

INDEX

<b>Sec. No.</b>	<b>Items</b>	<b>Page Nos.</b>
1.	Ductile Iron Pipe .....	DWM-2 thru DWM-5
2.	Reinforced Concrete Water Main .....	DWM-5 thru DWM-6
3.	Hydrants .....	DWM-7
4.	Gate Valves and Wells .....	DWM-8

**1. DUCTILE IRON PIPE**

**a. Pipe**

The ductile iron pipe to be furnished, delivered and installed under this specification shall conform in all respects with the requirements of the current American National Standards Institute for "Ductile-Iron-Pipe, centrifugally cast in Metal or Sand-Lined Molds for Water or Other Liquids", (ANSI A21.51), or American Water Works Association (AWWA C-151) except as may otherwise be specified herein.

All sizes of pipe shall conform to the dimensions shown in the following table.

<b>Size Nominal Inside Diameter Inches</b>	<b>Outside Diameter Inches</b>	<b>Pipe Barrel Thickness Inches</b>	<b>Thickness Class</b>
6"	6.90	0.37	54
8"	9.05	0.39	54
10"	11.10	0.41	54
12"	13.20	0.43	54
16"	17.40	0.46	54
18"	19.50	0.47	54
20"	21.60	0.51	55
24"	25.80	0.56	56
30"	32.00	0.63	56

The manufacturer shall furnish a sworn statement as described in ANSI/AWWA A21.52/C-151.

**b. Lining**

The pipe shall be lined with a cement mortar lining in accordance with the requirements of the current standard for "Cement Mortar Lining for Cast Iron Pipe and Fittings for Water" (ANSI/AWWA A21.4/C-104). The lining shall be double thickness.

**c. Joints**

The pipe shall have push on type joints, unless otherwise noted on the plans. The joints shall be "Super Bell Tite" or "Tyton" or approved equal.

Fittings, valves and appurtenances may have push-on, or mechanical joint joints. Joints other than of the push-on type may only be used upon the express approval of the Engineer.

Push-on and mechanical type joints shall be in accordance with the current standard for "Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings" (ANSI/AWWA A21.11/C-111). Bolts and nuts for Mechanical Joints shall be of high strength low alloy steel conforming to the characteristics listed in this standard. All bolts in contact with soil shall be Cor-Ten t-bolts or equal.

**1. DUCTILE IRON PIPE (continued)**

Flanged joints, when and where approved, shall be in conformity with the requirements of the current standard for "Ductile Iron Flanges and Flanged Fittings", Class 125, (ANSI/AWWA A21.15/C-115). Flanged faces shall be coated with a rust inhibitor immediately after drilling. Flanged joints shall be made with single piece full-face rubber gaskets 1/8 inch thick or as approved by the engineer.

Flanges shall be firmly bolted with machine, stud or tap bolts of the proper size and number meeting the requirements of ASTM A-307 Grade B. Joints made with bolts or bolt studs shall have a nut on each side. Bolt projection through nuts shall be equal, and where studs are used, bolt projection on each side of the flange shall be equal.

All nuts and bolts shall be Cor-Ten steel or equal. All bolts shall be coated with anti-seize compound prior to assembly.

**d. Fittings**

Gray Iron Full Body Fittings - 2" through 36" Fittings shall be gray or ductile iron clay 250 minimum and in conformity with the requirements of the ANSI/AWWA A21.10/C-110 and ANSI/AWWA A21.11/C-111.

Ductile Iron Short Body Fittings - 3" through 24" Ductile Iron Fittings shall be Class 350 minimum and in conformity with the requirements of the ANSI/AWWA C153/A21.53-94 and ANSI/AWWA C111/A21.11. The working pressure rating shall be 350 p.s.i.

Coatings - Interior and exterior coatings shall conform to AWWA C-110. Fittings shall have double thickness cement lining.

Markings - The manufacturer's mark, nominal diameter of openings and the number of degrees in fractions of a circle on all bends, shall be distinctly cast on the fittings. The pressure rating shall be distinctly marked on the fitting.

