 Loading and Disinfection of Watermain

Watermain disinfection shall be done in accordance with AWWA C651. The "Dry Calcium Hypochlorite" method shall be used.

Watermain loading, flushing and bacterial sampling/testing will be done by Rochester Public Utilities personnel. After the final flushing, the water shall be tested for bacteriological quality and found to meet the standards prescribed by the Minnesota Department of Health.

All “dead-end” watermains over 20 feet long must be flushed and tested.

The Contractor is not to operate water distribution system valves or hydrants.

W200.304 Pressure, Leakage and Electrical Conductivity Testing

A. Testing Equipment and Facilities

The Contractor shall provide, at its own expense, all necessary piping and piping connections between the pipe line to be tested, at the point of test thereof, and the nearest available source of supply of acceptable water, together with test pumping equipment, water loss measuring container, pressure gauge, and other equipment, materials and facilities required for and in connection with the specified tests.

Test pressures shall be applied by means of a pump of such design and capacity that the required pressure can be applied and maintained without interruption for the duration of each test. The pressure gauge used shall be tested, accurately calibrated, and approved by Rochester Public Utilities. The container used to measure the volume of water replaced in the water main during the leakage test shall be sized to permit accurate measurement of the pumped replacement water volume (typically less than five gallons).

Rochester Public Utilities will provide the necessary supervision, and the Contractor shall conduct the test at its own expense.

B. Hydrostatic Pressure Test

All pipelines constructed hereunder shall be tested for defective materials and workmanship by being subjected to a hydrostatic test pressure of 150 pounds per square-inch gauge (psig.). Such test pressure shall be assumed to be applied at the lowest point in the line of pipe being tested and the pressure applied at the point of gauge attachment shall be the specified test pressure corrected as necessary to compensate for any difference in elevation of the gauge above such lowest point in the said line of pipe.

The test pressure shall be applied to watermains only. In the event that any service lines are connected to any watermain that is to be subjected to the test pressure, the curb stop or other shut-off valves in all such services shall be closed in order that no plumbing be subjected to the specified test pressure. In each case where water service is interrupted for the duration of the hydrostatic tests, the water customer affected thereby shall be notified of the proposed interruption at least one hour before shutting off the water supply.

After the section of the line to be tested has been filled with water, the specified or otherwise authorized test pressure shall be applied and maintained for a period of not less than two hours and as long as necessary for Rochester Public Utilities to complete the inspection of the line under test and for the Contractor to locate any and all defective joints and pipe line materials.

The hydrostatic test, pressure requirement for an acceptable test shall be a maximum pressure drop of 2 psi during the last hour of the two hour pressure test. If this test requirement cannot be met, the Contractor shall investigate the cause, make corrections, and retest until the pressure drop requirement can be met.

In special situations, Rochester Public Utilities may approve modifying the hydrostatic test pressure to match the pressure in existing adjacent City watermains, but in all other respects the test shall be carried out as specified above.

C. Leakage Test

At the discretion and option of Rochester Public Utilities, the leakage test will be taken in cases where deemed necessary or advisable, or it may be waived where the prior observations and testing so indicate. When the leakage test is taken, it shall be conducted in the following manner:

After the specified pressure test has been completed and any and all pipeline repairs have been made and tested to the satisfaction of Rochester Public Utilities, the line or lines being tested shall be subjected to a leakage test under a hydrostatic pressure of 150 pounds per square-inch gauge (psig) as defined in paragraph B above. The pressure shall be maintained constant (within a 5% maximum variation, plus or minus) during the entire time that line leakage measurements are being made, in order that the allowable leakage rate may be determined accurately from the leakage rate formula hereinafter specified (or the included allowable leakage table).

Leakage measurements shall not be started until a constant test pressure has been established. Compression of air trapped in unvented pipes or fittings will give false leakage readings under changing
Pressure conditions. After the test pressure has been established and stabilized, the line leakage shall be determined by measuring the volume of water pumped from the measuring container to replace the volume of water leaked from the line being tested.

No pipeline, or tested section thereof, will be accepted unless it has a leakage rate less than or equal to the rate determined by the following formula:

$$L = (S \times D \times P^{1/2}) / 133{,}200$$

In which,
L = Maximum permissible leakage rate, in gallons per hour.
S = Length of pipe tested, in feet
D = Nominal diameter of the pipe, in inches
P = Average pressure (in psig) during the leakage test (not necessarily the test pressure). This pressure shall be determined by subtracting the average elevation of all tested pipe joints from the elevation of the pressure plane represented by the specified or authorized leakage test pressure, and then converting this difference, in feet or head, to pounds per square-inch hydrostatic pressure. The average pressure may be assumed to be equal to the test pressure where the maximum difference in elevations of the pipe joints being tested does not exceed 20 feet.

