Designation: C1244 – 11 (Reapproved 2017)

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 C1244; 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 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. Users are hereby cautioned that misuse or misapplication of the test criteria contained herein can cause permanent damage to the system being tested.

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—The user of this test method is advised that no correlation has been found between vacuum (air) and hydrostatic tests.

1.3 This test method is the companion to metric Test Method C1244M; therefore, no SI equivalents are shown in this test method.

1.4 *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.*

1.5 *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

C924 Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method (Withdrawn 2013)[3]

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

C1244M Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill (Metric)

3. Terminology

3.1 For definitions of terms relating to manholes, see Terminology C822.

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.

[1] This test method is under the jurisdiction of ASTM Committee C13 on Manholes and Specials.

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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.

[3] The last approved version of this historical standard is referenced on www.astm.org.

TABLE 1 Minimum Test Times for Various Manhole Diameters (30 – 120 in.) in Seconds

Depth (ft)	Diameter, in.								
	30	33	36	42	48	54	60	66	72
	Time, in seconds								
<4	6	7	7	9	10	12	13	15	16
6	9	10	11	13	15	18	20	22	25
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	29	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

TABLE 1 Minimum Test Times for Various Manhole Diameters (30 – 120 in.) in Seconds *(continued)*

Depth (ft)	Diameter, in.							
	78	84	90	96	102	108	114	120
	Time, in seconds							
<4	18	19	21	23	24	25	27	29
6	26	29	31	34	36	38	41	43
8	35	38	41	45	48	51	54	57
10	44	48	52	56	60	63	67	71
12	53	57	62	67	71	76	81	85
14	62	67	72	78	83	89	94	100
16	70	76	83	89	95	101	108	114
18	79	86	93	100	107	114	121	128
20	88	95	103	111	119	126	135	142
22	97	105	114	122	131	139	148	156
24	106	114	124	133	143	152	161	170
26	114	124	134	144	155	164	175	185
28	123	133	145	155	167	177	188	199
30	132	143	155	166	178	189	202	213

7. Procedure

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

7.2 A vacuum of 10 in. 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. Hg.

7.3 The manhole is acceptable if the time for the vacuum reading to drop from 10 in. Hg to 9 in. Hg meets or exceeds the values indicated in Table 1.

7.4 If the manhole fails the initial test, the manhole shall be repaired by an approved method 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 C969), or other means.

8. Precision and Bias

8.1 No justifiable statement is presently capable of being 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. Air Testing for a Single Diameter Pipe

X1.1 The standard accepted method of air testing, for a single diameter pipe, Practice C924, 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 C924, 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:

TABLE X1.1 Minimum Test Times for Various Pipe Diameters (Practice C924)

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 C924)

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

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

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

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

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

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

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

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

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

for 78 in. $(Q = 15\ \text{ft}^3/\text{min})$, $T_{vac} = 0.00018\,\frac{D^2}{Q}\,L = 0.073\,L$

for 84 in. $(Q = 16\ \text{ft}^3/\text{min})$, $T_{vac} = 0.00018\,\frac{D^2}{Q}\,L = 0.079\,L$

for 90 in. $(Q = 17\ \text{ft}^3/\text{min})$, $T_{vac} = 0.00018\,\frac{D^2}{Q}\,L = 0.086\,L$

for 96 in. $(Q = 18\ \text{ft}^3/\text{min})$, $T_{vac} = 0.00018\,\frac{D^2}{Q}\,L = 0.092\,L$

for 102 in. $(Q = 19\ \text{ft}^3/\text{min})$, $T_{vac} = 0.00018\,\frac{D^2}{Q}\,L = 0.099\,L$

for 108 in. $(Q = 20\ \text{ft}^3/\text{min})$, $T_{vac} = 0.00018\,\frac{D^2}{Q}\,L = 0.105\,L$

for 114 in. $(Q = 21\ \text{ft}^3/\text{min})$, $T_{vac} = 0.00018\,\frac{D^2}{Q}\,L = 0.112\,L$

for 120 in. $(Q = 22\ \text{ft}^3/\text{min})$, $T_{vac} = 0.00018\,\frac{D^2}{Q}\,L = 0.118\,L$