**e. Laying Pipe**

**(1) General**

Pipe shall be installed in accordance with the current AWWA Standard for installation of Ductile Iron Water Mains (C-600).

Before lowering into the trench, and while suspended, each pipe and fitting shall be inspected for defects. Defective, damaged or unsound pipe shall immediately be removed from the construction site. The interior of each pipe shall be inspected for cleanness and cleared of all dirt and foreign matter before being lowered into the trench.

Unless otherwise directed, pipe shall be laid with bell ends facing in the direction of laying. After a length of pipe is placed in the trench, the spigot shall be centered in the bell of the adjacent pipe, the pipe shoved into position and brought to true alignment and there secured with sand tamped under and on each side of the pipe, excepting at bell holes. No earth or other foreign matter shall be allowed to enter the joint space.

**1. DUCTILE IRON PIPE (continued)**

When the temperature is above 60° F, the spigot of each pipe laid shall be brought tightly home in the bell of the preceding pipe. When the temperature is below 60°F, the pipe shall be laid with the spigot end approximately 1/16" from the face of the bell to allow for expansion.

Whenever deflections at joints are required by changes in grade or alignment, or to plumb valve stems, the deflection at any bell and spigot joint shall not exceed that which will cause the spigot end of pipe to be away from home in the bell of the adjacent pipe a distance of 1/4 inch at the point of greatest opening.

Where necessary to cut pipe, cutting shall be done with approved tools and cut ends of pipe shall be square and regular. Cutting shall be done in a manner to avoid damage to lining and coating.

To prevent trench water from entering the pipe, joints, which for any reason may not be completed as the pipe is laid, shall be thoroughly packed with approved material, in a manner to make them watertight. Open ends of fittings shall be tightly closed with approved plugs and well packed, as shall the end of the last pipe laid whenever work is not in progress.

Tools or other objects shall not be stored or left in the pipe.

(2) Jointing Pipe

(a) Mechanical Joint

Bells and spigots shall be thoroughly cleaned and all foreign matter shall be removed. The bells, spigots and rubber gaskets shall then be thoroughly washed with soapy water to make sure that no particles of sand or grit can damage the gasket.

The gland followed by the gasket, painted with soapy water, or the pipe manufacturer's recommended lubricant, shall then be placed over the plain end of the pipe, and this end shall be inserted into the bell. The gasket shall then be pushed into position with the fingers, making sure that it is evenly seated in the socket of the pipe bell. After the gland has been moved into position against the rubber gasket, the bolts shall be inserted and made finger tight. All bolts shall be tightened with a 10-inch wrench, alternately and evenly, until all bolts are drawn up tight.

Mechanical joint fittings, special castings and valves, when specified, shall be set and jointed to the pipe in the manner heretofore specified for cleaning, laying and jointing mechanical joint pipe.

(b) Push-on Joint

Bells, spigots and gaskets shall be thoroughly cleaned and all foreign matter shall be removed. Wet sand, mud or ice shall be removed by using a wire brush or scraping tool, or by flushing with water. In cold weather the gaskets shall be warmed prior to placement.

**1. DUCTILE IRON PIPE (continued)**

The outside edge of any field cut pipe shall be beveled and smooth because any sharp corner can cause gasket damage, as recommended by the manufacturer.

The bells, spigots and gaskets shall be covered with the pipe manufacturer's recommended lubricant. The gasket shall be properly positioned in the gasket groove, and the plain end shall be guided into the bell with reasonably straight alignment. The joint shall be made by pushing the plain end into the bell.

Deflections shall be made after the joint as assembled.

**2. REINFORCED CONCRETE WATER MAIN**

**a. Pipe and Fittings**

All prestressed concrete pressure pipes shall be manufactured and delivered in accordance with current AWWA Standard C-301. Design calculations for this specification shall be submitted for approval prior to manufacture of pipe with the following provisions:

- (1) Prestressed concrete cylinder pipe with rubber and steel joints in sizes 16-inch through 20-inch diameter (SP-5).
- (2) Prestressed concrete embedded cylinder pipe with rubber and steel joints in sizes 24-inch diameter and larger (SP-12).