In the event that the line or section being tested contains pipe of more than one size, the allowable leakage from all joints of each size shall be calculated separately and then added to obtain the total allowable leakage from the entire line or lines.

The table below summarizes the maximum allowable main leakage (taken from Table 6A, AWWA C600):

Allowable Leakage per 1000 ft of Pipeline, gal/hr*							
Avg Test	**Nominal Pipe Diameter, In.**						
Pressure, (psi)	4	6	8	12	16	20	24
100	0.30	0.45	0.60	0.90	1.20	1.50	1.80
125	0.34	0.5	0.67	1.01	1.34	1.68	2.01
150	0.37	0.55	0.74	1.10	1.47	1.84	2.21
175	0.40	0.59	0.80	1.19	1.59	1.98	2.38
200	0.43	0.64	0.85	1.28	1.70	2.12	2.55
Normal test pressure is 150 psi.	*Allowable leakage for typical watermain installation.						

Based on 11.65 gpd/mi/in. nominal diameter at a pressure of 150 psi. (AWWA C600)

Where a second pressure test is made following line repairs, the leakage during such test may be measured as a part of the leakage test, provided that where the remainder of the leakage test is made at a reduced pressure as provided herein, the leakage during the application of each of the two pressures shall be measured separately.

It is the intent of this Specification and the Contract based thereon that (a) all joints in piping shall be watertight and free from visible leaks during the prescribed leakage test, and (b) each and every leak that is discovered at any time prior to the expiration of two (2) years from and after the date of final acceptance of the work by the City shall be located and repaired by and at the expense of the Contractor, regardless of any amount that the total line leakage rate during the specified leakage test may be below the specified maximum rate.

If the specified leakage test is made after the pipe line has been backfilled and the joints covered, and such test shows a leakage rate in excess of the permissible maximum, the Contractor shall make all necessary surveys in connection with the location and repair of leaking joints to the extent required to reduce the total leakage to an acceptable amount. Where evidence of leaking joints does not appear on the ground surface above or near the leaks, the Contractor shall prospect the line by sinking a hole, with an auger or otherwise, at the location of each joint and determine any undue saturation of the soil that would indicate a leak at such joint. This prospecting shall be done after pressure has been maintained in the line for a sufficient time to provide adequate soil saturation for locating leaks by this method.

Leaks in mechanical joints shall be repaired by dismantling, cleaning, realigning gland and gasket and rebolting. Under no circumstances shall gland bolts be tightened beyond the specified and allowable torque limits in an attempt to reduce or stop leakage from a defective joint or for any other purpose.

D. Electrical Conductivity Testing

The Contractor shall perform conductivity testing on newly installed watermain in the presence of Rochester Public Utilities personnel within one week after completion of pressure and leakage testing to document electrical conductivity of the watermain.

All watermain, valves, fittings, and hydrants shall be tested for electrical conductivity and current capacity. The test shall be conducted while the watermain is at normal operating pressure. Backfilling shall have been completed. The watermain may be tested in sections of convenient length as approved by Rochester Public Utilities.

Direct Current (315 – 385 amps) shall be passed through ductile iron watermain for five minutes. Current flow through the watermain will be measured continuously on a suitable ammeter and shall remain steady without interruption or excessive fluctuation throughout the 5-minute test period.

Tracer wire testing shall be conducted by Rochester Public Utilities personnel for PVC watermain to verify proper conductivity and traceability for both dual strands along all segments of watermain installed.

Insufficient current or intermittent current or arcing, indicated by large fluctuations of the ammeter needle, will be evidence of defective conductivity in the watermain. The cause shall be isolated and corrected. Thereafter, the section in which the defective test occurred shall be retested.

Direct current arc welders will typically be the source of direct current for this testing. Conductivity testing equipment shall be furnished by the Contractor, subject to the approval of Rochester Public Utilities.

Cables from the current source to the section of watermain under test shall be of sufficient size to carry the test current without overheating or excessive voltage drop.

Conductivity testing connections for the test shall be made at fire hydrants. Hydrants used for a test shall be in the open position with the caps on during the test. The cable shall be clamped to the hydrant standpipe and flange bolt. The hydrant-operating nut shall not be used as a terminal during the test.

When conducting a conductivity test, the current control should be set to a minimum before starting. After starting the test, gradually increase the current until the current indicated on the ammeter is at the desired test value. Caution: the voltage drop across a defective watermain joint may be in the order of 50-100 volts.

Conductivity testing shall not be performed on non-metallic water main. Upon completion of rough grading and prior to final acceptance, all new tracer wire installations shall be located by Contractor using typical low frequency (512 Hz) line tracing equipment, witnessed by the Engineer and/or Rochester Public Utilities personnel. Contractor shall find and repair any broken tracer wires prior to acceptance.

W200.305 Placing Watermain In-Service or Suspension of Service

All water system valve operations are to be done by Rochester Public Utilities personnel.

