

San Antonio Water System Standard Specifications for Construction

ITEM NO. 841

Water and Reclaimed Water Mains Hydrostatic Testing Operations

841.1 DESCRIPTION: This item shall consist of hydrostatic testing operations of water mains and reclaimed water mains in accordance with these specifications.

841.2 REFERENCED STANDARDS: Reference standards cited in this Specification Item No. 841 refer to the current reference standard published at the time of the latest revision.

1. San Antonio Water System (SAWS):
 - a. Specifications for Water and Sanitary Sewer Construction
 - b. SAWS Materials Specifications
2. City of San Antonio (COSA) Standard Specification for Construction
3. Texas Commission of Environmental Quality (TCEQ)
 - a. Chapter 210 Use of Reclaim Water and
 - b. Chapter 290 Public Water Systems
 - c. Chapter 217 Design Criteria for Domestic Wastewater Systems
 - d. Chapter 213 Edwards Aquifer

841.3 SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawing, and certifications. All submittals shall be in accordance with Engineer's requirements and submittals shall be approved prior to delivery.

841.4 MATERIALS: The materials for hydrostatic testing operations installation and adjustment shall conform to the appropriate specifications contained within the latest revision of SAWS' Material Specifications.

841.5 CONSTRUCTION:

1. General:
 - a. Flushing: Immediately upon completion of water main work, the Contractor shall flush all mains affected by the scope of the work. This flushing shall consist of completely filling sections of main between valves and then displacing such initial volumes of water by introducing clear water from existing facilities into and through the main to the point of discharge from the main being flushed. The flow-through shall continue until it is determined all dust, debris, or foreign matter that may have entered during pipe laying operations has been flushed out. All new mains shall then be isolated prior to and during testing.

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- b. For flushing and testing of reclaimed water main with reclaimed water, water must be disposed of in accordance with TCEQ Chapter 210 Use of Reclaimed Water.
 - c. To avoid damage to pavement and inconvenience to the public, fire hoses shall be used to direct flushing water from the main into suitable drainage channels or sewers. The Contractor is to coordinate with the Inspector prior to flushing.
 - d. Cross Contamination is to be avoided.
 - e. Operation of Valves: No valve in the Owner's water distribution system shall be operated by the Contractor without prior permission of the Inspector. The Contractor shall notify the Inspector when a valve is to be operated and shall only operate the valve in the presence of the Inspector.
2. Hydrostatic Test: All new mains shall be hydrostatically field tested at a maximum test pressure of 160 psi before acceptance by the Engineer or Inspector or where designated as a SAWS High Pressure Area all mains shall be hydrostatically tested at a maximum test pressure of 200 psi.
- a. It is the intent of these Specifications that all joints be watertight and that all joints which are found to leak by observation during any test shall be made watertight by the Contractor.
 - b. When repairs are required, the hydrostatic field test shall be repeated until the pipe installation conforms to the specified requirements and is acceptable to the Engineer/Inspector.
 - c. The Contractor shall insure that the Engineer/Inspector be present for the duration of the pressure test.
3. Test Procedures: After the new main has been laid and backfilled as required in Specification Item No. 804 "Excavation, Trenching, and Backfill," (but prior to chlorination and replacement of pavement), it shall be filled with water for a minimum of 24 hours and then subjected to a hydrostatic pressure test.
- a. The specified test pressure shall be supplied by means of a pump connected to the main in a satisfactory manner.
 - b. The pump, pipe connection, and all necessary appurtenances including gauges and meters measuring (gallons) shall be furnished by the Contractor.
 - c. Unless otherwise specified, the Owner will furnish water for filling lines and conducting tests from existing mains.
 - d. Before applying the specified test pressure, all air shall be expelled from the main.
 - e. To accomplish this, taps shall be made, if necessary, at the points of highest elevation and afterwards tightly plugged at no cost to the Owner.