The design aforementioned shall be considered as part of the requirements of the current AWWA Standard C-301, Sec. 1.5.

The pipe shall be made by a manufacturer experienced in producing pipe of the type, size, and quality herein specified with a record of at least five years successful performance in use in projects of a considerable magnitude in the United States.

Wherever adapters are required to properly connect the reinforced concrete pipe with existing pipe of other material or manufacture, the nominal I.D. of adapters shall be the same size as the nominal diameter of pipe connected thereto. Adapters shall also be furnished and used as required by the manufacturer for connection to fittings, valves and hydrants.

**b. Tapping Outlet**

A tapping outlet shall be provided for each existing commercial and/or residential building and elsewhere at locations and of such sizes as shown on the plans.

The outlet shall be constructed in accordance with the detail shown on the plans and installed in accordance with the pipe manufacturer's specifications.

The cost of the outlets shall be included in the unit price bid per foot of water main.

**2. REINFORCED CONCRETE WATER MAIN (continued)**

**c. Laying Reinforced Concrete Pipe**

The pipes shall be carefully lowered into the trench by crane or other approved means. Just prior to joining the pipes, the surfaces of the joint rings shall be wiped clean and the joint rings and rubber gasket shall be liberally lubricated with an approved type of vegetable oil soap. The spigot end, with the gasket placed in the groove, shall be entered into the bell of the pipe already laid, making sure that both pipes are properly aligned. The pipe is then forced "home". Before the joint is fully "home", the position of the gasket in the joint shall be determined by means of a suitable feeler gage supplied by the pipe manufacturer. If the gasket is found not to be in proper position, the pipes shall be separated and the damaged gasket replaced. In its final position, the joint between the pipes shall not be deflected more than one half inch at any point.

When the pipe has been joined, a band at least five and one-half inches wide shall be placed around the outside of the pipe at the joint as recommended by and available from the pipe manufacturer. This band shall serve as a form for placing a 1:2 cement mortar grout in the external recess formed by the face of the bell and the shoulder of the spigot. If a reinforced paper joint band is used, it shall be drawn up tight around the pipe and the backfill tamped against it up to the spring line before pouring the grout. If a cloth band is used, it shall be wired around the outside of the pipe and the grout poured before backfilling. On pipes of twenty-four inch diameter or larger, the joint space remaining on the inside of the pipe shall be filled with a stiff mix of 1:2 cement mortar which shall be trowled in place so as to produce a continuous, smooth, flush surface across the joint.

**d. Anchorage and Encasement**

The Contractor shall furnish and place all concrete anchorage and encasements, as called for on the drawings. The cost of anchorage and encasements shall be included in the unit price bid per foot of water main.

**e. Pipes of Special Lengths**

Pipe of varying lengths, or other approved means of adjusting length of line as laid shall be provided to the end that each element of the main shall be placed at the location shown on the drawings. Such number of approved closure sections shall be provided as may be required in the course of the work.

The design and manufacture of pipe specials and fittings shall be AWWA Standard C-301, Type A such as to produce specials and fittings having strength and durability comparable with the pipe itself and suitable for the same service. Details of all proposed specials and fittings, including pipe with outlets, special joint details, reducers, bends, adapters, closure sections, boiler type manholes in pipe, air vent outlets, caps and plugs, shall be submitted to the Engineer and the Engineer's approval thereof obtained before their manufacture.

**3. HYDRANTS**

Fire Hydrants furnished under these specifications shall conform to AWWA C-502 for Dry Barrel Fire Hydrants. Hydrants shall have the following design features or equal as approved by the engineer:

- a. Mueller Super Centurian Model 250 compression type, 5 1/4 inch valve openings, with breakable safety flange and "O" ring assembly construction, , 5-1/2 foot bury, 6 inch mechanical joint inlet connection. Operating nut shall open left (counter-clockwise).
- b. East Jordan Iron Works compression type, model 5BR Traffic Model with breakable safety flange, 5 1/4 inch valve opening, 5-1/2 foot bury, 6 inch mechanical joint inlet connection. Operating nut shall be open left (counter-clockwise).

