

SECTION 5000--WATER LINES

5001 SCOPE. This section covers all labor and materials for the construction of water lines including all thrust blocks, plugs, valves, pipe encasement, valve boxes, hydrants, connections to existing mains and other appurtenant work.

5002 DUCTILE IRON PIPE. Water lines shall be constructed of ductile iron or polyvinyl chloride (PVC) pipe. Unless otherwise shown on the drawings, joints in ductile iron piping shall be push-on types.

The ductile iron pipe shall conform to ANSI A21.51; ASTM A536, Grade 60-42-10, AWWA C151. The minimum nominal thickness class for ductile iron pipe shall be Class 50 for all mains unless otherwise directed by the city engineer. All water mains shall be polyethylene encased and shall conform to ASTM A674.

The location of all water mains shall be marked on the ground surface during construction. All marks shall remain until the project completion certification has been issued.

5003 PVC PIPE. For water line diameters four (4") inches through twelve (12") inches, PVC shall meet the requirements of ASTM D1784, cell classification 12454-B for PVC compounds, and ANSI/AWWA C900, with the same outside diameter dimensions as ductile iron pipes. The pipe shall be Class 150 unless otherwise designated by the City Engineer.

The location of all water mains shall be marked on the ground surface during construction. All marks shall remain until the project completion certification has been issued.

5004 UNDERGROUND TRACER WIRE. The contractor shall install 12 gauge copper wire along all PVC water lines to facilitate underground location. Connection shall be made to all valve risers as a minimum where no other connection points such as hydrants or flushing assemblies are available. Attachment to valve risers, fire hydrants, or flushing assemblies shall be made using stainless steel band clamps one inch (1") above ground level. Splicing shall be held to a minimum and will not be allowed between valve risers. Split bolt connectors or service connectors shall be used at splice points to maintain electric continuity. Before project acceptance the city will test the electric continuity of all installations at no cost to the contractor.

5005 GATE VALVES. The type, size, and location of valves shall be as indicated on the plans. Except as modified or provided herein, all gate valves shall be 200 psi, resilient seated valves of the waterworks type. All gate valves shall have cast iron bodies or ductile iron and shall have non-rising stems.

Resilient-seated gate valves shall conform to all applicable requirements of AWWA A509 and shall be **American Flow Control Series 2500**, Mueller A2370-20, or Kennedy "Ken-Seal" or Mullen "Waterous" series NRS.

Valve ends shall be of the push-on type conforming to ANSI A21.11 except where flanged ends are required by the drawings and specifications. The end flanges of flanged gate valves shall be ANSI 125 pounds.

All valves shall be provided with stem seals of the O-ring type.

All valves shall be provided with manual operators equipped with a wrench nut conforming to the requirements of AWWA C509.

The direction of rotation of the wrench nut to open the valve shall be to the left (counterclockwise). Each valve body or operator shall have cast thereon the word "*Open*" and an arrow indicating the direction to open.

All exposed bolts below grade shall be stainless steel.

- 5006 BUTTERFLY VALVES. Butterfly valves shall be of the rubber-seat, tight-closing type. Valve discs shall seat at 90° with the pipe axis. Flanged end valves shall be of the short-body type. For buried service, shaft shall be O-ring type.

All butterfly valves and operators shall conform to AWWA C504. Metal mating seat surfaces shall be 18-8 stainless steel or nickel copper alloy. Each valve shall be provided with an operator with a torque rating at least equal to the torques listed in AWWA C504, Table 1.

Butterfly valve shall be Kennedy 50C, American C-150B, Mueller "Line Seal III" or approved equal.

All exposed bolts below grade shall be stainless steel.

