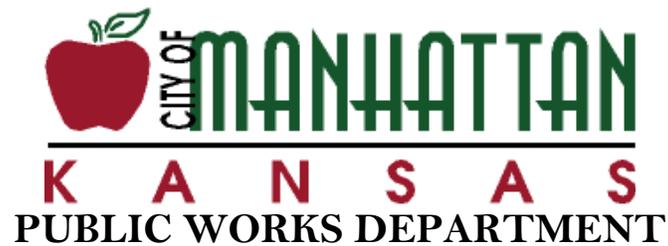


Division II
Section 2300
Waterlines



**DIVISION II
CONSTRUCTION AND MATERIAL SPECIFICATIONS**

SECTION 2300 WATERLINES

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SECTION 2300 WATERLINES

2300 SCOPE

The work to be done under these specifications consists of the construction of pipelines and appurtenances as shown on the drawings and as herein specified. The Contractor shall furnish all materials and labor, and upon completion of the work the entire area within the limits of the contract shall be left in a clean and sightly condition. Unless otherwise specified on the plans or in the contract documents, all water lines shall be ductile iron of the approved thickness class as specified herein. All water lines shall be installed to provide a minimum depth of cover between the top of pipe and the finished ground surface of not less than three and one-half (3 1/2) feet.

2301 MATERIAL

Upon the request of the City Engineer the Contractor shall provide three (3) copies of certified test reports indicating the material conforms to the specifications as outlined in the following sections. The manufacturer shall perform all tests in conformance with applicable standards. Testing may be witnessed by the City Engineer or approved independent testing laboratory.

All materials shall be stored so as to prevent deterioration or intrusion of foreign matter. No deteriorated or damaged material shall be used.

2301.11 Ductile Iron Pipe

Ductile iron pipe shall conform to ANSI 12.51. All six (6) inch or larger ductile iron pipe shall be class 50. All four (4) inch or smaller shall be class 51. Any deviation from this shall be approved by the City Engineer. All ductile iron pipe shall have a cement mortar lining conforming to ANSI A 21.4.

2301.2 Joints

All joints shall conform to ANSI 21.11.

2301.3 Gate Valves

All valves 12.inches and smaller shall be standard gate valves, and shall be iron body, bronze mounted, resilient seat, non-rising stem type valves, with slip-on type joints.

All valves shall turn to the left to open and shall be equipped with a two (2) inch operating nut. The diameter of the valve's fully opened flow-way shall be equal to the nominal size of the connecting pipe.

The structural design of the valve shall be such that if excessive torque is applied to the stem in the closing direction with the disc seated, failure of the pressure retaining parts shall not occur. Stem failure under such conditions shall occur externally at such a point as to enable the stem to

be safely turned in the opening direction by use of a pipe wrench or other such readily available tool after exposure of the valve through excavation.

After final assembly, the manufacturer shall hydrostatically test each valve for zero leakage past the seat at full working pressure of 150 psi. Each fully assembled valve shall also be tested for zero leakage at the bonnet flanges and stem packing at twice the working pressure. All gate valves shall be Mueller, American or approved equivalent.

2301.4 Butterfly Valve

All **valves 14 inches and** larger shall be butterfly valves, and shall comply with the latest revision of ANSI/AWWA Standard C-504, Class 150-B. They shall have a rubber disc seat ring molded to a stainless steel retaining ring.

For 14 inch through 24 inch butterfly valves, operators shall be of the traveling nut type with endstops that can be adjusted without disassembly or use of machine tools. For 30 inch and larger butterfly valves, operators shall be the Link-Lever type. Operators shall be field replaceable and the valve shall open to the left.

After final assembly, the manufacturer shall hydrostatically test each valve for zero leakage past the seat at full working pressure of 150 psi. Each fully assembled valve shall also be tested for zero leakage at the flanges and shaft seals at twice the working pressure. All butterfly valves shall be Mueller or approved equivalent.

2301.5 Air Release Valve

Air release valves shall be APCO #50.3 or approved equivalent.

