Grease Trap Abandonment Procedure

Pump trap by licensed waste disposal firm

Disconnect and plug or cap inlet and discharge piping with proper manufactured fittings

Remove or fill trap with suitable compacted material

Inspected by wastewater department personal before back filling

Designation: F1417 – 11a

An American National Standard

Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air[1]

This standard is issued under the fixed designation F1417; 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 practice provides procedures for testing non-pressure plastic pipe sewer lines, using low-pressure air to prove the integrity of the installed material and the construction procedures. Two procedures are included to find the rate of air leakage—the constant-pressure method and the time-pressure drop method.

1.2 This practice is performed on lines after all connections and service laterals have been plugged and braced adequately to withstand the test pressure. The time between completion of the backfill operation and low-pressure air testing may be specified by the approving authority.

1.3 This practice is used as a preliminary test, which enables the installer to show the condition of a buried line prior to final backfill, paving, and other construction activities.

1.4 This practice is applicable to all non-pressure sewer lines made of thermoplastic pipe, reinforced thermosetting resin (RTRP) pipe, and reinforced plastic mortar (RPM) pipe, defined in Terminology D883, D1600, and F412.

1.5 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.6 *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.* For specific precautionary statements, see Section 5.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C828 Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines

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

D883 Terminology Relating to Plastics

D1600 Terminology for Abbreviated Terms Relating to Plastics

D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

D3567 Practice for Determining Dimensions of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings

F412 Terminology Relating to Plastic Piping Systems

2.2 *Uni-Bell PVC Pipe Association Standard:*

UNI-B-6 Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe[3]

3. Summary of Practice

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 leakage, as measured by a constant-pressure method or a time-pressure drop method. The rate of air leakage may be determined by using Table 1 or ~~Table 2~~, or calculated by use of the equations in Section 9.

4. Significance and Use

4.1 This low-pressure air testing practice detects damaged piping or improper jointing by measuring the rate at which air under pressure escapes from an isolated section of sewer.

4.2 The rate of air loss indicates the presence or absence of damaged piping or leaking joints. This practice is not intended to show total system water leakage limits and shall not be used as a quantitative measure of leakage under service conditions for infiltration or exfiltration.

NOTE 1—A finding of acceptable air loss specified in this practice can be interpreted as an installation acceptance test in lieu of infiltration or exfiltration testing.

4.3 This practice provides assurance of initial condition and quality of workmanship of properly-installed sewer pipe.

[1] This practice is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.62 on Sewer.

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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] Available from Uni-Bell PVC Pipe Association, Suite 155, 2655 Villa Creek Drive, Dallas, TX 75234.

***A Summary of Changes section appears at the end of this standard**

TABLE 1 Minimum Time for a 1.0 psig Pressure Drop for Size and Length of Pipe for *Q* = 0.0015

NOTE 1—See Practice UNI-B-6.
NOTE 2—Consult with pipe and appurtenance manufacturer for maximum test pressure for pipe size greater than 30 in. in diameter.

Pipe Diameter, in.	Minimum Time, min:s	Length for Minimum Time, ft	Time for Longer Length, s	Specification Time for Length (L) Shown, min:s							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46
42	39:48	57	41.883 L	69:48	104:42	139:37	174:30	209:24	244:19	279:13	314:07
48	45:34	50	54.705 L	91:10	136:45	182:21	227:55	273:31	319:06	364:42	410:17
54	51:02	44	69.236 L	115:24	173:05	230:47	288:29	346:11	403:53	461:34	519:16
60	56:40	40	85.476 L	142:28	213:41	284:55	356:09	427:23	498:37	569:50	641:04

TABLE 2 Minimum Time for a 0.5 psig Pressure Drop for Size and Length of Pipe for *Q* = 0.0015

NOTE 1—Consult with pipe and appurtenance manufacturer for maximum test pressure for pipe size greater than 30 in. in diameter.