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- f. At intervals during the test, the entire route of the new main shall be inspected to locate any leaks or breaks.
 - 1. If any are found, the test shall be stopped and the main repaired, and the main test shall be repeated until satisfactory results are obtained.
- g. The hydrostatic test shall be made so that the maximum pressure at the lowest point does not exceed the specified test pressure.
- h. The duration of each pressure test shall be a minimum of 4 hours for new mains in excess of 1000 linear feet and a minimum of 1 hour for new mains less than 1000 linear feet after the main has been brought up to test pressure.
- i. The test pressure shall be measured by means of a tested and properly calibrated pressure gauge acceptable to the Engineer/Inspector.
- j. All pressure tests shall be continued until the Inspector is satisfied that the new main meets the requirements of these Specifications.
- k. Should any test of pipe in place disclose leakage greater than that listed in Table 841-1 or 841-2, "Hydrostatic Test Leakage Allowances," as applicable, the Contractor shall, at his own expense, locate and repair the main until the leakage is within the specified allowance.
- l. All pipelines with welded joints shall have zero leakage.
- m. Leakage is defined as the quantity of water supplied into the newly laid main, or any valved section of it, necessary to maintain the specified leakage test pressure after the main has been filled with water and the air expelled.
- n. DD-841 Drawing Series includes a schematic showing the arrangement of the test apparatus as well as the detailed procedure for conducting the hydrostatic field test.

841.6 MEASUREMENT: Water and Reclaimed Water Main Hydrostatic Pressure Test shall be measured by the unit of each required successful test conducted.

841.7 PAYMENT: Payment for "Water and Reclaimed Water Main Hydrostatic Pressure Test" will be made at the unit price bid for each required successful test. Such payment shall also include all pipe, valves, fittings, pumping equipment, pressure gauge, and other required apparatus incidental to conduct the test.

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TABLE 841-1														
HYDROSTATIC TEST LEAKAGE ALLOWANCES (MAXIMUM) @ 150 PSI														
Nominal Diameter & Type Pipe	ALLOWABLE LEAKAGE IN GALLONS PER HOUR (GPH)*													
	100 L.F.	200 L.F.	300 L.F.	400 L.F.	500 L.F.	600 L.F.	700 L.F.	800 L.F.	900 L.F.	1000 L.F.	2000 L.F.	3000 L.F.	4000 L.F.	5000 L.F.
6" DI**	0.11	0.22	0.33	0.44	0.55	0.66	0.77	0.88	0.99	1.10	2.20	3.30	4.40	5.50
8" DI**	0.15	0.29	0.44	0.59	0.71	0.88	1.03	1.18	1.32	1.47	2.94	4.41	5.88	7.35
12" DI**	0.22	0.44	0.66	.088	1.10	1.32	1.54	1.76	1.98	2.20	4.40	6.60	8.80	11.00
16" DI**	0.29	0.59	0.88	1.18	1.47	1.76	2.06	2.35	2.65	2.94	5.88	8.82	11.76	14.70
20" DI**	0.39	0.74	1.10	1.47	1.84	2.21	2.55	2.94	3.31	3.68	7.63	11.04	14.72	18.40
20" CSC	0.08	0.16	0.24	0.32	0.40	0.47	0.55	0.63	0.71	0.79	1.58	2.37	3.16	3.95
24" DI**	0.44	0.88	1.32	1.76	2.21	2.65	3.09	3.53	9.97	4.41	8.82	13.23	17.64	22.05
24" CSC	0.1	0.19	0.29	0.38	0.48	0.57	0.67	0.76	0.86	0.95	1.90	2.85	3.80	4.75
30" DI**	0.55	1.1	1.66	2.21	2.76	3.31	3.86	4.42	4.97	5.52	11.04	16.56	22.08	27.60
30" CSC	0.12	0.24	0.35	0.47	0.59	0.71	0.83	0.94	1.06	1.18	2.36	3.54	4.72	5.90
36" DI**	0.66	1.32	1.99	2.65	3.31	3.97	4.63	5.3	5.96	6.62	13.24	19.86	26.48	33.10
36" CSC	0.14		0.28	0.57	0.71	0.85	0.99	1.14	1.28	1.42	2.84	4.26	5.68	7.10
42" DI**	0.77	1.54	2.32	3.09	3.86	4.63	5.4	6.18	6.95	7.72	15.44	22.16	30.88	38.60
42" CSC	0.17	0.33	0.5	0.66	0.83	1	1.16	1.33	1.49	1.66	3.32	4.98	6.64	8.30
48" DI**	0.88	1.77	2.65	3.53	4.42	5.3	6.18	7.06	7.95	8.83	17.66	26.16	35.32	44.15
48" CSC	0.19	0.38	0.57	0.76	0.95	1.13	1.32	1.51	1.7	1.89	3.78	4.98	6.64	8.30
54" CSC	0.21	0.42	0.63	0.84	1.05	1.26	1.47	1.68	1.89					
60" CSC	0.24	0.48	0.72	0.96	1.2	1.44	1.68	1.92	2.16					

* PVC pipe shall be tested to DI pressures. GPH for CSC Pipe are manufacturer's maximum.