2301.6 Fire Hydrants

All hydrants shall have bell ends for connection to six (6) inch standard ductile iron pipe. Two-way fire hydrants shall have a four and one-half (4 1/2) inch main valve opening, and shall have two (2), two and one-half (2 1/2) inch hose nozzles. Three-way fire hydrants shall have a five and one-quarter (5 1/4) inch valve opening, and shall have two (2), two and one-half (2 1/2) inch hose nozzles, and one (1), four and one-half (4 1/2) inch pumper nozzle. Hydrants shall be post style, gate or compression type, suitable for 150 pound working pressure and tested and guaranteed for pressure of 300 pounds per square inch. Hydrants shall open to the left (counter-clockwise), and shall conform to the A.W.W.A. Standard Specifications. Hydrant size shall be designated as the nominal size of the main valve opening, and the net area of the smallest part shall not be less than 120 percent of the fully opened valve. Hydrants shall be for a minimum four (4) foot depth of bury.

Hose caps shall be provided for all outlets and shall be securely chained to the barrel with one-eighth (1/8) inch galvanized steel, non-kinking chain. A leather, rubber or lead washer shall be provided in the hose cap. To prevent the washer from dropping out, it shall be set into a groove in the hose cap. The hose cap nuts shall be identical in size and shape to the operating nut. All hydrants shall be Mueller Centurion, or approved equivalent.

2301.7 Concrete

All concrete used in association with water main installation shall be the standard City mix as described in Div II Section 2600 "PAVING" Section 1.2.

2301.8 Plugs

Plugs at the end of water lines shall be push in or mechanical joint type plugs.

2302 INSTALLATION

2302.1 Pipe

Pipe, fittings, valves, and hydrants shall be handled in a manner that will insure their installation in the work in a sound and undamaged condition conforming in all respects to specified requirements. Particular care shall be taken not to injure the coatings and linings. Broken or loosened cement lining in pipe or fittings shall be sufficient cause for rejection of the unit containing such damage. Damaged pipe or fittings may be repaired by a representative of the pipe manufacturer, or under the representative's direct supervision. Any such repairs shall be at the expense of the Contractor.

Prior to placing a length of pipe or a fitting in the trench, the trench bottom shall be accurately graded or otherwise prepared as provided in Section 4.1 of EARTHWORK AND TRENCHING. The interior surfaces of the pipe or fitting shall be brushed and swabbed until they are free from mud, dirt, dust and other foreign matter. Every precaution shall be used to prevent the entrance of foreign matter into pipe, valve, and fitting interiors during, and subsequent to, installation. Any pipe that has its grade or joint disturbed after laying shall be taken up and re-laid.

Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather is unsuitable for proper grading, laying, or jointing operations.

At all times, when work is not in progress, all open ends of pipes and fittings shall be securely closed with a water-tight plug, so that no water, earth or other foreign matter will enter the pipe or fittings. All water that may have entered the trench shall be removed prior to removing the plug. It is essential that no mud, trench water, or other foreign matter be permitted to get into the line at any time.

With the exception of closures and connections with existing lines, pipe shall be laid with the bells facing in the direction of laying.

Pipe lines or runs intended to be straight shall be laid straight. Deviations from a straight line or grade, in authorized or specified vertical and horizontal curves or offsets, may be made at the joints between straight pipes, or between straight pipes and valves or fittings, within the allowable deflection limits. Maximum deflections, expressed in inches of deflection per linear foot of pipe, between centerlines extended of the connecting piping units, shall not exceed the manufacturer's recommendations for the pipe being laid.

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. All pipe shall be cut by a tool designed for such use.

2302.1.1 Slip Joints

The installation of slip joint pipe shall be in accordance with the recommendations and instructions of the pipe manufacturer, and as herein specified. Slip joint pipe shall be installed with care to insure proper water-tight connections which are free of foreign material. As the spigot end is readied for installation into an adjoining bell end, the spigot end shall be cleaned and lubricated. The bell shall contain a gasket in place free from cracks or cuts. The pipe shall be rammed home according to proper installation procedures.