Pipe Diameter, in.	Minimum Time, min:s	Length for Minimum Time, ft	Time for Longer Length, s	Specification Time for Length (L) Shown, min:s							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	1:53	597	0.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	0.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	0.760 L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709 L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15	7:05	159	2.671 L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51
21	9:55	114	5.235 L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54
30	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	12.926 L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57
36	17:00	66	15.384 L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23
42	19:54	57	20.942 L	34:54	52:21	69:49	87:15	104:42	122:10	139:37	157:04
48	22:47	50	27.352 L	45:35	68:23	91:11	113:58	136:46	159:33	182:21	205:09
54	25:31	44	34.618 L	57:42	86:33	115:24	144:15	173:05	201:56	230:47	259:38
60	28:20	40	42.738 L	71:14	106:51	142:28	178:05	213:41	249:18	284:55	320:32

5. Apparatus

5.1 *Plugs*—Mechanical or pneumatic type.

5.2 *Air Compressor*—A properly calibrated portable, oil-free air source with a singular control panel containing a main shut-off valve, pressure-regulating valve, 9 psig pressure-relief valve, input pressure gauge, and a continuous monitoring pressure gauge having a pressure range from 0 psi to at least 10 psi with minimum divisions of 0.10 psi and an accuracy of ± 0.04 psi.

5.3 *Rotameter,* standard CFM reading with an accuracy of ± 2 %.

5.4 *Time measuring equipment*—A stopwatch or watch with a second hand or digital readout in minutes and seconds with an accuracy of 0.1.s.

6. Safety Precautions

6.1 This low-pressure air testing practice may be dangerous to personnel if, through lack of understanding or carelessness, a line is over-pressurized or plugs/caps are installed or restrained improperly. It is extremely important that the various plugs be properly installed, restrained and braced to prevent the sudden expulsion of a poorly installed or partially inflated plug. Observe the following minimum safety precautions:

6.1.1 During testing, no one shall be allowed in manholes or in the possible path of a suddenly expelled cap or plug.

6.1.2 Install and restrain all caps and plugs securely.

6.1.3 When lines are tested, it is mandatory that all the caps and plugs shall be braced as an added safety factor.

6.1.4 Do not over-pressurize the lines. Do not exceed 9.0 psig.

NOTE 2—The axial force on a plug at 9 psig internal pressure is F = P $\pi D^2/4$ lb, where D is the inside diameter in inches. For example, the axial force on an 30-in. plug at 9.0 psig maximum allowable pressure is over 6 300 lb. Restraint systems must be designed to handle these forces with adequate safety factors. Every effort should be made to maintain backfill over the pipe during air testing.

6.1.5 A regulator or relief valve set no higher than 9 psi shall be included on all pressurizing equipment.

7. Preparation of the Line

7.1 Clean the section of sewer line to be tested by flushing or other means prior to conducting the low-pressure air test. This cleaning serves to eliminate debris and produce consistent results.

8. Procedures

8.1 Isolate the section of sewer line to be tested by inflatable stoppers or other suitable test plugs or caps.

8.1.1 The ends of all branches, laterals, tees, wyes, and stubs included in the test section shall be plugged or capped to prevent air leakage. All plugs and caps shall be securely braced to prevent blow-out. One of the plugs or caps shall have an inlet tap, or other provision for connecting an air hose to a portable air control source.

8.1.2 Connect the air hose to the inlet tap and to the portable air source and control equipment. The air equipment shall consist of necessary valves and pressure gages to control an oil-free air source, to control the rate at which air flows into the test section, and to enable monitoring of the air pressure within the test section.

8.1.3 Add air slowly to the test section until the pressure inside the test section reaches 4.0 psig.

8.1.4 After the pressure of 4.0 psig is obtained, regulate the air supply so that the pressure is maintained between 3.5 to 4.0 psig for at least 2 min. Depending on air/ground temperature conditions, the internal air temperature will stabilize in equilibrium with the temperature of the pipe walls. The pressure will normally drop slightly until equilibrium is obtained; however, a minimum of 3.5 psig is required.

8.2 After equilibrium is obtained, determine the rate of air loss by either the constant pressure method or the time-pressure drop method.

