

Introduction

For gravity flow storm sewer systems, various tests may be performed to demonstrate the integrity of the joints of the installed non-perforated pipe. Air tests are becoming more common in pipe joint testing due to the ease of using air compared to water. This technical note will provide clarification to the requirements and testing procedure detailed in ASTM F1417 *Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air*. This testing procedure is intended for non-perforated HDPE or HP pipe with watertight joints meeting the requirements of AASHTO M252, AASHTO M294, or ASTM F2306 for HDPE and AASHTO M330 or ASTM F2881 for HP. Since air is a compressible gas, it is extremely important to follow all safety regulations as defined in OSHA and project specifications.

Summary of Air Test

The section of the pipeline to be tested is sealed at all inlets and outlets. Air is pumped into the isolated section to a specified pressure and monitored for changes. The pipe section passes the test if the time it takes for pressure in the section to drop 1.0 psig (or 0.5 psig) is greater than the minimum time required for a specific length and diameter of pipe. These times are displayed in Table 1 and Table 2.

Time-Pressure Drop Air Test:

Below are the basic steps for testing a pipeline by a low-pressure air test:

- Step 1: Pipeline installation and initial backfilling is to be completed before testing takes place. Groundwater should be lowered below the elevation of the pipe.
- Step 2: Obtain necessary materials: pipe plugs (mechanical or pneumatic), a time measuring device (minimum accuracy of 0.1 seconds), and an air compressor (range of 0 psig to at least 10 psig) with control panel, monitoring, and safety equipment.
- Step 3: Clean and plug all branches, laterals, tees, wyes, and stubs of the test section to an airtight seal. All plugs should be securely braced to prevent blow-outs. One plug should have an inlet tap to supply pressure to the test section.
- Step 4: Slowly increase the pressure of the test section to 4.0 psig. Hold the pressure between 3.5 psig and 4.0 psig for 2 minutes to obtain a temperature equilibrium within the pipe.
- Step 5: Determine the time required for pressure to drop either a 1.0 psig or 0.5 psig from Table 1 or Table 2, respectively. The required pressure drop will be determined by the project engineer.
- Step 6: Disconnect the air supply and allow pressure to drop to 3.5 psig before starting the test.
- Step 7: Start the test: Measure the time it takes for the pressure to drop 1.0 psig (3.5 to 2.5 psig) or 0.5 psig (3.5 to 3.0 psig) and compare that value to the minimum required time for the given pipe diameter and length found in Table 1 for 1.0 psig pressure drop or Table 2 for 0.5 psig pressure drop.
- Step 8: If the pressure-drop time is longer than the minimum time specified in Table 1 or Table 2, the pipe section passes the test and installation is acceptable.
- Step 9: Open the bleeder valve to allow the section to return to atmospheric pressure. Caps and plugs should remain in place until the system pressure is at equilibrium.

Pressure Drop times

Minimum times for pressure to decrease for each given pipe diameter and length in Tables 1 and 2. If a section of pipe loses pressure quicker than the minimum time specified in the tables, that section of pipe fails the test and should be retested or examined to determine the mode of failure.

For lengths of pipe longer than 450 feet, refer to the column "Time for Longer Length" where length of pipe (L) is multiplied by a constant to determine the required pressure-drop test time.

**Table 1. Minimum Time for a 1.0 psig Pressure Drop for Size and Length of Pipe for Q = 0.0015 ft³/min/ft² of internal surface**

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	3:46
6	5:40	398	0.854 L	5:40	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	11:48
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48	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	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	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	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	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	102:33

Table taken from *ASTM 1417-11a Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air*
 Note 1 – Consult with pipe and appurtenance manufacturer for maximum test pressure for pipe size greater than 30 in. in diameter.

A pressure drop of 0.5 psig is typically used for longer sections of pipeline, pipes of a larger diameter, or both. The pressure-drop time values are represented in Table 2.

Table 2. Minimum Time for a 0.5 psig Pressure Drop for Size and Length of Pipe for Q = 0.0015 ft³/min/ft² of internal surface

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	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	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	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	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	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	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	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	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	51:17

Table taken from *ASTM 1417-11a Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air*
 Note 2 – Consult with pipe and appurtenance manufacturer for maximum test pressure for pipe size greater than 30 in. in diameter.

For safety reasons Prinsco recommends testing individual joints for diameters 30" and larger. To test individual joints reference ASTM F3058, also known as the joint isolation test. This test is done with either air or water, and the use of inflatable bladders placed on each side of the joint which ultimately creates a void/open space between them. Once the bladders are inflated, the void is pressurized to 3.5 psi. If the pressure drop is less than 1.0 psi (3.6 kPa) in 5 seconds, the joint passes the test. This is a go/no go test with the design engineer having the final decision on acceptance. An advantage to using this test method is the ability to quickly test a joint and to make any corrections if needed.

**Reference Specifications**

- *ASTM 3212 – Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals*
- *ASTM F2487 – Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Corrugated High Density Polyethylene and Polypropylene Pipelines*
- *ASTM F3058 – Standard Practice for Preliminary Field Testing of Thermoplastic Pipe Joints for Gravity Flow (Non-Pressure) Sewer Lines*
- *ASTM F1417 – Standard Practice for Installation Acceptance for Plastic Non-Pressure Sewer Lines Using Low-Pressure Air*