Pumper nozzle and hose nozzle sizes and threads, and operating nut size shall be per local municipalities' requirements.

The ground drain shall be plugged.

All hydrants shall have breakaway flange.

All hydrants shall be painted red above ground and black below.

Hydrants shall be carefully plumbed, braced, and back-filled in such a manner that they will remain plumb. All hydrants shall have a concrete thrust block and shall be bedded with a dry mix, 3-sack concrete, and at least one-foot thick.

All grade facing and vertical alignment adjustments of hydrants shall be made prior to pressure testing.

All hydrant joints shall be totally restrained by the use of concrete thrust blocks, meg-a-lugs or other types of restrained joints.

All hydrants shall be cleaned and field painted to the municipal color code after all tests are completed and prior to final acceptance. Type of paint shall be equal approved by the Engineer, to that presently used by the municipality or the Oakland County Drain Commissioner's Office.

A six (6) inch valve and a cast iron, 3 piece gate box, Buffalo Type, 5-1/4 inch screw shaft, shall be placed between hydrant and main and placed as close to hydrant as possible, but in no case less than 18 inches from hydrant. Valve boxes shall be Tyler Pipe series 6850 or approved equal.

Hydrants will be paid for at the Contract unit price each and shall include excavating, backfilling, stone, concrete, hydrant, gate valve, gate box, tees, all connecting pipes and all other materials necessary to make the installation complete to the main.

If this construction takes place during cold weather the Contractor must keep all fire hydrants pumped to protect them from freezing until the system is accepted. If he should fail to comply with this requirement the Owner will have the hydrants pumped at the Contractor's expense.

**4. GATE VALVES AND WELLS**

All 6-inch through 16-inch Gate Valves and Tapping Valves provided under these specifications shall be iron body, full bronze mounted, double disk, parallel seat type, opening per the local municipalities' requirements, with non-rising 2-inch stem conforming to the current AWWA C-500 specifications as manufactured by East Jordan Iron Works, Mueller or equal as approved by the engineer

To facilitate taking samples after the water main has been chlorinated and flushed, the Contractor shall install corporation stops on the pipe inside the gate well at such locations as may be required by the engineer. Corporation stops shall be 1" diameter for pipe less than 16" diameter. Corporation stops shall be 2" diameter for pipe 16" diameter and larger.

Gate wells shall be brick or precast concrete and shall be sized and built in accordance with the details shown on the plans.

When brick is used, a 1/2-inch coat of plaster shall be applied on the outside. Two and one half parts sand to one part air entrained cement. No lime shall be used. Calcium chloride not to exceed **3%** shall be used when the temperature is below 30°F.

Floors in gate wells shall be at least 6 inches thick 3,000 p.s.i. concrete (wet mix) protruding at least 6 inches out from periphery of the wall. Precast bottoms may be used. They shall be installed on a 2-inch to 4-inch sand or stone cushion.

Gate well steps shall be plastic coated steel meeting the requirements of ASTM D2146, Type II, Grade 49108, M.A. Industries P.S.I. Polypropylene, or approved equal, with foot recess, suitable secured to provide a non-slip surface. Steps shall be installed on 16" centers, 21" maximum below the casting elevation and 24" maximum above the structure bottom.

Well frame and cover castings shall conform to the latest requirements of the Standard Specifications for Gray Iron Castings ASTM Designation A-48. All castings shall be sound, smooth, clean and free from defects. No plugging will be allowed. The cover shall have the words "Department of Water Supply" spaced in from the periphery of the cover, and shall be of Detroit Water System Type.

The joint between the cover and frame shall be machine finished. The combined weight of frame and cover shall be no less than 400 pounds. All well frames and covers shall be coated with coal-tar pitch varnish, with sufficient oil added to produce a smooth coating, tough and tenacious when cold, and not brittle nor with any tendency to scale off.

Basis of Payment - Gate and well will be paid for at the Contract unit price each and shall be payment in full for furnishing all materials, labor, and equipment necessary to make the installation complete including excavation, compacted backfill, valve, cover and corporation stops.