NOTE 3—All test pressures are measured as gauge pressure, which is any pressure greater than atmospheric pressure. Since water produces a pressure of 0.43 psi for every foot of depth, air test pressures must be increased to offset the depth of ground water over the sewer line. If the ground water level is 2 ft or more above the top of the pipe at the upstream end, or if the air pressure required for the test is greater than 9-psi gauge, this air testing practice should not be used. Before this air testing practice is used, the ground water level should be lowered by pumping or dewatering.

8.2.1 *Constant Pressure Method*—Add air until the internal air pressure of the test section is raised to 4.0 psig and the test section is stabilized as in 8.1. Reduce pressure to 3.5 psig to run the constant pressure test. The air-flow rate in standard cubic feet per minute is read directly by a rotameter. Convert this air-flow rate to actual cubic feet per minute of air leaking from the test section by using the absolute pressure and temperature in the test section. The requirements for air loss under the constant pressure method shall be considered satisfied if the air loss does not exceed the specified leakage rate in cubic feet per minute per square foot of internal pipe surface area.

8.2.2 *Time-Pressure Drop Method*—Air is slowly introduced into the test section, until the air pressure is raised to approximately 4.0 psi and the test section is stabilized as in 8.1. Disconnect the air supply and decrease the pressure to 3.5 psi before starting the test. Determine pressure drap time per 8.2.2.1 and 8.2.2.2

8.2.2.1 *1.0 psig pressure drop*—Determine the time required for the pressure to drop from 3.5 psi to 2.5 psi, and compare this interval to the minimum time for the pipe diameter and the length per Table 1. If the rate of air loss is greater than or equal to the minimum time for the pipe diameter and length per Table 1, the installation is acceptable.

8.2.2.2 *0.5 psig pressure drop*—Determine the time required for the pressure to drop from 3.5 psi to 3.0 psi, and compare this interval to the minimum time for the pipe diameter and length per ~~Table 2~~. If the rate of air loss is greater than or equal to the minimum time for the pipe diameter and length per ~~Table 2, the installation is acceptable.~~

NOTE 4—The time-pressure drop method assumes an atmospheric pressure of 14.7 psia. Locations of high altitude need compensation for variation in atmospheric pressure to maintain the same air leakage test criteria.

8.3 Upon completion of the test, open the bleeder valve and allow all air to escape. Caps and plugs shall not be removed until all air pressure in the test section has been reduced to atmospheric pressure.

9. Test Time Calculations

9.1 *Test Time Criteria*—No test section shall be accepted if air loss is more than a specified leakage rate (in cubic feet per minute per square foot) determined by the approving authority.

9.2 Calculate all test times by the following equation:

$$T = 0.085\ DK/Q$$

where:

T = shortest time allowed for the air pressure to drop 1.0 psig, s,
K = 0.000419 DL but not less than 1.0,
Q = leak rate in cubic feet/minute/square feet of internal surface = 0.0015 CFM/SF,
D = measured average inside diameter of sewer pipe (see Test Method D2122 and Practice D3567), in., and
L = length of test section, ft.

Table 1 contains the specified minimum times required for a 1.00 psig pressure drop from a starting pressure of 3.5 psig to a final pressure of 2.5 psig using a leakage rate of 0.0015 $ft^3/min/ft^2$ of internal surface.

9.3 The total leakage from any test section shall not exceed 625Q.

9.4 If the pressure drops 1.0 psig before the appropriate time shown in Table 1 has elapsed, the air loss rate shall be considered excessive and the section of pipe has failed the test. If the line fails the test, segmented testing may be utilized

solely to find the location of leaks. Once leaks are located and repaired, retest the completed pipe installation to requirements of this practice.

9.5 For testing of long sections or sections of larger diameter pipes, or both, a timed-pressure drop of 0.5 psig shall be used in lieu of a 1.0 psig timed-pressure drop. If a 0.5 psig pressure drop is used, the appropriate required test time shall be exactly one-half the values shown in Table 1. ~~(See Table 2.)~~

NOTE 5—It is not necessary to hold the test for the entire period of time in Table 1 or Table 2 when it is evident that the rate of air loss is zero or less than the allowable, and is authorized by the approving authority.

