

SECTION 1431

HYDROSTATIC PRESSURE TESTING OF WATER FACILITIES

1431.0100 GENERAL

1431.0101 Description of Work. The work under this section shall consist of furnishing all labor, materials, and equipment required to hydrostatically test water facilities in accordance with the requirements of these specifications. The contractor shall provide a calibrated pump suction tank for the test pressure pump. Water line to be tested shall pass a pretest conducted by the contractor before the official test is scheduled.

1431.0200 PRODUCTS

1431.0300 EXECUTION

1431.0301 General. All new waterline installations, including services and reclaimed waterlines, shall be subjected to a hydrostatic pressure test. In the event that the new waterline requires connection to an existing line for the purpose of filling the new line with water, the connection between the existing and new line shall be broken and the new line plugged prior to commencing the test, unless prior approval is received from the Engineer.

Hydrostatic pressure testing of all waterlines, including reclaimed water lines, shall be conducted with potable water only, air testing is not allowable.

The contractor shall furnish all material, equipment, and labor necessary to perform the hydrostatic pressure test with the exception of the pressure gauge which shall be provided by the Engineer.

Hydrostatic pressure testing shall be conducted upon completion of backfill and installation of thrust restraints.

Hydrostatic testing may be conducted against existing valves upon written acceptance of the Engineer. However, it is understood by the contractor that such acceptance shall in no way relieve the contractor of responsibility for damage to lines, valves, or appurtenances caused by the test. Further, the Agency assumes no risk, liability, or obligation of any kind regarding the condition of existing facilities nor any connection the contractor may make to said facilities. Any damage to new or existing water facilities resulting from the hydrostatic testing shall be repaired at the contractor's sole cost.

All sections of newly installed waterline shall be inspected to ensure that all entrapped air has been completely expelled from the pipe, valves, and hydrants. If permanent air release outlets are not located at all high points, the contractor shall install additional air release ports as may be necessary or as directed by the Engineer.

These components shall be considered incidental to the construction and testing of the waterline. For concrete cylinder pipe, the contractor shall specify and require the pipe supplier to include an appropriate number of outlets for the removal of trapped air. The location of the outlets shall be shown on the shop drawings. The cost of these outlets shall be considered incidental to the cost of the pipe and testing.

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The test pump may be either hand or motor driven. The test pump shall be connected to the waterline under test only through a tap into the main.

1431.0302 Hydrostatic Testing. Hydrostatic testing shall be conducted only after all new work has been installed. Hydrostatic testing shall be conducted only in the presence of the Engineer. The hydrostatic test pressures specified herein shall be maintained for a period of two hours.

Unless otherwise noted in the special specifications, on the plans or as directed by the Engineer, test pressures shall conform with the following table:

MINIMUM HYDROSTATIC TEST PRESSURE REQUIREMENTS

Class of Pipe	Lowest Elevation Minimum Test Pressure	Highest Elevation Minimum Test Pressure
Class 150	200 p.s.i.	175 p.s.i.
Class 200	200 p.s.i.	175 p.s.i.

The test pressure shall not vary by more than ± 5 psi during the duration of the test.

Leakage shall be defined as the quantity of water that must be supplied into the newly installed waterline, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and all air expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

No pipe installation shall be accepted if the leakage exceeds that determined by the following formula for ductile iron pipe:

$$L = \frac{SD\sqrt{P}}{133,200}$$

Where:

L = Maximum allowable leakage, in gallons per hour

S = Total length of pipe tested, in feet

D = Nominal diameter of pipe, in inches

P = Average test pressure during the leakage test, in pounds per square inch (gauge)

Allowable leakage for ductile iron pipe, at test pressures noted in Table 1431-1.

