

San Antonio Water System Standard Specifications for Construction

ITEM NO. 812
WATER MAIN INSTALLATION

812.1 DESCRIPTION: This item shall consist of water main installation in accordance with these specifications and as directed by the Engineer.

812.2 MATERIALS: The materials for water main installation shall conform to the specifications contained within the latest revision of SAWS Material Specifications "Ductile Iron Pipe", Item No. 05-11, "Steel Water Pipe", Item No. 05-30, "PVC C-900 Water Pipe", Item No. 05-12, "PVC C-905 Water Pipe", Item No. 819 and "Reinforced Concrete Water Pipe Steel Cylinder Type", Item No. 05-20. The pressure rating for pipe materials shall be in accordance with Table HP, "High Pressure Levels," in Appendix A. Minimum pressure rating for all pipes in high pressure zones shall be 200 psi.

812.3 CONSTRUCTION:

1. Start of Work: The Contractor shall start his work at a tie-in or point designated by the Engineer. Pipe shall be laid with bell ends facing in the direction of pipe laying, unless otherwise authorized or directed by the Engineer. All valves and fire hydrants must be installed as soon as pipe laying reaches their established location. Pipe shall be installed to the required lines and grades with fittings, valves, and hydrants placed at the required locations. Spigots shall be centered in bells or collars, all valves and hydrant stems shall be set plumb, and fire hydrant nozzles shall face as per SAWS standard details or as directed by the Engineer. No valve or other control on the existing system shall be operated for any purpose by the Contractor unless a representative of the San Antonio Water System is present.
2. Crossing Other Underground Lines: New water mains crossing any other utilities shall have a minimum of 30 inches of cover over the top of the pipe unless otherwise waived or modified by the Engineer. Excavation around other utilities shall be done by hand for at least 12 inches all around. Any damage to the protective wrap on gas lines or electrodes shall be reported immediately to the C. P. S. Energy, phone (210) 353-3333. Any damage to other utilities shall be reported to their proper governing entity.

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3. Pipe Grade: Water mains 16" or smaller shall have a minimum of 48 inches of cover from the proposed final finish ground/street/elevation and 60 inches of cover when the main is installed in a parkway or under the pavement where there are no existing/proposed curb or existing drainage facilities. Water mains 20" and above shall have a minimum of 60 inches of cover—over the top of the pipe from the proposed final finish ground/street/elevation unless otherwise waived or modified by the Engineer. Pipe grades shall be as required by the plans or as directed by the Engineer. Grades shall be met as specified by "Excavation, Trenching and Backfilling", Item No. 804. Precaution shall be taken to insure that the pipe barrel has uniform contact with the cushion material for its full length except at couplings. The couplings shall not be in contact with the original trench bottom prior to backfilling. Cushion material shall be placed under the coupling and compacted by hand prior to backfilling so as to provide an even bearing surface under the coupling and pipe. Changes in grade shall be made only at joints.
4. Cushion and Cushion Materials: Prior to placing pipe in a trench, the trench shall have been excavated to the proper depth as required in "Excavation, Trenching, and Backfilling", Item No. 804, of these specifications. Approved imported materials or Engineer approved materials selected from suitable fines derived from the excavation shall be smoothly worked across the entire width of the trench bottom to provide a supporting cushion.
5. Structures to Support Pipe: Where the bottom of a trench at subgrade consists of material that is notably unstable by the Engineer and cannot be removed and replaced with approved material which may be properly compacted in place to support the pipe. The Contractor shall also construct a foundation for the pipe consisting of piling, concrete beams, or other supports in accordance with plans prepared by the Engineer. Extra compensation will be allowed for the Contractor for the additional work done. In this event it shall be paid for in accordance with the provisions of ARTICLE VI. CONTRACT CHANGES of the General Conditions of the Contract.
6. Lowering Materials into Trench: Proper implements, tools, and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient completion of work. All pipe, fittings, valves, and hydrants shall be carefully lowered into the trench piece by piece, by means of a derrick, ropes, or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective

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coatings and linings. Under no circumstances shall water main materials, pipes, fittings, etc, be dropped or dumped into the trench. Extreme care shall be taken to avoid damaging polywrap films. No chains or slings shall be allowed unless the entire sling is wrapped with a protective nylon web sock.