- 5007 TAPPING SLEEVES AND VALVES. Tapping sleeves and valves shall be furnished and installed where required by the drawings. The valves shall be 200 psi, resilient-seated, cast or ductile iron body, non-rising stem gate valves conforming with all applicable requirements of AWWA C509 and shall be Mueller "No. A-2307-16" or an approved equal. Each tapping valve shall be provided with a flanged inlet end designed, faced, and drilled for connection to the outlet end of the tapping sleeve. The outlet end of the tapping valve shall be provided with a tapping flange for attachment of a standard drilling machine and also with a mechanical joint-type bell end for connection of the branch main. The tapping sleeve must have pipe tap for pressure testing (water pressure only).

Tapping sleeves shall be of the flanged-outlet type designed for attachment to the flanged inlet end of the tapping valve, and shall be provided with mechanical joint ends at each end of the run and shall be Mueller "No. H-615" for ductile iron pipe, Mueller "No. H-619" or PowerSeal Model 3490 for asbestos-cement pipe, PowerSeal Model 3490 for sandcast iron pipe, JCM model heavy duty stainless steel, with full neoprene gasket or approved equals.

The contractor shall provide 48 hours notice to Public Works prior to tapping the main. A hydrostatic test by the contractor will be required prior to tapping the main. A city representative shall be on site throughout the entire test.

Back-taps shall not be accepted until prior approval is granted by the city engineer. Details shall be provided prior to approval. The pipe plug installed at the completion of the pressure test shall be corrosion resistant to reduce risk of corrosion and/or electrolysis.

5008 VALVE COATINGS. All ferrous metal surfaces of valves and accessories, both interior and exterior, shall be shop-painted for corrosion protection with two coats of asphalt varnish conforming to Federal Specification TT-V-51.

5009 AIR RELEASE AND VACUUM RELIEF VALVES. Combination air release and vacuum relief valve assemblies shall be installed in the locations indicated on the drawings. Each valve assembly shall be installed complete with appurtenant piping and valves as specified or shown.

Combination air release and vacuum relief valves shall be of the integral type with a valve assembly which functions as both an air and vacuum valve and an air release valve. Valves shall have a 2" inlet connection.

The valves shall be designed for a water working pressure of 125 psi, shall have stainless steel floats, and all working parts shall be brass, stainless steel, or other noncorroding materials.

Shutoff valves shall be provided in the piping to each combination air release and vacuum relief valve assembly. Shutoff valves shall be 2" solid wedge gate valves. A precast concrete vault will be positioned at air release location conforming to Standard Detail 50-3.

5010 VALVE BOX AND EXTENSION STEM ASSEMBLY. All buried valves shall be provided with valve boxes. Valve boxes shall be an assembled unit consisting of the valve box, extension stem and a self-centering alignment ring. Valve boxes shall be suitable for the depth of cover required by the drawings. The stem assembly shall be of a telescoping type, to allow for variable adjustment lengths. The stem assembly shall not disengage at the fully extended length. Valve boxes shall not be less than 5 inches (5") in diameter, and shall have a minimum thickness of 3/16-inch at any point. Covers shall have cast thereon the word "*Water.*"

Valve box and extension stem assemblies shall be Ametek with integral key, 2-inch square nut, or equal.

Valves and valve boxes shall be set plumb. Each valve box shall be placed directly over the valve it serves, with the top of the box brought flush with the finished grade. After being placed in proper position, earth backfill shall be filled in around each valve box and thoroughly tamped on each side of the box.

5011 FIRE HYDRANTS. Fire hydrants shall be Mueller A-423, Waterous "Pacer" 100, **U.S. Pipe Metropolitan 250 Model 94**, American Darling "Quik-Fix" B-84-B, or Kennedy Guardians and shall be furnished with a 6-inch auxiliary gate valve. The fire hydrants shall be pressure rated at 150 psi working pressure and 300 psi test pressure. Hydrants shall be traffic models with breakaway flange or coupling. Fire hydrants shall conform to AWWA C502 with information required by Section 2 as follows:

Type of Shutoff	Compression
Size of Hydrant	5 1/4 inches
Inlet Connection	6 inches
Outlet Nozzles	2-2 1/2 inch hose and 1-4 1/2 inch pumper
Outlet Nozzle Threads	ANSI B-26
Direction to Open	Counterclockwise
Stem Seals	O-ring
Outlet Nozzle Cap Chains	Required
Drain Outlet	Required
Finish Paint	Factory painted above the ground line with yellow enameled paint
Weather Cap on Operating Nut	Required

Hydrants shall be restrained joint and furnished with all joint gaskets required for installation. Hydrants shall be set so that at least the minimum pipe cover is provided for the branch supply line. Each hydrant shall be set on a concrete foundation at least 18" square and 6" thick. Each hydrant shall be suitably anchored.