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TABLE 1431-1 Ductile Iron

Allowable Leakage per 1000 ft of Pipeline*--gallons per hour(gph)

Avg. Test Pressure psi	Nominal Pipe Diameter – in.															
	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48	54
450	0.48	0.6	0.9	1.2	1.5	1.9	2.2	2.5	2.8	3.1	3.8	4.7	5.7	6.6	7.6	8.6
400	0.45	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.6	4.5	5.4	6.3	7.2	8.1
350	0.42	0.5	0.8	1.1	1.4	1.6	1.9	2.2	2.5	2.8	3.3	4.2	5.0	5.9	6.7	7.5
300	0.39	0.5	0.7	1.0	1.3	1.5	1.8	2.0	2.3	2.6	3.1	3.9	4.6	5.4	6.2	7.0
275	0.37	0.5	0.7	1.0	1.2	1.4	1.7	1.9	2.2	2.4	2.9	3.7	4.4	5.2	5.9	6.7
250	0.36	0.4	0.7	0.9	1.1	1.4	1.6	1.9	2.1	2.3	2.8	3.5	4.2	4.9	5.7	6.4
225	0.34	0.4	0.6	0.9	1.1	1.3	1.5	1.8	2.0	2.2	2.7	3.3	4.0	4.7	5.4	6.0
200	0.32	0.4	0.6	0.8	1.0	1.2	1.4	1.7	1.9	2.1	2.5	3.1	3.8	4.4	5.0	5.7
175	0.30	0.4	0.5	0.8	0.9	1.1	1.3	1.5	1.7	1.9	2.3	2.9	3.5	4.1	4.7	5.3
150	0.28	0.3	0.5	0.7	0.9	1.1	1.2	1.4	1.6	1.8	2.2	2.7	3.3	3.8	4.4	4.9
125	0.25	0.3	0.5	0.6	0.8	1.0	1.1	1.3	1.5	1.6	2.0	2.5	3.0	3.5	4.0	4.5
100	0.23	0.3	0.4	0.6	0.7	0.9	1.0	1.2	1.3	1.5	1.8	2.2	2.7	3.1	3.6	4.0

- If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

Minimum Hydrostatic Test Pressure Requirements
Nominal Pipe Diameter in Inches

4"	6"	8"	12"
0.43	0.64	0.85	1.28

No pipe installation shall be accepted if the leakage exceeds that determined by the following formula for PVC pipe:

$$L = \frac{ND\sqrt{P}}{7400}$$

Where:

- L = The allowable leakage, gallons per hour (gph)
- N = The number of joints in the length of pipeline tested
- D = The nominal diameter of pipe
- P = The average test pressure during the leakage test, in pounds per square inch(gauge)

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Allowable leakage for polyvinylchloride pipe, at test pressures noted in Table 1431-2. HDPE Testing will be in accordance with Section 1403.0302 Paragraph "C".

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TABLE 1431-2 Polyvinylchloride

Allowable Leakage per 1000 ft of Pipeline*--gallons per hour(gph)

Avg. Test Pressure psi	Nominal Pipe Diameter – in. (mm)												
	(kPa)	4 (100)	6 (160)	8 (200)	10 (250)	12 (300)	14 (350)	16 (400)	18 (450)	20 (500)	24 (600)	30 (760)	36 (915)
300	(2,070)	0.47	0.70	0.94	1.17	1.40	1.64	1.87	2.11	2.34	2.81	3.51	4.21
275	(1,900)	0.45	0.67	0.90	1.12	1.34	1.57	1.79	2.02	2.24	2.69	3.36	4.03
250	(1,720)	0.43	0.64	0.85	1.07	1.28	1.50	1.71	1.92	2.14	2.56	3.21	3.85
225	(1,550)	0.41	0.61	0.81	1.01	1.22	1.42	1.62	1.82	2.03	2.49	3.04	3.65
200	(1,880)	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29	2.87	3.44
175	(1,210)	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15	2.68	3.22
150	(1,030)	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99	2.48	2.98
125	(860)	0.30	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81	2.27	2.72
100	(690)	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62	2.03	2.43
75	(520)	0.23	0.35	0.47	0.59	0.70	0.82	0.94	1.05	1.17	1.40	1.76	2.11
50	(340)	0.19	0.29	0.38	0.48	0.57	0.67	0.76	0.86	0.96	1.15	1.43	1.72

- If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.
- To obtain leakage in liters per hour, multiply the values in the table by 3.72.

Acceptance shall be determined on the basis of allowable leakage. Should any test of installed pipe disclose leakage of a greater quantity than that specified in this subsection, the contractor shall, at no additional cost to the Agency, locate and make repairs approved and inspected by the Engineer, until the leakage falls below the maximum allowable.

Retesting of segments shall be with the identical test boundaries used for the initial test.

All visible leaks shall be repaired by the contractor regardless of the amount of leakage.

HDPE Testing will be in accordance with Section 1403.0302 Paragraph “C”.