Designation: C1618 – 13

Standard Test Method for Concrete Sanitary Sewer Pipe by Negative (Vacuum) or Positive Air Pressure[1]

This standard is issued under the fixed designation C1618; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers procedures for testing of precast concrete pipe sections, prior to delivery, where maximum field leakage rates are specified.

1.2 Tests described in this standard are intended to be used at the point of manufacture of the concrete pipe and are not intended for testing installed pipe (for field tests see Practices C924, C969, and C1214). The user of this specification is advised that individual or multiple pipe sections may be tested for the purpose of testing the pipe barrel and additionally the joints in straight alignment when multiple pipe sections are tested.

1.3 Test times are based on leakage rates and therefore are proportional only to the pipe diameter and are constant for any length of test pipe or pipeline.

1.4 Test times tabulated and the rate of air loss in this standard are based on successful testing of installed pipelines. However, since air and water have different physical properties, retests of some pipelines not meeting field air tests have been successful when tested with water. The leakage rates of 0.0017 CFM/ft^2 and 0.0003 CFM/ft^2, were determined empirically as the maximums for pipe to meet the 50 and 200 gal/(in. of internal diameter) (mile of sewer) (24h) test rates, respectively.

1.5 The values stated in inch-pound units are to be regarded as standard. No other units of measurement are included in this standard.

NOTE 1—The availability of this test procedure for concrete pipe varies from location to location. Check with local supplier(s) for availability and recommendations.

1.6 *This standard does not purport to address all the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish the appropriate safety and health practices and to determine the applicability of regulatory limitations prior to its use.* See Section 6 for specific safety precautions.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C822 Terminology Relating to Concrete Pipe and Related Products

C924 Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method

C969 Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines

C1214 Test Method for Concrete Pipe Sewerlines by Negative Air Pressure (Vacuum) Test Method

3. Terminology

3.1 *Definitions*—For definitions of terms related to precast concrete pipe, see Terminology C822.

4. Summary of Test Method

4.1 The pipe to be tested shall be sealed at the outer ends with suitable airtight bulkheads. The manufacturer shall choose to use either low-pressure air or negative pressure air (vacuum) test methods to evaluate the condition of the pipe before delivery. The change in the internal pressure during a specified time is used to determine the acceptability of the pipe.

5. Significance and Use

5.1 This is a quality control test performed at the manufacturing plant to establish that the finished, shippable pipe meets the leakage limits stated in the specifications.

6. Safety Precautions

6.1 The user of this specification is advised of the following:

6.1.1 This test may be dangerous if a pipe is not prepared properly and proper procedures are not followed.

6.1.2 No one should be allowed near the ends of the pipe or test bulkheads during the test.

[1] This test method is under the jurisdiction of ASTM Committee C13 on Concrete Pipe and is the direct responsibility of Subcommittee C13.09 on Methods of Test.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

7. Apparatus

7.1 For positive air pressure test, one bulkhead shall include a remote controlled valve that will release the internal test pressure.

7.2 For the low-pressure air test, tie rods or an external test frame that is designed to resist the force caused by internal air pressure shall be used to restrain the bulkheads. The low-pressure air test assembly shall be protected by a relief valve set to release at a pressure no greater than 6 psi. The bulkheads used for negative pressure air tests do not require external restraints.

7.3 The pressure or vacuum pumps shall have adequate capacity to obtain the required test pressure.

7.4 The test pressure shall be measured with a gage or manometer that is precise enough to measure the increments of pressure change specified by this standard.

7.5 The pressure measuring devices shall be located in a safe area where they can be observed without danger to test personnel.

8. Preparation of the Pipe

8.1 Allow the test pipe to cool to ambient air temperature.

NOTE 2—A wetted pipe is desirable and will produce more consistent test results. Air may pass through the walls of dry pipe.

8.2 The pipe joint shall be visually inspected for smoothness. The dimensions of the gasket-bearing surfaces shall be verified to be within tolerances that were established in the design criteria.

8.3 Test bulkheads shall be installed on the outer ends of the pipe section(s).

8.4 Longitudinal tie rods or an external test frame shall be used to secure bulkheads used for low-pressure air tests. Review safety precautions found in Section 6.

