Designation: C1214 – 19

Standard Test Method for Concrete Pipe Sewerlines by Negative Air Pressure (Vacuum) Test Method[1]

This standard is issued under the fixed designation C1214; 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 concrete pipe sewerlines, when using the negative air pressure (vacuum) test method to demonstrate the integrity of the installed material and the construction procedures. This test method covers testing of 4 to 36-in. diameter circular concrete pipe sewerlines utilizing gasketed joints.

NOTE 1—The user of this test method is advised that methods described herein may also be used as a preliminary test to enable the manufacturer or installer to demonstrate the condition of sewer pipe prior to delivery or backfill. Minimum test times presented in Table 1 are for pipelines. Holding times for testing an individual pipe may have to be increased to allow for the accumulation of leakage when the tested pipe are incorporated into a continuous pipeline.

NOTE 2—The user of this test method is advised that the negative air pressure (vacuum) test criteria presented in this test method are similar to those in general use. The test and criteria have been used widely and successfully in testing smaller diameter pipe. Larger pipe will be accepted more conveniently by visual inspection and individual joint testing.

NOTE 3—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.

1.2 This test method is the inch-pound companion to Test Method C1214M; therefore, no SI equivalents are presented in the test method.

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

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C822 Terminology Relating to Concrete Pipe and Related Products

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

3. Terminology

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

4. Summary of Test Method

4.1 The sewerline to be tested is plugged. Air is removed from the plugged line by a vacuum pump or vacuum reservoir. The amount of vacuum loss is used to determine the acceptability of the sewerline.

5. Significance and Use

5.1 This is not a routine test. The values recorded are applicable only to the sewer being tested and at the time of testing.

6. Safety Precautions

6.1 **Warning—**The user of this test method is advised that this test may be dangerous if a line is not prepared properly and proper procedures are not followed.

6.2 Access manholes or structures must be ventilated and air quality continuously monitored.

6.3 No one shall be allowed in or near the manholes during testing.

7. Preparation of the Sewerline

7.1 Where practical, clean the line prior to testing, wet the pipe surface, and eliminate debris.

NOTE 4—The user of this test method is advised that a wetted exterior pipe surface is desirable and will produce more consistent test results. Air

[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.

TABLE 1 Minimum Test Time

Nominal Pipe Size, in.	T (Time), min/100 ft	Nominal Pipe Size, in.	T (Time), min/100 ft
4	0.3	21	3.0
6	0.7	24	3.6
8	1.2	27	4.2
10	1.5	30	4.8
12	1.8	33	5.4
15	2.1	36	6.0
18	2.4		

may pass through the walls of dry pipe. This can be overcome by wetting the pipe. Usually, moisture absorbed from the backfill is sufficient to cope with this situation. If the problem persists, segmental testing of the line will establish if there is a significant leak.

7.2 Plug all pipe outlets including laterals. Review safety precautions in Section 6.

8. Procedure

8.1 Determine the test time for the sewerline to be tested by using Table 1. Table 1 has been established using the criteria specified in Table 2 and the formulas contained in the Appendixes. The test time is the time required for the vacuum to drop from 7 to 5 in. of mercury. (**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.)

NOTE 5—To provide satisfactory test results, the vacuum pump shall be capable of evacuating the sewer test section in the required test time, or less, as determined by 8.1. The pump capacity required to accomplish the evacuation of the line is equal to the rate necessary to reduce the sewer to the desired pressure plus the allowable vacuum loss rate:

$$C = 0.17D^2L/T + Q \quad (1)$$

where:

C = vacuum pump capacity, ft^3/min,
T = required test time, or less, min,
D = pipe internal diameter, ft,
L = length of test section, ft, and
Q = allowable vacuum loss rate, ft^3/min.

8.2 Evacuate air until the internal air pressure of the sewerline is lowered by approximately 8 in. of mercury. Close the valve on the vacuum line and shut off the vacuum pump. Allow the air pressure to stabilize.

8.3 When the pressure has stabilized and is at or below the starting test vacuum of 7 in. of mercury, commence the test by allowing the gage pressure to drop to 7 in. of mercury, at which point the time recording is initiated. Record the drop in vacuum for the test period.

8.4 If the drop in vacuum is 2 in. of mercury or less during the test period, accept the line. If the drop in vacuum is more than 2 in. of mercury during the test period, inspect, evaluate, and retest the line to determine the cause of excessive vacuum loss.

8.5 Use or failure of this vacuum test shall not preclude acceptance by appropriate water infiltration or exfiltration testing (see Practice C969), or other means.

TABLE 2 Allowable Air Loss

Nominal Pipe Size, in.	Q, ft^3/min	Nominal Pipe Size, in.	Q, ft^3/min
4	2.0	21	5.5
6	2.0	24	6.0
8	2.0	27	6.5
10	2.5	30	7.0
12	3.5	33	7.5
15	4.0	36	8.0
18	5.0		

9. Vacuum Test Criteria

9.1 An appropriate allowable vacuum loss, Q, in cubic feet per minute has been established for each nominal pipe size. Based on field experience, the vacuum loss Qs that have been selected will enable detection of any significant leak. Table 2 lists the Q established for each pipe size.

9.2 When a main line with connected lateral is to be tested as a unit, the total volume of the main and laterals shall be considered and the allowable air loss rate shall be that listed for the main.

10. Precision and Bias

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