Designation: C 828 – 013

Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines[1]

This standard is issued under the fixed designation C 828; 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 defines procedures for testing vitrified clay pipe lines, using low-pressure air, to demonstrate the integrity of the installed line. Refer to Practice C 12.

1.2 This test method shall be performed on lines after connection laterals, if any, have been plugged and braced adequately to withstand the test pressure, and after the trenches have been backfilled for a sufficient time to generate a significant portion of the ultimate trench load on the pipe line. The time between completion of the backfill operation and low-pressure air testing shall be determined by the approving authority.

1.3 This test method may also be used as a preliminary test, which enables the installer to demonstrate the condition of the line prior to backfill and further construction activities.

1.4 This test method is suitable for testing gravity-flow sewer pipe constructed of vitrified clay or combinations of clay and other pipe materials.

1.5 Terminology C 896 is to be used for clarification of terminology in this test method.

1.6 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.7 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

[1] This test method is under the jurisdiction of ASTM Committee C04 on Vitrified Clay Pipe and is the direct responsibility of Subcommittee C04.20 on Methods of Test and Specifications.

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C 12 Practice for Installing Vitrified Clay Pipe Lines[2]

C 1091 Test Method for Hydrostatic Infiltration and Exfiltration Testing of Vitrified Clay Pipe Lines[2]

C 896 Terminology Relating to Clay Products[2]

3. Summary of Test Method

3.1 The section of the line to be tested is plugged. Air, at low pressure, is introduced into the plugged line. The line passes the test if the rate of air loss, as measured by pressure drop, does not exceed a specified amount in a specified time. This may be determined by the use of Table 1, or calculated by use of the formulas in Appendix X1.

4. Hazards

4.1 The low-pressure air test may be dangerous to personnel if, through lack of understanding or carelessness, a line is overpressurized or plugs are installed improperly. It is extremely important that the various plugs be installed so as to prevent the sudden expulsion of a poorly installed or partially inflated plug. As an example of the hazard, a force of 250 lbf (1112 N) is exerted on an 8-in. (205-mm) plug by an internal pressure of 5 psi (34 kPa). Observe the following safety precautions:

4.1.1 No one shall be allowed in the manholes during testing because of the hazards.

4.1.2 Install all plugs securely.

4.1.3 When lines are to be tested, it may be necessary that the plugs be braced as an added safety factor.

4.1.4 Do not overpressurize the lines.

5. Preparation of the Line

5.1 Air may pass through the walls of dry pipe. A wetted interior pipe surface is desirable and will produce more consistent test results. Usually moisture absorbed from the backfill is sufficient to cope with this situation. Where practical, clean the line prior to testing to wet the pipe surface and eliminate debris.

6. Procedure

6.1 Determine the test time for the section of line to be tested using Table 1 or Table X1.1 or the formulas in Appendix X1.

6.2 Plug all openings in the test section.

6.3 Add air until the internal pressure of the line is raised to approximately 4.0 psi (28 kPa). After this pressure is reached, allow the pressure to stabilize. The pressure will normally drop as the air temperature stabilizes. This usually takes 2 to 5 min, depending on the pipe size. The pressure should be reduced to 3.5 psi (24 kPa) before starting the test.

6.4 Start the test when the pressure is at 3.5 psi (24 kPa). If a 1 psi (7 kPa) drop does not occur within the test time, the line has passed. If the pressure drop is more than 1 psi (7 kPa) during the test time, the line is presumed to have failed the test. If the line fails the test, segmental testing may be utilized solely to determine the location of leaks, if any, but not for the acceptance test as required by this section. (see X2.3.3.2.)

NOTE 1—Ground water above the pipe will reduce air loss. If the section of line under test shows significant infiltration, the agency may require an infiltration test. Refer to Test Method C 1091.

7. Test Time

7.1 Table 1 shows the required test time, *T*, in minutes/100 ft of pipe for each nominal pipe size. Test times are for a 1.0-psi (7-kPa) pressure drop from 3.5 to 2.5 psi (24 to 17 kPa). Table 1 has been established using the formulas contained in the appendix.

7.2 If the section of line to be tested includes more than one pipe size, calculate the test time for each size and add the test times to arrive at the total test time for the section.

7.3 It is not necessary to hold the test for the whole period when it is clearly evident that the rate of air loss is less than the allowable.

[2] *Annual Book of ASTM Standards,* Vol 04.05.