Hydrant drainage shall be provided by installing around the hydrant, and below the top of the hydrant supply pipe, at least 1/2-cubic yard of 3/4-inch rock.

Fire hydrant installations shall conform to Standard Detail 50-2. All hydrants shall stand plumb. The exact direction the nozzles will be facing shall be determined by the engineer.

The hydrant barrel and shoe shall be secured by means of stainless steel nuts and bolts. All exposed nuts and bolts below the ground level shall be stainless steel. The lower seat shall be threaded into a bronze insert which is threaded into a shoe to form a bronze-to-bronze assembly. Cross arm shall be all bronze.

Immediately before installation of a hydrant, the following operations shall be performed: (a) the hydrant shall be thoroughly inspected; (b) the hydrant interior shall be thoroughly cleaned; (c) the hydrant shall be opened and closed as many times as may be necessary to determine if all parts are in proper working order, with valves seating properly and the drain valve operating freely; and (d) the packing gland checked to determine if the packing is in place and the gland nut properly tightened.

5012 CORPORATION COCKS. One-inch corporation cocks shall be furnished by the contractor for installation along the pipelines where necessary to vent the lines during filling. The number

and location of the corporation cocks shall be as determined by the contractor. After testing and disinfection of the lines, the corporation cocks shall be removed and a suitable plug installed in each opening. A single hinge brass saddle and a brass plug shall be required.

- 5013 FLUSHING ASSEMBLIES. Flushing assemblies shall be provided at the locations shown on the drawings. Each installation shall be complete with all piping, the gate valve, valve box, covers and lids as required, and shall conform with Standard Detail 50-3. Flushing assemblies will only be allowed on 6-inch mains which will be extended in the future. For all lines greater than 6", a fire hydrant will be required for flushing.
- 5014 MECHANICAL JOINT PIPE AND FITTINGS. Mechanical joint pipe and fittings shall not be used except as approved by the city engineer.
- 5015 PUSH-ON JOINT PIPE AND FITTINGS. Fittings shall be cast from ductile iron in accordance with ANSI/AWWA C153/A21.53, 250 psi pressure rating. Fittings shall be Tyton® Joint, Starr, Union Tite by Tyler, or equal, in accordance with all applicable requirements of ANSI/AWWA C111/A21.11. Design of the joint shall permit deflection of up to 5 degrees after assembly. Gaskets shall be neoprene or other synthetic rubber. Natural rubber will not be acceptable.

In the case of the push-on joint, the gasket seat in the bell shall be wiped clean with a cloth after which the gasket should be sprung into place. Thereafter a thick film of lubricant should be applied to all of the inner surface of the gasket which will come into contact with the entering pipe.

The lubricant and the gaskets shall be as recommended and supplied by the manufacturer of the pipe being used. The lubricant shall be odorless, tasteless, and shall be non-toxic.

The plain end of the pipe shall be wiped clean and a thin film of lubricant shall be applied to the outside of the plain end of the pipe and its beveled edge. The plain end of the pipe should then be placed in approximate alignment with the bell of the pipe to which it is to be joined. The joint can be made up with the entering pipe deflected at an angle, but this angle should not exceed the recommended maximum of the manufacturer. The plain end of the pipe should then be lifted and started into the socket so that it is in contact with the gasket.