9.6 If lateral or service lines are included in the test, their length may be ignored for computing required test time if the test time requirements are met. The maximum permissible air loss shall not exceed 625Q. If the test section fails, time shall be recomputed to include all the lateral lengths using the following equation:

$$T = 0.085 \left[\frac{D_1{}^2 L_1 + D_2{}^2 L_2 + \ldots + D_n{}^2 L_n}{D_1 L_1 + D_2 L_2 + \ldots + D_n L_n} \right] \frac{K}{Q}$$

where:

T	=	shortest time allowed for the air pressure to drop 1.0 psig, s,
K	=	0.000419 ($D_1L_1 + D_2L_2 + \ldots + D_nL_n$), but not less than 1.0,
Q	=	0.0015 CFM/SF,
D_1, D_2, *etc.*	=	nominal diameter of different size of pipe being tested, and
L_1, L_2, *etc.*	=	respective lengths of the different size pipes being tested.

If the recomputed test time is short enough to allow the section tested to pass, then the test section meets the requirements of this practice.

10. Precision and Bias

10.1 This practice provides qualitative data only; therefore, a precision and bias statement is not applicable.

11. Keywords

11.1 air test; plastic; sewer

APPENDIXES

(Nonmandatory Information)

X1. EXAMPLES

X1.1 In order to show the technique of applying this practice, the following examples have been prepared. The examples have been designed to illustrate the use of Table 1 and ~~Table 2~~ and the formula in 9.1 that uses a leakage rate of 0.0015 CFM/ft^2.

X1.2 *Example 1*—A manhole-to-manhole reach of nominal 12 in. pipe is 350 ft long. No lateral connections exist in the reach. What is the required test time for a 1.0 psig pressure drop?

X1.2.1 *Solution*—The required test time can be read directly from Table 1. For 350 ft of 12 in. pipe, the required test time is 19:56 (19 min and 56 s).

X1.3 A350 ft section of nominal 12 in. pipe is ready for testing. A total of 128 ft of 4 in. lateral sewer pipe is connected to the 350 ft section and will be included in the test. What will be the required test time for a 0.5 psig pressure drop?

X1.3.1 *Solution*—Lateral sewers may be disregarded when selecting test times (see 9.1). Therefore, the required test time will be 9 min and 58 s as shown in ~~Table 2~~.

NOTE X1.1—If the lateral sewers had not been disregarded, the required test time would be 10 min and 22 s, that is, only 24 s longer.

X1.4 What should the required test time be for a 1.0 psig pressure drop in 327 ft of nominal 8 in. diameter pipe between two manholes?

X1.4.1 *Solution*—The exact test time is easily calculated by using Table 1. Table 1 is used because a 1.0 psig pressure drop is specified. Since 327 ft exceed the 298 ft length associated with the minimum test time for an 8 in. pipeline, the fourth column in Table 1 is used to calculate the required test time as follows:

$$T = 1.520 \times L = 1.52 \times 327 = 497 \text{ s}$$

Therefore, the required test time for a 1.0 psig pressure drop is 497 s or 8 min and 17 s.

X1.5 *Example 2*—A manhole-to-manhole reach of nominal 24 in. pipe is 82 ft long. What is the required test time for a 0.5 psig pressure drop?

X1.5.1 *Solution*—~~Table 2~~ is used because a 0.5 psig pressure drop is specified. Since 82 ft is less than the 99 ft length associated with the minimum test time for a 24 in. pipeline, the minimum test time shall apply. Thus, the required test time for a 0.5 psig pressure drop is 11:24 (11 min and 24 s).

X1.6 *Example 3*—A 412ft section of nominal 15 in. sewer pipe has been readied for air testing. A total of 374 ft of nominal 6 in. lateral piping and 148 ft of nominal 4 in. lateral piping branch off the 15 in.-sewer line. All laterals have been capped or plugged, or both, and will be tested together with the 15 in. main line. The specified pressure drop, which will be timed, is 0.5 psig. What is the appropriate test time for this pipe network?

X1.6.1 *Solution*—All lateral sewer sizes and lengths may be disregarded since their influence is generally not significant enough to warrant computation. ~~Table 2 is used for a 0.5 psig~~ pressure drop. The fourth column in the table gives the

appropriate formula for calculating the required test time because 412 ft is longer than the third column value of 159 ft.

$$T = 2.671L = 2.671 \times 412 = 1100 \text{ s}$$

The required test time is 1100 s or 18 min and 20 s.