** DI pipe includes mechanical and push-on joints.

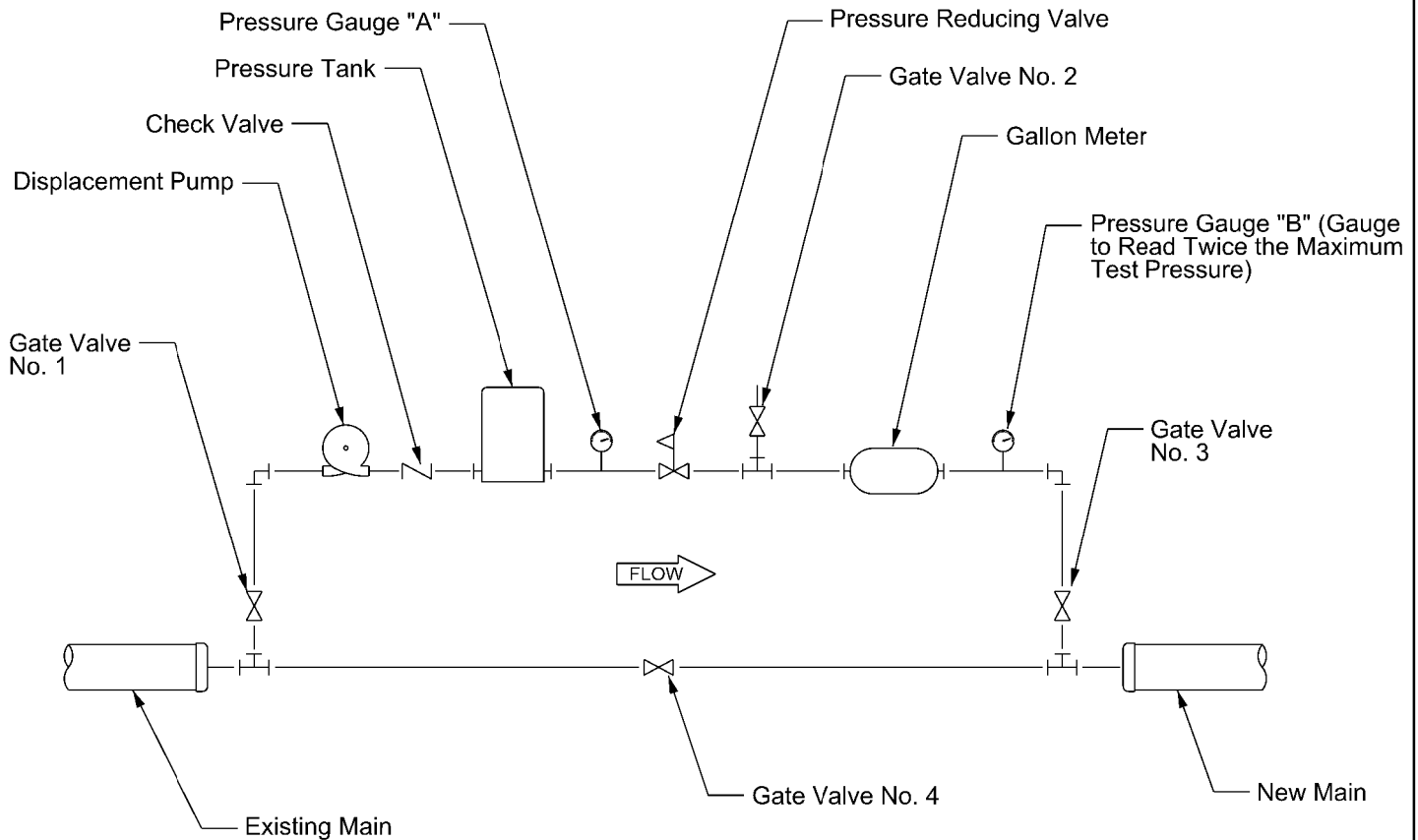
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TABLE 841-2										
Hydrostatic Test Leakage Allowances (Maximum) @ 200 PSI										
Nominal Pipe Diameter	Allowable Leakage in Gallons Per Hour (GPH)*									
	100 L.F.	200 L.F.	300 L.F.	400 L.F.	500 L.F.	600 L.F.	700 L.F.	800 L.F.	900 L.F.	1000 L.F.
6" DI**	0.13	0.25	0.38	0.51	0.64	0.6	0.89	1.02	1.14	1.27
8" DI**	0.17	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.7
12" DI**	0.26	0.51	0.77	1.02	1.28	1.53	1.79	2.04	2.3	2.55
16" DI**	0.34	0.68	1.02	1.36	1.7	2.04	2.38	2.72	3.06	3.4
20" DI**	0.43	0.85	1.28	1.7	2.13	2.55	2.98	3.4	3.83	4.25
20" CSC	0.08	0.16	0.24	0.32	0.4	0.47	0.55	0.63	0.71	0.79
24" DI**	0.51	1.02	1.53	2.04	2.55	3.06	3.57	4.08	3.59	5.1
24" CSC	0.1	0.19	0.29	0.38	0.48	0.57	0.67	0.76	0.86	0.95
30" DI**	0.64	1.27	1.91	2.55	3.19	3.82	4.46	5.1	5.73	6.37
30" CSC	0.12	0.24	0.35	0.47	0.59	0.71	0.83	0.94	1.06	1.18
36" DI**	0.76	1.53	2.29	3.06	3.82	4.58	5.35	6.11	6.88	7.64
36" CSC	0.14	0.28	0.43	0.57	0.71	0.85	0.99	1.14	1.28	1.42
42" DI**	0.89	1.78	2.68	3.57	4.46	5.35	6.24	7.14	8.03	8.92
42" CSC	0.17	0.33	0.5	0.66	0.83	1	1.16	1.33	1.49	1.66
48" DI**	1.02	2.04	3.06	4.08	5.1	6.11	7.13	8.15	9.17	10.19
48" CSC	0.19	0.38	0.7	0.76	0.95	1.13	1.32	1.51	1.7	1.89
54" CSC	0.21	0.42	0.63	0.84	1.05	1.26	1.47	1.68	1.89	2.1
60" CSC	0.23	0.46	0.69	0.92	1.15	1.38	1.61	1.84	2.07	2.3