7. Pipe Laying: Every precaution shall be taken to prevent foreign material from entering the pipe during installation. Under adverse trenching conditions, work stoppage for an extended period of time and/or otherwise required by the Engineer, a manufactured cap/plug is to be used to prevent any foreign type material entering. The cap/plug shall be left in place until it is connection to an adjacent pipe. The interior of each pipe shall be inspected for defects, and the pipe shall be rejected if any defects are found.

After placing a length of pipe in the trench, the jointed end shall be centered on the pipe already in place, forced into place, brought to correct line and grade, and completed in accordance with the requirements of these Specifications. The pipe shall be secured in place with approved backfill material tamped around it. Pipe and fittings which do not allow a sufficient and uniform space for joints shall be rejected by the Engineer and shall be replaced with pipe and fittings of proper dimensions. Precautions shall be taken to prevent dirt or other foreign matter from entering the joint space.

At times when pipe laying is halted, the open end of pipe in the trench shall be closed by a watertight plug or other means approved by the Engineer. Pipe in the trench which cannot temporarily be jointed shall be capped or plugged at each end to make it watertight. This provision shall apply during all periods when pipe laying is not in progress. Should water enter the trench, the seal shall remain in place until the trench is pumped completely dry. The Contractor shall provide all plugs and caps of the various sizes required.

8. Deviations in Line or Grade: Wherever obstructions not shown on the plans are encountered during the progress of the work and interfere to an extent that an alteration in the plan is required, the Engineer shall have the authority to change the plans and direct a deviation from the line and grade or to arrange with the owners of the structures for the removal, relocation, or reconstruction of the obstructions. Any deviation from the line shall be accomplished by the use of appropriate bends unless such requirement is specifically waived by the Engineer.

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Whenever it is necessary to deflect pipe from a straight line, the deflection shall be as directed by the Engineer and as described herein. In no case shall the amounts shown in Table 812-1, "Maximum Deflections of Ductile-Iron Pipe" for ductile-iron pipe and Table 812-2, "Maximum Deflections of Concrete-Steel-Cylinder Pipe" for concrete steel cylinder pipe, be exceeded.

9. Cutting Pipe: The cutting of pipe for inserting valves, fittings, or closure pieces shall be accomplished in a neat and workmanlike manner so as to produce a smooth end at right angles to the axis of the pipe. The recommendations of the pipe manufacturer shall be strictly followed by the Contractor. Only qualified and experienced workmen shall be used and, under no circumstances, shall a workman not equipped with proper safety goggles, helmet and all other required safety attire be permitted to engage in this work.

Asbestos-Cement (AC): No field cutting will be allowed on asbestos-cement pipe. Repairs to AC pipe shall be accomplished by removing one full joint of AC pipe and replacing with appropriate PVC or Ductile Iron pipe and fittings. Information about handling AC pipe may be obtained through the SAWS homepage at <http://www.saws.org>.

All cuts made on ductile-iron pipe shall be done with a torch or power saw. The cuts shall be made at right angles to the pipe axis and shall be smooth. The edges of the cut shall be finished smoothly with a hand or machine tool to remove all rough edges. The outside edge of pipe should be finished with a small taper at an angle of about 30 degrees.

To facilitate future repair work on water mains, no sections less than 3 feet in length between fittings shall be allowed.

10. Joint Assembly:
 - a. Rubber Ring Joints. The installation of pipe and the assembly of rubber ring joints for Ductile-Iron pipe, Concrete-Steel-Cylinder pipe, and Asbestos-Cement pipe shall conform to the pipe manufacturer's assembly instructions. The method of inserting spigot ends of pipe in bells or collars known as "stabbing" shall not be permitted with pipe larger than 6 inches in size. Spigot ends of pipe larger than 6" in size must be properly inserted in the joint by means of suitable pushing/pulling devices or an approved

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manufactures' method.

- b. Mechanical Couplings. Mechanical couplings shall be assembled and installed according to the standards recommended by the manufacturer.

Mechanical coupling consists of a cylindrical steel middle ring, two steel follower rings, two rubber compound gaskets, and a set of steel bolts. The middle ring is flared at each end to receive the wedge-shaped gasket which is compressed between the middle ring flare and the outer surface of the pipe by pressure exerted on the follower rings through the bolt circle.