X1.7 *Example 4*—A manhole-to-manhole reach of nominal 8 in. pipe is only 100 ft long. A total of 300 ft of nominal 4 in. lateral piping is connected to the 100 ft section and will be included in air testing the section. What will be the required test time for a 1.0 psig pressure drop?

X1.7.1 *Solution*—The required test time can be read directly from Table 1. Thus, for 100 ft of 8 in. pipe, the required holding time is 7:34 (7 min and 34 s). However, should the section fail to meet this test, recalculate the required holding time, taking into account the connected laterals. This recalculation is required because the total internal pipe surface area is less than 625 ft^2.

$$\text{Total area} = \pi \left[\frac{D\,L_1 + D\,L_2 + \ldots + D_n L_n}{12} \right]$$

$$= \pi \left[\frac{(8 \times 100) + (4 \times 300)}{12} \right] = 524 \text{ ft}^2$$

Using the equation provided in 9.1, the required test time should be recomputed as follows:

K = 0.000419 [(8 × 100) + (4 × 300)]
= 0.838
0.838 = 1.0 —> K = 1.0

NOTE X1.2—K will always be 1.0 when the total area is less than 625 ft^2.

$$T = = 0.085 \left[\frac{(8^2 \times 100) + (4^2 \times 300)}{(8 \times 100) + (4 \times 300)} \right] \frac{1.0}{0.0015}$$

$$T = 317$$

The required test time is actually only 317 s or 5 min and 17 s for a 1.0 psig pressure drop. Therefore, if the section can meet this test time, it shall be accepted.

NOTE X1.3—For a specified 0.5 psig pressure drop, the test holding time would be only half as long, that is 2 min and 38 s.

X2. RATIONALE

X2.1 Low-pressure air testing is a fully accepted means of testing sewer lines. (Refs **1**, **2**, and **3**)[4]

X2.2 It is true that due to the differing physical properties of water and air, no direct numerical correlation exists between air loss and water leakage. This does not mean that the two are unrelated. It has been established that lower air loss rates are associated with lower leakage rates.

X2.3 The data in these studies are based on installed sewer of concrete, clay, and asbestos cement sanitary sewers and were useful in deriving Test Method C828 and Practice C924.

[4] The boldface numbers in parentheses refer to the references listed at the end of this practice.

REFERENCES

(1) Hobbs, S. H., and Cherne, L. G., "Air Testing Sanitary Sewers," *WPCF Journal*, April 1968.

(2) Ramseier, R. E., "Low Pressure Air Test for Sanitary Sewers," *Journal of the Sanitary Engineering Division*, ASCE, April 1964.

(3) Ramseier, R. E., "Testing New Sewer Pipe Installation," *Water Pollution Central Federation Journal*, April 1972.