2302.1.2 Mechanical Joints

The installation of mechanical joint pipe shall be in accordance with the recommendations and instructions of the pipe manufacturer and as herein specified. After the pipe has been installed as specified, the socket, gland, gasket, and spigot end of the entering pipe, shall be wiped clean, lubricated, and the gland and gasket slipped over the spigot end of the pipe. The spigot shall be inserted the full depth of the socket and then retracted one-eighth (1/8) inch. The gasket shall then be lubricated and carefully pushed into position, care being taken that it is evenly seated in the bell. The gland shall then be shoved in place, the bolts inserted, and the nuts initially tightened with the fingers. Beginning with a bottom bolt and then the opposite top bolt, bolts 180 degrees apart shall be tightened gradually, alternately, in rotation, and at a uniform rate.

2302.1.3 Connections to Existing Pipe Lines

Connections between new work and existing pipelines shall be made in a thorough and competent manner using proper fittings to suit actual conditions encountered in each case. Each connection with an existing waterline shall be made at a time and under conditions which will least interfere with water service to affected customers. Suitable facilities shall be provided for proper dewatering, drainage, and disposal of all water removed from the dewatered lines and excavations without damage to adjacent property. The attention of the Contractor is called to the fact that intersecting lines with which connections are to be made vary in depth, and it will be necessary to approach each intersection at such an elevation that the two (2) lines will meet properly. In order to minimize the time required to complete the installation at each connection, the Contractor shall carefully plan the sequence of each part of the operation and the total length of time involved. He shall then submit his plan and schedule to the City Engineer for approval. If so requested, the connection shall be made at night or at some other time of minimum demand.

Great care shall be taken to prevent pipeline contamination when dewatering, cutting into, and making connections with, existing pipelines. The Contractor shall cooperate with the Owner in isolating services, and shall conduct his operations in such a manner that no trench water, mud, or other contamination substances are permitted to get into the new or existing lines at any time during the progress of work. The interiors of all new and re-used pipe, fittings and valves installed in such connections, shall be thoroughly cleaned and disinfected as indicated under Water Main Disinfection Procedures of this section.

All pipe, fittings, valves, jointing materials, tools, and equipment required to complete the connection shall be on hand before the water is turned off in the connecting main or mains.

2302.2 Fittings

All fittings at bends, branches, and ends of pipelines shall be adequately supported by reaction or thrust blocking installed between solid, undisturbed soil and the fitting to be anchored. Reaction or thrust blocking shall consist of concrete installed in such a manner that all joints between pipe and fittings are accessible for repair or replacement.

Fittings at bends in grade shall be provided with adequate concrete embedment, and shall be adequately anchored to resist forces at the maximum test pressure.

2302.3 Valves

New valves shall be furnished unless otherwise specified. Valves and valve boxes shall be plumb, and graded to finished elevation as shown on the plans. After the valve is in place, earth shall be compacted about it, as specified for the rest of the trench.

Before installing any valve, care shall be taken to see that all foreign material is removed from within the valve body. The packing glands shall be inspected to see that they are properly packed, gland nuts tightened and the valve opened and closed to see that all parts are in first-class working condition.

To install an air release valve the Contractor shall drill and tap the top of the main according to the detail. The air release valve shall be at the high point of the main, or at the location shown on the plans.

Each valve installed shall be covered and enclosed by a valve box designed for such purposes. Pipe substitute is not allowed. The Contractor shall furnish the valve box, and the material and equipment to set the valve box. The box shall be centered on the valve, plumbed, brought to the proper grade, and backfilled.

2302.4 Fire Hydrants

Hydrants shall be set at an elevation that will provide at least the minimum specified cover over the pipe. Any hydrant not set to the proper grade shall be reset at the full expense of the Contractor.

The hydrant shall be set on a substantial foundation, and a reaction block shall be installed for each hydrant. The reaction block shall be braced against the vertical face of unexcavated soil at the end of the trench. When necessary and approved by the City Engineer, the hydrant may be tied to the pipe with suitable rods or clamps adequately protected from corrosion.