The joint is made up by exerting sufficient force on the entering pipe so that its plain end is moved past the gasket (which is thereby compressed) until it makes contact with the base of the socket of the bell. This force can be applied by means of a jack-type tool or backhoe.

Field cut pipe, in the case of the push-on joint, shall be bevel-filed to remove any sharp or rough edges which might otherwise injure the gasket.

- 5016 FLANGED JOINTS. Flanges shall conform to ANSI B16.1, 125 pound or U.S. Pipe "Flange-Tyte." Bolts shall be ASTM A307, chamfered or rounded ends projecting 1/4- to 1/2-inch beyond the outer face of the nut which shall be ASTM A307, hexagonal, ANSI B18.2, heavy

semi-finished pattern. Gaskets shall conform to ASTM D1330, Grade I, red rubber, ring type, 1/8-inch thick or U.S. Pipe "Flange-Tyte", 1/8-inch thick.

The pipe end and flange face shall be machine-finished in a single operation. Flange faces shall be flat and perpendicular to the pipe centerline.

When bolting flanged joints, care shall be taken to ensure that there is no restraint on the opposite end of the pipe or fitting which would prevent uniform gasket compression or which would cause unnecessary stress in the flanges. One flange shall be free to move in any direction while the flange bolts are being tightened. Bell and spigot joints shall not be packed or assembled until all flanged joints affected thereby have been tightened. Bolts shall be tightened gradually and at a uniform rate, so that gasket compression is uniform.

- 5017 RESTRAINED JOINTS. Restrained joints shall be push-on type. Where restrained joints are required or specified, the Mega-Lug, Field Lok® gasket, Fast Grip gasket or approved equal shall be used. Field Lok gaskets shall be used in approved Tyton® Joint, Starr, and Union Tite by Tyler Bells. Fast Grip gaskets shall be used in Fastite Bells. Both assemblies shall be capable of deflection of up to 5 degrees after assembly.

Restrained joint pipe shall be used where shown on the drawings and shall be installed in accordance with the recommendations of the pipe manufacturer. Each restrained joint shall be capable of resisting the thrust of the pressures to be applied.

- 5018 RETAINER GLANDS. Retainer glands shall be manufactured by American "Mechanical Joint Retainer Glands" or Clow "F-1058" and may be used on 12" or smaller pipe for making connection to existing lines provided their installation is in accordance with the recommendations of the pipe manufacturer.

Retainer glands shall not be used on any new or relocated mains where restrained joints are indicated on the drawings.

- 5019 SHOP COATING AND LINING. The interior surfaces of all pipe, regardless of length or type of joint, and the interior surfaces of all 14-inch or larger fittings shall be lined with cement conforming to ANSI A21.4. Flange faces shall be shop-coated with Rust-Oleum "R-9" or Houghton "Rust Veto 344" rust preventative compound. All other surfaces of pipe and fittings shall be coated with a bituminous coating.

- 5020 HANDLING. Pipe, fittings, and accessories shall be handled in a manner that will ensure installation in sound, undamaged condition. Equipment, tools, and methods used in unloading, reloading, hauling, and laying pipe and fittings shall be such that the pipe, pipe coating, and fittings are not damaged. Hooks inserted in ends of pipe shall have broad, well-padded contact surfaces. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

Pipe and fittings in which the cement lining has been broken or loosened shall be replaced by and at the expense of the contractor. Where the damaged areas are small and readily accessible, the contractor may be permitted to repair the lining.

All pipe coating which has been damaged shall be repaired by the contractor before installing the pipe.

- 5021 CUTTING PIPE. Cutting shall be done in a neat manner, without damage to the pipe or to the cement lining. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the end of the pipe shall be dressed with a file to remove all roughness and sharp corners.
- 5022 CLEANING. The interior of all pipe and fittings shall be thoroughly cleaned of foreign matter before being installed and shall be kept clean until the work has been accepted. Before jointing, all joint contact surfaces shall be wire brushed if necessary, wiped clean, and kept clean until jointing is completed.
- 5023 INSPECTION. Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation. Spigot ends shall be examined with particular care since they are vulnerable to damage from handling. All defective pipe and fittings shall be removed from the site of the work.
- 5024 ALIGNMENT. Pipelines or runs intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the quantities stipulated in Table 1 or Table 2 of AWWA C600.