* PVC pipe shall be tested to DI pressures. GPH for CSC pipe are manufacturer's maximum.

** DI pipe includes mechanical and push-on joints.

-End of Specification-



Step One: Close Gate Valve No. 3 and Gate Valve No. 4 and open Gate Valve No. 1 and Gate Valve No. 2 and fill test piping to system pressure. All test equipment and joints on test equipment must be watertight. If leakage occurs, the test should not be continued until appropriate repairs are made.

Step Two: Close Gate Valve No. 1, Gate Valve No. 2 and Gate Valve No. 3. Open Gate Valve No. 4 and fill new main to system pressure. All air should be expelled from the new main at this time.

Step Three: Close Gate Valve No. 4 and open Gate Valve No. 1 and Gate Valve No. 2, leaving Gate Valve No. 3 closed. Start pump and with flow through Gate Valve No. 2, set the maximum test pressure on the down stream side of the pressure reducing valve. Pressure Gauge "B" should read maximum test pressure in pounds per square inch.

Step Four: Close Gate Valve No. 2 and open Gate Valve No. 3, leaving Gate Valve No. 1 open and Gate Valve No. 4 closed. Pump pressure tank to a pressure 20% greater than the maximum test pressure and maintain a positive head on the pressure reducing valve during the test period. Pressure Gauge "A" should always read higher than Pressure Gauge "B" during the test period. When Pressure Gauge "B" reaches maximum test pressure, record reading on gallon meter and start timing the hydrostatic pressure test. After the specified time has passed, record reading on gallon meter and compare water loss with Table 841-1 or Table 841-2 "Hydrostatic Test Leakage Allowances," as appropriate, in the San Antonio Water System - Standard Specifications For Water Works Construction.

HYDROSTATIC FIELD TEST EQUIPMENT SCHEMATIC AND FIELD TESTING SEQUENCE

PROPERTY OF SAN ANTONIO WATER SYSTEM SAN ANTONIO, TEXAS	HYDROSTATIC FIELD TEST EQUIPMENT SCHEMATIC AND FIELD TESTING SEQUENCE	APPROVED	REVISED
			AUG 2019
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