TABLE 1 Minimum Test Time for Various Pipe Sizes

Nominal Pipe Size, in. (mm)	*T* (time), min/100 ft	Nominal Pipe Size, in. (mm)	*T* (time), min/100 ft
		~~21 (535)~~	~~3.0~~
48 (1220)	8.5	21 (535)	3.0
4 (100)	0.3	24 (610)	3.6
6 (150)	0.7	27 (685)	4.2
8 (205)	1.2	30 (760)	4.8
10 (255)	1.5	33 (840)	5.4
12 (305)	1.8	36 (915)	6.0
15 (380)	2.1	39 (990)	6.6
18 (455)	2.4	42 (1065)	7.3

APPENDIXES

(Nonmandatory Information)

X1. FORMULAS AND ALLOWABLE AIR LOSS STANDARDS USED IN TEST METHOD C 828

X1.1 Calculate the required test time at a given allowable air loss as follows:

$$T = K \times \frac{D^2 L}{Q}$$

X1.2 Calculate air loss with a timed pressure drop as follows:

$$Q = K \times \frac{D^2 L}{T}$$

X1.3 *Symbols* :

D = nominal size, in. (mm),
K = 0.371×10^{-3} for inch-pound units,
K = 0.534×10^{-7} for S.I. units,
L = length of line of one pipe size, ft (m),
Q = air loss, ft^3/min (m^3/min), and
T = time for pressure to drop 1.0 psi (7 kPa), min.

X1.4 An appropriate allowable air loss, *Q*, in cubic feet per minute, has been established for each nominal pipe size. Based on field experience, the *Q*'s that have been selected will enable detection of any significant leak. Table X1.1 lists the *Q* established for each pipe size.

X2. APPLICATION OF TEST METHOD C828

TABLE X1.1 Allowable Air Loss for Various Pipe Sizes

Nominal, Pipe Size, in. (mm)	*Q*, ft^3/min	Nominal Pipe Size, in. (mm)	*Q*, ft^3/min
		~~21 (535)~~	~~5.5~~
48 (1220)	10.0	21 (535)	5.5
~~4 (100)~~	~~2~~	~~24 (610)~~	~~6~~
4 (100)	2.0	24 (610)	6.0
~~6 (150)~~	~~2~~	~~27 (685)~~	~~6.5~~
6 (150)	2.0	27 (685)	6.5
~~8 (205)~~	~~2~~	~~30 (760)~~	~~7~~
8 (205)	2.0	30 (760)	7.0
10 (255)	2.5	33 (840)	7.5
~~12 (305)~~	~~3~~	~~36 (915)~~	~~8~~
12 (305)	3.0	36 (915)	8.0
15 (380)	4	39 (990)	8.5
~~18 (455)~~	~~5~~	~~42 (1065)~~	~~9~~
18 (455)	5	42 (1065)	9.0

X2.1 In order to demonstrate the technique of applying this test method, the example in X2.2 has been prepared. It utilizes various pipe sizes, lengths, and conditions that may be encountered in the field. The example has been designed to illustrate the use of Table 1 and the formulas.

X2.2 *Example* —An installation has been made that consists of line 1: 300 ft (91.4 m) of 15-in. (380-mm) vitrified clay pipe with no laterals, and line 2: a reach of 350 ft (106.8 m) of 8-in. (205-mm) of vitrified clay pipe to which are attached 120 ft (36.6 m) of 4 in. (100-mm) laterals of vitrified clay pipe.

X2.2.1 *Problem*—What are the appropriate test times to use in order to demonstrate the integrity of the installed lines?

X2.3 *Solutions* :

X2.3.1 What is the appropriate test time, *T*, for line 1?

X2.3.1.1 Use Table 1, find time, $T = 2.1$ min/100 ft (30.5 m), for 15-in. (380-mm) pipe.

$$T_{15} = 300 \times \frac{2.1}{100} = 6.3 \text{ min}$$

X2.3.2 What is appropriate time for line 2?

X2.3.2.1 *Solution*—Use Table 1.

$$T_8 = 350 \times \frac{1.2}{100} = 4.2 \text{ min}$$

$$T_4 = 120 \times \frac{0.3}{100} = 0.4 \text{ min}$$

Total test time 4.6 min

X2.3.3 If further analysis is desired, the following example is provided:

X2.3.3.1 If in the test of line 1, the 1.0-psi (7-kPa) pressure drop occurs in 3.3 min instead of 6.3 min, what is the rate of air loss?

$$Q = K \times \frac{D^2 L}{T}$$

where:

$$Q = 0.000371 \times \frac{15^2 \times 300}{3.3} = 7.6 \text{ ft}^3\text{/ min.}$$

This exceeds the 4 ft^3/min allowed in Table X1.1.

X2.3.3.2 What further courses of action might be considered in resolving this excess rate of air loss?

(1) Segmentally test the line and compare the time-air loss values in each segment.

(2) If the values in each segment are comparable, the air-loss problem may be distributed throughout the line, and further analysis should be made.

(3) If the values in each segment are significantly different, each segment may be evaluated and further analysis be made in order to determine the location of any significant air losses.