

LOW PRESSURE AIR TESTING

Low Pressure Air Testing is an acceptance test utilized by design engineers since the early 1960's to demonstrate the quality of an installed pipeline. It was never intended as a test to determine the quality of the pipe since such testing is completed at the plant prior to shipping but rather a field installation test to assure the pipe is properly installed.

Low Pressure Air Testing has been used for many years and was adopted by various agencies and consultants in the early 1960's. Since that time, there have been some refinements to the test procedures as well as establishing safety limits. Several ASTM specifications have been adopted for both line testing and joint testing using positive and negative air pressure.

Many manufacturers and engineers agree that better quality pipelines and improved installation techniques have resulted. Concrete pipe manufacturers have since employed air testing in the plant for quality control purposes.

SAFETY CONSIDERATIONS

Low Pressure Air Testing, per ASTM C 924, is used for testing 4-inch to 24-inch concrete pipe utilizing gasketed joints. Pipe larger than 24-inch should be visually inspected or in the case of larger diameters, joint tested. The reason for establishing 24-inch diameter as the maximum size to be air tested is strictly for safety considerations.

"It is extremely important that plugs be installed and braced in such a way as to prevent blowouts. It is also imperative that the pressure in the pipe be relieved completely before any plug is loosened for removal. As an example, 4-psi air pressure acting on one side of a 15-inch plug results in a total force of approximately 700 lb. on the plug. Such force could cause the expulsion of an improperly installed plug."⁽¹⁾

TOTAL FORCE ACTING UPON TEST PLUGS at 4 psig

Diameter	Total Force	Diameter	Total Force
6"	113	15"	707
8"	201	18"	1018
10"	314	21"	1385
12"	452	24"	1810

CAPACITY OF AIR COMPRESSOR

In extreme cases, it is possible to misinterpret what appears to be a problem with what is really an undersized air compressor. If an air compressor does not have the capacity to properly fill the test section as well as compensate for the allowable air loss, then the testing operator could assume there was a major problem with the line.

"The compressor capacity required to accomplish the pressurization is equal to the rate necessary to fill the sewer to the desired pressure plus the allowable air loss rate:

$$\text{Where: } C = \frac{0.17D^2L + Q}{T}$$

C = compressor capacity, cfm

T = required test time, or less, min.

D = pipe internal diameter, ft

L = length of test section, ft

Q = allowable air loss, rate, cfm⁽²⁾

TEST PROCEDURE⁽³⁾

Determine the test time for the sewer line to be tested by using Table 1. This table has been established using the criteria specified in Table 2, and the formulas contained in the Appendix of ASTM C924. The test time is the minimum time allowed for the pressure to drop from 3.5 psi to 2.5 psi.

All test pressures are measured as gage pressure, which is defined as the pressure in excess of the 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 5-psi gage, the air test method should not be used. In that event, the infiltration test (see ASTM C 969), should be used.

Add air until the internal air pressure of the sewer line is raised to approximately 4 psi. Allow the pressure to stabilize. The pressure will normally drop as the temperature of the air in the line stabilizes.

Table 1

MINIMUM TEST TIME FOR VARIOUS PIPE SIZES

Nominal Pipe Sizes, in.	T (time) minutes/100 ft	Nominal Pipe Size, in.	T (time) minutes/100 ft.
4	0.3	15	2.1
6	0.7	18	2.4
8	1.2	21	3.0
10	1.5	24	3.8
12	1.8		

Table 2

ALLOWABLE AIR LOSS FOR VARIOUS PIPE SIZES

D, Nominal Pipe Size, in.	Q ft ³ /minutes	D, Nominal Pipe Size, in.	Q ft ³ /minutes
4	2	15	4
6	2	18	5
8	2	21	5.5
10	2.5	24	6
12	3		

When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi, commence the test by allowing the gage pressure to drop to 3.5 psi, at which point the time recording is initiated. Record the drop in pressure for the test period.

If the drop in pressure is 1 psi or less during the test period, accept the line. If the drop in pressure is more than 1 psi during the test period, inspect, evaluate, and retest the line to determine the cause of excessive air loss.

It should be noted that a wetted pipe interior is recommended for the most consistent results and proper evaluation requires exclusion of laterals and manholes from such testing.

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

⁽¹⁾ ASTM C 924, Para. 6.2

⁽²⁾ ASTM C 924, Para. 7.1

⁽³⁾ ASTM C 924, Para. 9