When it becomes necessary to close off any section of watermain in place or in service for the purpose of making connections to the section in place or for any other purpose, the Contractor shall notify all consumers connected to, and receiving water service from that section of watermain at least one hour in advance of the shutting off of service. Contractor's work, during the suspension of service, shall be arranged and conducted so as to reduce to a minimum the time necessary for any suspension of existing service. In no case shall existing water service be suspended overnight.

Section 4 METHOD OF MEASUREMENT

W200.401 Watermain

A. General

All items will be measured separately according to design designation as indicated in the pay item name and as may be detailed and defined in the Plans or Special Provisions. Linear measurements of piping will include the running length of any special fittings (tees, wyes, bends, gates, etc.) installed within the line of measure between specified terminal points.

B. Water Pipe

Mainline pipe of each kind and size will be measured separately to the nearest foot, by the overall length along the axis of the pipeline, from beginning to end of each installation and without regard to intervening valves or specials. Terminal points of measure will be the spigot or cut end, base of hub or bell end, center of valves or hydrants, intersecting centers of tee or wye branch service connections, and center of corporation stop or curb stop couplings.

W200.402 Special Structures and Appurtenances

Measurement of special structures and appurtenances, specialty construction items such as insulating concrete, sleeves, etc., and certain removal items shall be as stated in the Special Provisions.

W200.403 Valves, Hydrants and Fittings

A. Valves

Valves of each size and type will be measured separately as complete units, including the valve box.

B. Hydrants

Hydrants will be measured by the number of complete units installed.

C. Ductile Iron Fittings

Tees, crosses, plugs, reducers, bends, or other fittings will be measured by the weight of ductile iron fittings. The weight of each fitting will be those listed in AWWA Standard Specification C153, 3 inch through 24 inch and 54 inch through 64 inch for water service, and all MJ ends, regardless of the actual weight of fittings installed in the work. Joint materials (glands, gaskets, bolts, nuts, washers, ties rods and other jointing materials) will not be included in fitting weights.

DUCTILE IRON COMPACT MECHANICAL JOINT FITTING TOTAL & OVERSIZE REIMBURSEMENT WEIGHTS (IN POUNDS)

SIZE	ITEM											
	11 1/4 BEND		22 1/2 BEND		45 BEND		90 BEND		SLEEVE (LONG)		PLUG	
	TL	OS	TL	OS	TL	OS	TL	OS	TL	OS	TL	OS
4"	16		18		22		25		20		10	
6"	30		31		32		39		29		16	
8"	38		42		46		57		45		26	
10"	58	20	64	22	70	24	83	26	61	16	36	10
12"	72	34	80	38	98	52	115	58	76	31	46	20
14"	121	83	136	94	146	100	195	138	128	83	75	49
16"	148	110	172	130	188	142	252	195	159	114	95	69
20"	245	207	266	224	309	263	411	354	236	191	135	109
24"	315	277	353	311	419	373	555	498	306	261	175	149

SIZE	ITEM					
	TEE		REDUCER		CROSS	
	TL	OS	TL	OS	TL	OS
4" X 4"	32				40	
6" X 4"	46		24		52	
6" X 6"	56				68	
8" X 4"	60		32		68	
8" X 6"	72		36		84	
8" X 8"	86				105	
10" X 4"	78	18	46	14	84	16
10" X 6"	90	18	47	11	100	16
10" X 8"	105	19	50	50	119	14
10" X 10"	114	28			133	28
12" X 4"	94	34	58	26	103	35
12" X 6"	110	38	58	22	121	37
12" X 8"	125	39	57	57	139	34
12" X 10"	140	54	61	61	161	56
12" X 12"	160	74			182	77
14" X 4"	152	92	N/A	N/A	N/A	N/A
14" X 6"	178	106	93	57	190	106
14" X 8"	193	107	92	92	209	104
14" X 10"	211	125	92	92	N/A	
14" X 12"	228	142	94	94	N/A	
14" X 14"	262	176			313	208
16" X 6"	228	156	120	84	229	145
16" X 8"	233	147	118	118	249	144
16" X 10"	253	148	118	118	275	170
16" X 12"	272	186	112	112	299	194
16" X 14"	307	221	131	131	N/A	
16" X 16"	335	249			399	294

SIZE	ITEM			
	TEE		REDUCER	
	TL	OS	TL	OS
20" x 6"	315	243	N/A	N/A
20" x 8"	349	263	N/A	N/A
20" x 10"	374	288	206	206
20" x 12"	395	309	205	205
20" x 14"	440	354	216	216
20" x 16"	469	383	209	209
20" x 20"	543	457		
24" x 6"	423	351	N/A	N/A
24" x 8"	450	364	N/A	N/A
24" x 10"	480	394	N/A	N/A
24" x 12"	508	422	285	285
24" x 14"	550	464	298	298
24" x 16"	588	502	299	299
24" x 20"	670	584	291	291
24" x 24"	752	666		

REFERENCES: AWWA C153/A421.53-19

Section 5 BASIS OF PAYMENT

W200.501 Description

Payment for furnishing and installing watermain and appurtenances of each kind and size at the unit price bid shall be compensation in full for all labor, service, and other materials such as rubber ring gaskets, polyethylene encasement, materials for providing electrical conductivity, joint restraint materials, gasket lubricant, glands, bolts and nuts necessary for the satisfactory installation in accordance with the requirements specified and reasonably implied by the Contract, Plans and Specifications.