9. Procedure for Negative Air Pressure (Vacuum) Test

9.1 Negative air pressure tests are intended for use on pipe 96 in. in diameter and smaller.

9.2 A vacuum pump shall be used to increase the negative pressure of the bulkheaded pipe until the manometer reads approximately 8 in. of mercury. Close off the vacuum source.

9.3 When the negative pressure and temperature have stabilized and the negative pressure is less than the starting test pressure of 7 in. of mercury, begin the test by allowing the negative pressure to increase to 7 in. of mercury. At that point, the recording of test time shall be initiated. If the change in pressure is no greater than 0.1083 in. of mercury in the test time specified in Table 1, the pipe is acceptable. (**Warning—** Mercury has been designated by EPA and many state agencies as a hazardous material that can cause central nervous system, kidney and liver damage. Mercury, or its vapor, may be hazardous to health and corrosive to materials. Caution should be taken when handling mercury and mercury containing products. See the applicable product Material Safety Data Sheet (MSDS) for details and EPA's website—http://www.epa.gov/mercury/faq.htm—for additional information. Users should be aware that selling mercury and/or mercury containing products into your state may be prohibited by state law.)

TABLE 1 Test Times For Negative Pressure Air Test, Seconds

NOTE 1—A pressure increase of 0.1083 in. Hg was chosen because it corresponds to a change in water column height of approximately l ½ in. (1.4725 in. exactly) and a change in manometer oil column height (specific gravity 2.945) of ½ in. Test times shall be increased proportionally if larger changes in the height of the manometer column are required.

NOTE 2—The two leakage rates shown, which were used in calculating the test times, were chosen based on two generally accepted field air and vacuum test criteria.

NOTE 3—Test times are based on leakage rates and therefore are proportional only to the pipe diameter and are constant for any length of test pipe or pipeline.

Pipe Size, in.	0.0017CFM/ft^2	0.003 CFM/ft^2
12	32	18
15	41	23
18	49	28
21	57	32
24	64	36
27	73	41
30	81	46
33	90	51
36	97	55
42	114	64
48	128	72
54	146	82
60	162	92
66	180	102
72	194	110
78	209	118
84	226	128
90	243	138
96	256	144

NOTE 3—The manufacturer is not prohibited from increasing the test pressure above the required 7 in. of mercury and reducing the test times found in Table 1 proportional to the increase in test pressure. The allowable change in pressure of 0.1083 in. of mercury must be maintained.

10. Procedure for Positive Air Pressure Test

10.1 Positive pressure air tests are intended to be used on pipe 24 in. in diameter and smaller.

10.2 A pressure pump shall be used to increase the internal air pressure of the bulkheaded pipe until the pressure gage reads approximately 4 psi. Close off the air pressure source.

10.3 When the pressure and temperature have stabilized and the pressure is above the starting test pressure of 3.5 psi, begin the test by allowing the pressure to drop to 3.5 psi. At that point, the recording of the test time shall be initiated. If the drop in pressure is no greater than 0.0532 psi in the test time specified in Table 2, the pipe is acceptable.

11. Precision and Bias

11.1 No justifiable statement is presently capable of being made either on the precision or bias of this procedure since the test results merely state whether there is conformance to criteria for the success specified. Due to sealing effects of ground water and internal flow on the pipeline, the test conditions and results are not reproducible.

TABLE 2 Test Times for Positive Air Pressure Test, Seconds

NOTE 1—A pressure decrease of 0.0532 psi was chosen because it corresponds to a change in water column height of approximately 1 ½ in. (1.4725 in. exactly) and a change in manometer oil column height (specific gravity 2.945) of ½ in. Test times shall be increased proportionally if larger changes in the height of the manometer column are required.

NOTE 2—The two leakage rates shown, which were used in calculating the test times, were chosen based on two generally accepted field air and vacuum test criteria.

NOTE 3—Test times are based on leakage rates and therefore are proportional only to the pipe diameter and are constant for any length of test pipe or pipeline.

Pipe Size, in.	0.0017CFM/ft^2	0.003 CFM/ft^2
12	32	18
15	41	23
18	49	28
21	57	32
24	64	36

12. Repairs

12.1 This specification does not prohibit concrete pipe sections that fail the air leakage test from being repaired and retested.