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Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill[1]

This standard is issued under the fixed designation C 1244; 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] This practice is under the jurisdiction of ASTM Committee C13 on Concrete Pipe and is the direct responsibility of Subcommittee C13.06 on Manholes and Specials.
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1. Scope

1.1 This test method covers procedures for testing precast concrete manhole sections when using the vacuum test method to demonstrate the integrity of the installed materials and the construction procedures. This test method is used for testing concrete manhole sections utilizing mortar, mastic, or gasketed joints.

1.2 This test method is intended to be used as a preliminary test to enable the installer to demonstrate the condition of the concrete manholes prior to ~~backfill. It may also be used to test manholes after backfilling; however, testing should be correlated with the connector supplier.~~ backfill.

1.3 *This standard does not purport to address all of the safety problems, 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.*

1.4 This test method is the companion to metric Test Method C 1244M; therefore, no SI equivalents are shown in this test method.

NOTE 1—Vacuum test criteria presented in this test method are similar to those in general use. The test and criteria have been widely and successfully used in testing manholes.

NOTE 2—It should be understood that no correlation has been found between vacuum (air) and hydrostatic tests.

2. Referenced Documents

2.1 *ASTM Standards:*

C 822 Terminology Relating to Concrete Pipe and Related Products[2]

C 924 Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method[2]

C 969 Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines[2]

3. Terminology

3.1 For definitions of terms relating to manholes, see Terminology C 822.

4. Summary of Practice

4.1 All lift holes and any pipes entering the manhole are to be plugged. A vacuum will be drawn and the vacuum drop over a specified time period is used to determine the acceptability of the manhole.

5. Significance and Use

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

6. Preparation of the Manhole

6.1 All lift holes shall be plugged.

6.2 All pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.

7. Procedure

7.1 The test head shall be placed at the top of the manhole in accordance with the manufacturer's recommendations.

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

TABLE 1 Minimum Test Times for Various Manhole Diameters in Seconds

Depth (ft)	Diameter, in.								
	30	33	36	42	48	54	60	66	72
	Time, in seconds								
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	39	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

7.2 A vacuum of 10 in. ~~of mercury~~ Hg shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 in. ~~of mercury.~~ Hg.

7.3 The manhole shall pass if the time for the vacuum reading to drop from 10 in. ~~of mercury~~ Hg to 9 in. ~~of mercury~~ Hg meets or exceeds the values indicated in Table 1.

7.4 If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall then be retested until a satisfactory test is obtained.

7.5 Use or failure of this vacuum test shall not preclude acceptance by appropriate water infiltration or exfiltration testing, (see Practice C 969), or other means.

8. Precision and Bias

8.1 No justifiable statement can be made either on the precision or bias of this procedure, since the test result merely states whether there is conformance to the criteria for the success specified.

9. Keywords

9.1 acceptance criteria; concrete; manhole sections; test method; vacuum test

APPENDIX

(Nonmandatory Information)

X1.

X1.1 The standard accepted method of air testing, for a single diameter pipe, Practice C 924, allows a drop of 1 psi pressure during the time calculated by the formula:

$$T_{Press.} = \frac{KD^2L}{Q} \quad \text{(X1.1)}$$

where:

T = time for 1 psi drop in pressure
K = 0.00037 for in./lb units
D = pipe diameter, in.
L = length of line, ft
Q = air loss, ft^3/min

X1.2 A pressure drop of 1 in. Hg for the vacuum test compares to a pressure drop of 0.490 psi for the air test.

$$1 \text{ in. Hg} \times \frac{14.696 \text{ lb/in.}^2}{29.02 \text{ 1 Hg}} = 0.490 \text{ psi} \quad \text{(X1.2)}$$

Therefore, the time relationship is:

$$T_{vac} = 0.490\ T_{press} \quad \text{(X1.3)}$$

or

$$T_{vac} = \frac{T_{press}}{2.04} \quad \text{(X1.4)}$$

X1.3 The allowable test times cited in Practice C 924, Table 2, for pipe sizes 4 in. to 24 in. diameter are provided in Table X1.1 and Table X1.2. The allowable test times for sizes above 24 in. were obtained by extrapolation. Therefore, using the appropriate *Q*. we find that:

for 30 in. ($Q = 7$ ft ^{3}/min), $T_{vac} = 0.00018 \frac{D^2}{Q} L = 0.023\ L$

for 36 in. ($Q = 8$ ft^3/min), $T_{vac} = 0.00018 \frac{D^2}{Q} L = 0.029\ L$

for 42 in. ($Q = 9$ ft^3/min), $T_{vac} = 0.00018 \frac{D^2}{Q} L = 0.035\ L$

for 48 in. ($Q = 10$ ft^3/min), $T_{vac} = 0.00018 \frac{D^2}{Q} L = 0.041\ L$

for 54 in. ($Q = 11$ ft^3/min), $T_{vac} = 0.00018 \frac{D^2}{Q} L = 0.048\ L$

for 60 in. ($Q = 12$ ft^3/min), $T_{vac} = 0.00018 \frac{D^2}{Q} L = 0.054\ L$

for 66 in. ($Q = 13$ ft^3/min), $T_{vac} = 0.00018 \frac{D^2}{Q} L = 0.060\ L$

for 72 in. ($Q = 14$ ft^3/min), $T_{vac} = 0.00018 \frac{D^2}{Q} L = 0.067\ L$

TABLE X1.1 Minimum Test Times for Various Pipe Diameters (Practice C 924)

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

TABLE X1.2 Allowable Air Loss for Various Pipe Diameters (Practice C 924)

Nominal Pipe Size, in.	Air Loss (*Q*), ft^3/min
4	2
6	2
8	2
10	2.5
12	3
15	4
18	5
21	5.5
24	6
30	7
36	8
42	9
48	10
54	11
60	12
66	13
72	14

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