Either shorter pipe sections or fittings shall be installed where the alignment or grade requires them.

- 5025 DEAD END LINES. Fire hydrants are required at the termination of all water mains or at locations indicated on the drawings.
- 5026 CONNECTIONS TO EXISTING WATER MAINS. The contractor shall furnish and install all of the fittings necessary for connections between new water mains and existing water mains. The fittings shall be as indicated on the plans unless otherwise authorized by the city engineer. All connections shall have a valve located at the connection point unless otherwise approved by the city engineer.

When the fittings consist of tapping sleeves and valves, the contractor shall perform the actual tapping operation of the mains under the direction of the Public Works Department. (The Public Works Department will not perform any tapping operations of the water mains unless specified otherwise in the construction drawings).

No connections to existing mains shall be started without prior approval of the Public Works Department, and each connection with an existing main shall be made at a time and under conditions which will least interfere with service to customers affected thereby.

In all cases where it is necessary to take an existing main or service line out of service in order to accomplish the work to be performed, the contractor shall notify the Municipal Services Department at least 24 hours in advance as to the approximate length of time the main or service line will be out of service. The contractor shall also be responsible for notifying all customers to be affected by loss or interruption of service by means of printed information sheets 24 hours in advance of taking the main or service line out of operation.

When the closing of a valve to make the connections affects a customer who cannot be without service, the contractor shall arrange to supply a temporary service and schedule the time which is most convenient to the customer for making the connection to the existing mains.

Facilities shall be provided for proper dewatering and for disposal of all water removed from the dewatered lines and excavations without damage to adjacent property.

Special care shall be taken to prevent contamination when dewatering, cutting into, and making connections with existing pipe. No trench water, mud, or other contaminating substances shall be permitted to get into the lines.

It shall be the responsibility of the contractor to make any and all excavations and backfill as required and furnish all labor, equipment, and material necessary to complete the connection as detailed on the plans.

5027 SANITARY SEWER LINE CROSSINGS. Sanitary sewers and water lines shall be constructed a distance of 10 feet apart when they are to be installed parallel to each other. Exceptions to this requirement shall be granted only upon written approval by the Kansas Department of Health and Environment.

Where water lines are to be constructed over and across sanitary sewer lines, at least 2 feet shall be maintained between the bottom of the water pipe and the top of the sewer pipe. At locations where a 2-foot clearance cannot be maintained, the sewer pipe shall be constructed of ductile iron pipe for a distance of at least 10 feet in each direction from the crossing. The ductile iron pipe joints shall be located as far as practical from the pipe crossing.

Where water lines are to be installed under and across sanitary sewer lines, the sanitary sewer lines shall be constructed of ductile iron pipe for a distance of at least 10 feet in each direction from the crossing. The ductile iron pipe joints shall be located as far as practical from the pipe crossing.

5028 ROCK EXCAVATION. Where rock is encountered, either dug or shot, the pipe shall be bedded with a minimum of 6 inches of CA-5 rock between the pipe and trench bottom. Granular embedment shall be used at locations directed by the engineer and shall be considered a subsidiary obligation unless specifically provided for as a bid item in the proposal.

- 5029 RESTORATION OF SURFACE CONSTRUCTION. The restoration of concrete and asphalt pavement, gravel surfacing, walks, drives, curbs, and other surface construction removed or damaged during the progress of the work covered by this section shall conform to the applicable provisions of Section 7000 *Restoration of Surface Construction* of these specifications.
- 5030 END OF CUL-DE-SAC. All cul-de-sacs shall provide a hydrant at the end.
- 5031 BORING WITHOUT CASING PIPE. Borings for watermain construction without casing pipe will be permitted only with the approval of the city engineer.