The hydrant shall be provided with adequate drainage facilities and shall stand plumb with nozzles pointed in the directions shown on the plans. Every hydrant shall be opened and checked for proper working order under flow conditions. The use of a fire hose may be required under these conditions when it is necessary to prevent damage caused by the flow of water from the hydrant.

2303 INSPECTION AND TESTING

2303.1 Pressure and Leakage Test

It is the intent of these specifications that the water main constructed hereunder shall be and remain tight, and free from weakness and leakage under all working and service conditions. All joints that are found to leak, either by observation or test, shall be repaired and made watertight by the Contractor, at his own expense.

Although not routinely required, at the request of the City Engineer the Contractor may be required to make pressure and leakage tests. The Contractor shall provide all necessary connections between the pipe line or piping, and the nearest available source of test water, test pumping equipment, pressure gauge, water meter (leakage test only), and other equipment, materials, and facilities necessary for filling the lines and for making the required tests. The specified test pressure shall be applied and maintained in each case by means of a hand operated force pump or other suitable device approved by the City Engineer.

The Contractor will be permitted to make the pressure and leakage tests either before or after the trench is backfilled. If the Contractor backfills the trench prior to testing he will be required to uncover the water line to the extent necessary to find and repair all leaks. Such work shall be done at the Contractor's expense. If the test is made before the trench is backfilled, the embedment of the pipe shall have been placed and compacted to a level six (6) inches above the center line of pipe with all joints exposed around their entire circumference. The line test should be made in sections using either the sectionalizing valves shown on the drawings to be permanently installed, or temporary plugs or valves. All bracing and blocking shall be in place prior to testing.

In making the tests, the section to be tested shall be slowly filled with water, and all air expelled from the pipe. All available hydrants, including auxiliary hydrant valves, and all other vents, should be open during the filling of the line.

Tests pressures shall be applied with a force pump of such design and capacity that the required pressures can be applied and maintained without interruption for the duration of the test. Meters and gauges shall be carefully tested and calibrated.

The line shall be subjected to a hydrostatic pressure of 200 pounds per square inch, which shall be maintained for at least one hour. If leakage is observed in excess of 100 gallons per day per inch diameter of pipe per mile of pipe, or if a drop in pressure indicates undisclosed leakage in excess of this rate, the leaks shall be located and repaired, and the line retested.

2303.2 Water Main Disinfection Procedures

All new waterlines, valves, fittings, and connections to existing lines shall be thoroughly flushed and disinfected before they are put to use. Water containing at least 50 mg/I of chlorine shall be allowed to stand in the line for 8 hours after which there shall be at least 10 mg/I residual chlorine remaining. The following table shows the minimum amount of calcium hypochlorite granules or hypochlorite tablets required for disinfection purposes (from Section 5, ANSI/AWWA C601-81):

Pipe Size	Calcium Hypochlorite Granules (Oz./500ft pipe)	Five (5) gram Hypochlorite Tablets (per 18' pipe section)
4"	.05	2
6"	1.0	2
8"	2.0	4
10"	3.0	6
12"	4.0	8
16" and larger	8.0	12

Calcium hypochlorite granules shall be placed at the bell end of the first section of pipe, at the upstream end of each branch main, and at 500 foot intervals. Calcium hypochlorite tablets shall be placed in each section of pipe, and also one tablet shall be placed in each fire hydrant. The tablets shall be attached to the inside, top of the pipe with Pernidex No. 1 adhesive or equivalent. There shall be no adhesive on the tablet except on the broad side attached to the surface of the pipe. If the tablets are placed in the pipe prior to placing the pipe in the trench, the pipe shall be marked so it is installed with the tablets on the top side of the pipe.

If 10 mg/1 of residual chlorine is not remaining at the end of the eight hour period disinfection shall be repeated.

Care shall be taken during the disinfecting process to prevent the chlorine solution from entering existing mains in active service.

2304 TIES AND RECORDS

The Contractor shall provide a full set of ties and records upon completion of the job, which will allow the future location of all fittings, valves, and end of lines. Each fitting, valve, or line end shall have a minimum of three (3) measurements tying it down. Two of the ties shall be to established property pins.