Prior to the installation of the mechanical coupling, the pipe ends shall be cleaned by wire brush or other acceptable method to provide a smooth bearing surface for the rubber compression gasket. The pipe shall be marked to align the end of the coupling which will center it over the joint. After positioning, the nuts shall be drawn up finger tight. Uniform pressure on the gaskets shall be applied by tightening alternate bolts on the opposite side of the circle in incremental amounts. Final tensioning shall be accomplished with a torque wrench and in a manner similar to the tightening procedure. The coupling shall then be left undisturbed for 24 hours to allow the gaskets to "pack in." Final torque check shall then be made prior to coating and wrapping the joint. Table 812-3, "Torque for Mechanical Couplings", sets forth the proper torque for various sized mechanical couplings and is included for the convenience of the Contractor.

- c. Restraint Joints. Restraint Joints shall be installed as shown on the plans or as directed by the Engineer. Installation shall conform to the manufactures' recommendation.

11. Abandonment of Old Mains. The Contractor shall accomplish all cutting, capping, plugging, and blocking necessary to isolate those existing mains retained in service from those abandoned. The open ends of abandoned mains and all other openings or holes in such mains occasioned by cutting or removal of outlets shall be blocked off by manually forcing cement grout or concrete into and around the openings in sufficient quantity to provide a permanent substantially watertight seal. Abandonment of old, existing water mains will be considered subsidiary to the work required, and no direct payment will be made.

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12. Abandoned Valves. Valves abandoned in the execution of the work shall have the valve box and extension packed with sand to within 8 inches of the street surface. The remaining 8 inches shall be filled with 2500 psi concrete or an equivalent sand-cement mix and finished flush with the adjacent pavement or ground surface. The valve covers shall be salvaged and returned to the Owner.

812.4 MEASUREMENT: Water main installed will be measured by the linear foot for each size and type as follows:

Measurements will be from the center line intersection of runs and branches of tees to the end of the valve of a dead end run.

Measurements will also be between the center line intersection of runs and branches of tees. Where the branch is plugged for future connection, the measurement will include the entire laying length of the branch or branches of the fitting.

The measurement of each line of pipe of each size will be continuous and shall include the full laying lengths of all fittings and valves installed between the ends of such line except that the laying length of reducers will be divided equally between the connected pipe sizes. Lines leading to a tapping connection with an existing main will be measured to the center of the main tapped.

812.5 PAYMENT: Payment for water main installed will be made at the unit price bid per linear foot of pipe of the various sizes installed by the open cut method. Such payment shall also include excavation, selected embedment material, backfill, compaction, polyethylene sleeve where required, hauling and disposition of surplus excavated material.

Removed AC pipe shall be manifested and disposed in accordance with standards that may be obtained through the SAWS homepage at <http://www.saws.org>. Payment for disposal of AC pipe will be made at the unit price bid.

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TABLE 812-1					
MAXIMUM DEFLECTIONS OF DUCTILE-IRON					
Nominal Pipe Diameter	Maximum Deflection Angle	Maximum Deflection In Inches		Approximate Radius Of Curve In Inches	
		18 Ft.	20 Ft.	18 Ft.	20 Ft.
6"	4°25'	16.7	18.5	234	260
8"	3°51'	14.6	16.2	268	297
10"	3°42'	14.0	15.5	279	310
12"	3°08'	11.9	13.2	327	363
16"	2°21'	8.8	9.7	440	488
20"	1°55'	7.2	8.0	540	600
	1°35'	6.0	6.7	648	720

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TABLE 812-2					
MAXIMUM DEFLECTIONS OF CONCRETE STEEL CYLINDER					
Nominal Pipe Diameter	Maximum Deflection Angle	Maximum Deflection In Inches		Approximate Radius Of Curve In Inches	
		16 Ft.	20 Ft.	16 Ft.	20 Ft.
16"	2°20'	--	9.8	--	500
20"	1°52'	--	7.8	--	600
24"	1°34'	--	6.6	--	750
30"	1°16'	--	5.3	--	900
36"	1°02'	--	4.3	--	1100
42"	0°54'	--	3.8	--	1300
48"	0°47'	2.6	--	1170	--
54"	0°44'	2.5	----	1237	--
60"	0°54'	3.0		1024	-

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TABLE 812-3		
TORQUE FOR MECHANICAL COUPLINGS		
Coupling Size	Bolt Diameter	Torque
2" to 24"	5/8"	75 ft-lb
2" to 24"	3/4"	90 ft-lb
30" & 36" (1/4" x 7" Middle Rings)	5/8"	65 ft-lb
30" thru 36" (3/8" & heavier Middle Rings)	5/8"	70 ft-lb
30" to 48"	3/4"	80 ft-lb
48" to 72"	3/4"	70 ft-lb