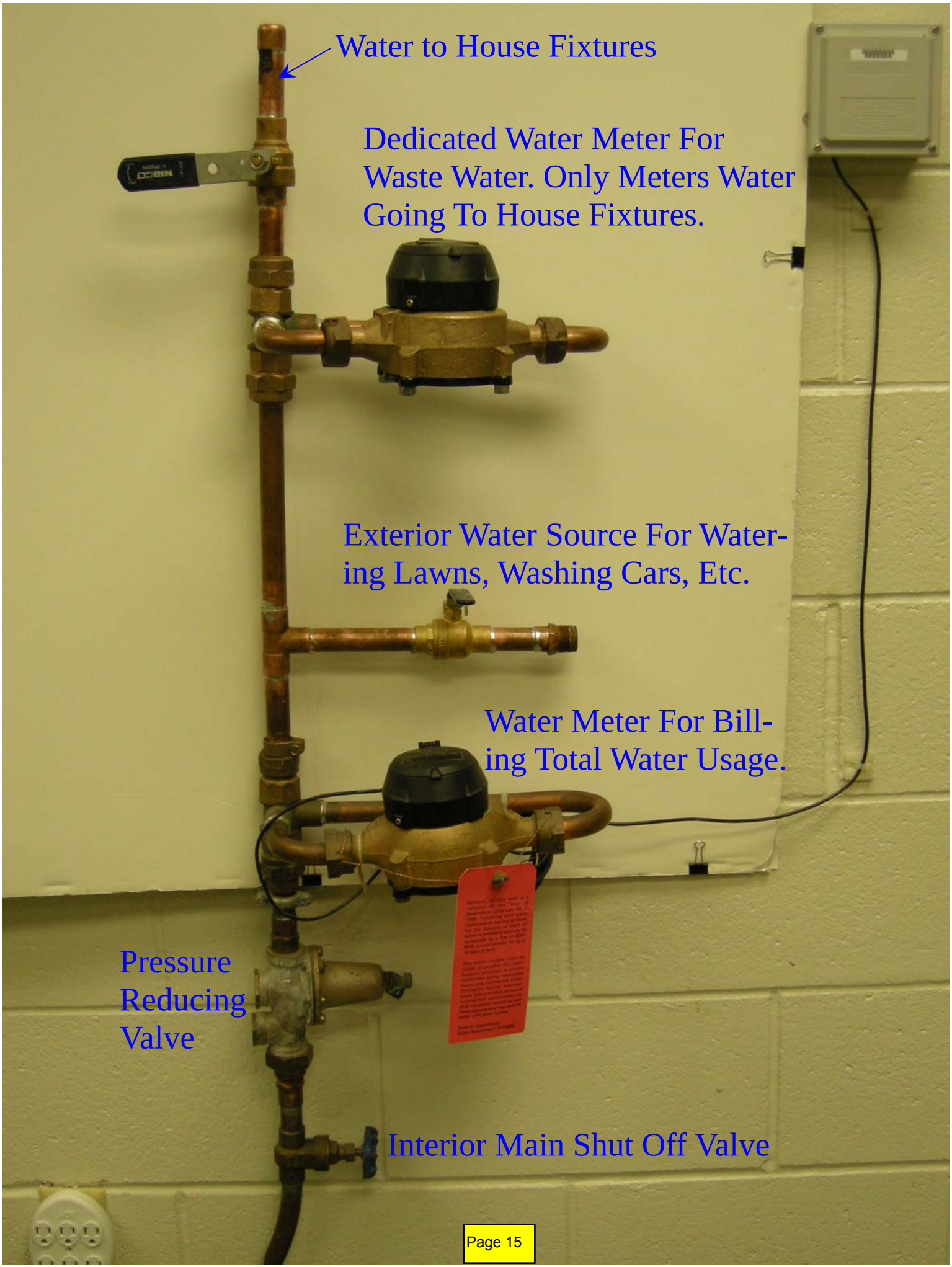
SUMMARY OF CHANGES

Committee F17 has identified the location of selected changes to this standard since the last issue (F1417–11) that may impact the use of this standard. (Approved August 1, 2011.)

(1) Table 1 and ~~Table 2~~ were revised.

Committee F17 has identified the location of selected changes to this standard since the last issue (F1417–92(2005)) that may impact the use of this standard.

(1) Title, Scope and throughout standard—changed Test Method to Practice; changed "gravity" to "non-pressure."
(2) Scope— Added 1.5; renumbered 1.5 as 1.6.
(3) Referenced Documents—Corrected document title for C828 and removed year of issue from UNI-B-6.
(4) Section 3, Summary of Practice and Section 4, Significance and Use— editorial changes.
(5) Apparatus —5.4 added.
(6) Section 6, Safety Precautions and Section 7, Preparation of the Line—editorial changes.
(7) Procedures—editorial changes; added 8.2.2.1 and 8.2.2.2.
(8) Section 9, Test Time Calculations and Section 10, Precision and Bias—editorial changes.
(9) Table 1 *and* ~~Table 2~~—editorial changes to captions.
(10) Appendix X1—editorial changes.


Water to House Fixtures
Dedicated Water Meter For Waste Water. Only Meters Water Going To House Fixtures.
Exterior Water Source For Watering Lawns, Washing Cars, Etc.
Water Meter For Billing Total Water Usage.
Pressure Reducing Valve
Interior Main Shut Off Valve