In the absence of special payment provisions:

1. All costs of furnishing, placing and removing sheeting, shoring, and bracing materials, including the value of materials left in place as required by the Contract, shall be included in the prices bid for pipe installation and will not be compensated for separately.

2. All costs of restoring surface improvements as required, disposal of surplus or waste materials, maintenance and repair of completed work, and final cleanup operations shall be incidental to the Contract Items under which the costs are incurred.

W200.502 Valves, Hydrants and Fittings

Payment for furnishing and installing valves and hydrants at the appropriate contract unit price per unit and fittings at the contract unit price per pound, shall be compensation in full for all costs of the work except those costs for which the proposal contains specific items, subject to the following additional provisions:

1. The cost of furnishing and installing rubber ring gasket, gasket lubricant, glands, bolts and nuts, etc. will be considered as incidental expense with no additional compensation therefore.

2. In the case of valves, the unit price bid shall include furnishing and installing of the valve, the box, and a valve extension stem as required

3. The unit price bid for furnishing and installing tapping sleeve and valve shall be compensation in full for all material, equipment, and services necessary for the satisfactory installation of the sleeve, valve, box, and a valve extension stem as required.

4. The unit price bid for furnishing and installing hydrants shall include the hydrants, hydrant extensions and hydrant protective posts, excavation, backfilling and drainage pit construction.

5. Furnishing and installing 3/4 inch corporation stops in conjunction with the installation or removal of plugs will be considered incidental expense with no additional compensation therefore.

6. Furnishing and installing of restrained joints (tie rods, retainer glands and single gasket type) will be considered as incidental expense with no additional compensation therefore.

W200.503 Special Structures and Appurtenances

Payment for special structures and appurtenances, specialty construction items such as insulating concrete, sleeves, etc. and certain removal items shall be made as stated in the Special Provisions.

W200.504 Items List

Payment for watermain construction will be made on the basis of the following schedule:

ITEM NO	ITEM	UNIT
W200.511	AGGREGATE FOR PIPE FOUNDATION GRADATION __ (__)	CU YD
W200.514	FURNISH & INSTALL __IN POLYSTYRENE INSULATION	SQ FT
W200.528	FURNISH & INSTALL __IN DUCTILE IRON PIPE CLASS 52	LIN FT
W200.529	FURNISH & INSTALL __IN POLYVINYL CHLORIDE PRESSURE PIPE C900	LIN FT
W200.530	FURNISH & INSTALL __IN TYPE K COPPER WATER PIPE	LIN FT
W200.535	FURNISH & INSTALL __IN CASING	LIN FT
W200.538	JACK & AUGER __IN CASING	LIN FT
W200.545	CONSTRUCT STRUCTURE TYPE 4 (PRV) __FT TO __FT DEEP (___IN)	STRUCTURE
W200.548	FURNISH & INSTALL CASTING ASSEMBLY	EACH
W200.550	FURNISH & INSTALL __IN GATE VALVE AND BOX	EACH
W200.552	FURNISH & INSTALL __IN CURB STOP AND BOX	EACH
W200.554	FURNISH & INSTALL __IN CORPORATION STOP	EACH
W200.556	FURNISH & INSTALL __IN X __IN TAPPING SLEEVE AND VALVE	EACH
W200.558	FURNISH & INSTALL __IN PLUG	EACH
W200.560	FURNISH & INSTALL HYDRANT	EACH
W200.562	FURNISH & INSTALL WATER MAIN FITTINGS	POUND
W200.564	REMOVE _____	EACH
W200.567	INSTALL _____	EACH
W200.570	RECONSTRUCT _____	EACH
W200.572	CONNECT TO EXISTING _____	EACH
W200.574	ADJUST _____	EACH
W200.574	HYDRANT EXTENSION	LIN FT
W200.576	TURN OFF EXISTING CORPORATION STOP	EACH
W200.578	LOWER WATERMAIN	LIN FT
W200.580	_,___,___ GAL. ELEVATED TANK	LUMP SUM
W200.582	EXISTING ELEVATED TANK - DEMOLITION	LUMP SUM
W200.585	RESTORATION	SQ YD