

Extra High Molecular Weight High Density Polyethylene PE 3408 Pipe

System Testing

Pressure Testing Considerations

1.0 Guidelines for All Test Methods

Leak testing may be conducted if specified by the responsible Project Engineer or Owner

Joints may be exposed to inspect for leakage. Heat fusion joints must be properly cooled before pressure testing. See Bulletins 101 and 108 for fusion joining procedures.

Testing may be conducted on the full System, or in sections. The test section size is determined by test equipment capability. If the pressurizing or pumping equipment is too small, it may not be possible to complete the test within allowable testing time limits. If so, higher capacity test equipment, or a smaller test section may be necessary,

Expansion joints and expansion compensatory should be temporarily restrained, or isolated, or removed during the pressure test,

The temperature of the test medium and the pipe test section should be the same, and should be at ambient temperature. Before applying test pressure, allow time for the test medium and the pipe test section to equalize. At temperatures above 100°F (38°C), test pressure must be reduced. Contact pipe manufacturer for technical assistance with elevated temperature pressure testing, consulted before using pressure testing procedures other than those presented herein. Other pressure testing procedures may or may not be applicable depending upon piping products and/or piping applications.

1.2 Test Pressure

Test pressure may be limited by valves, or other lower pressure rated components. Such components may not withstand the required test pressure. They should be either removed, or isolated from the test section to avoid possible damage, or failure of these devices, Isolated equipment should be vented. For pressure piping systems the maximum allowable test pressure is 1 1/2 times the system design operating pressure at the lowest point in the section under test, provided that test pressure limiting components or devices have been isolated, or removed from the test section. If a lower pressure rated device or component cannot be removed or isolated, then the test pressure is limited to the pressure rating of that device. For non-pressure, low pressure, or gravity flow (intermittent pressure) systems, consult Technical Personnel for information regarding maximum allowable test pressure.

WARNING: Pipe system pressure testing is performed to discover unacceptable faults In a piping system, pressure testing may cause such faults to fall by leaking or rupturing This may result In catastrophic failure. Piping system rupture any result In the sudden, forcible, uncontrolled :movement of system piping, or components, or parts or components.

WARNING: Pipe Restrain! The pipe system section under test and any closures In the test section should be restrained from catastrophic failure. Test equipment should be examined before pressure is applied to Insure that it Is tightly connected. All low pressure filling lines and other Items not subject to the test pressure should be disconnected or isolated

WARNING: Personal Protection. Take suitable Precautions to eliminate hazard personnel near lines being tested. Keep personnel a safe distance away from the test section during testing

1.1 References The following reference publications provide pressure testing information ASME 831.1 Power piping, Section 137, Pressure Tests; PPI TR-31, Underground Installation of Polyethylene Piping, Section 7. System Testing; and ASTM F 1417, Standard fast Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air. Technical Personnel should be

1.3 Test Duration

For any test pressure from 1 to 1 1/2 times the system operating design pressure, the total test time including initial pressurization, initial expansion, and time at test pressure, must not exceed eight (8) hours. If the test is not completed due to leakage, equipment failure, etc., depressurize the test section, then allow it to "relax" for at least eight (8) hours before bringing the test section up to test pressure again.

2.0 Hydrostatic Testing

2.1 General

Piping system pressure testing using hydrostatic procedures is recommended. The preferred testing medium is clean water, but other liquids may be suitable. The test section should be completely filled with liquid. Take care to bleed off any trapped air. While the test section is filling, venting at high points may be necessary to purge air pockets. Venting may be provided by loosening flanges, or by using equipment vents. Retighten any loosened flanges before applying test pressure.

2.2 Monitored Make-up Water Test

The test procedure consists of initial expansion, and test phases. During the initial expansion phase, the test section is pressurized to the test pressure, and enough make-up liquid is added each hour for three (3) hours to return to test pressure. The test phase follows immediately, and may be one (1), two (2), or three (3) hours. At the end of the test time, the test section is returned to test pressure by adding a measured amount of liquid. If the amount of make-up liquid added does not exceed Table I values on the facing page, leakage is not indicated.

2.3 Non-monitored Make-Up Water Test The test procedure consists of initial expansion, and test phases. For the initial expansion phase, make-up water is added as required to maintain the test pressure for three (3) hours. For the test phase, the test pressure is reduced by 10 psi. If the pressure remains steady (within 5% of the target value) for an hour, no leakage is indicated.

Table 1: Test Phase Make Up Amount

IPS Nominal Size Pipe (in.)	Make-up Water Allowance (U.S. Gallions/100 ft. Of Pipe)		
	1 hour test	2 hour test	3 hour test
1 ¼	0.06	0.10	0.16
1 ½	0.07	0.10	0.17
2	0.07	0.11	0.19
3	0.10	0.15	0.25
4	0.13	0.25	0.40
5	0.19	0.38	0.58
5 3/8	0.19	0.41	0.62
6	0.3	0.6	0.9
7 1/8	0.4	0.7	1.0
8	0.5	1.0	1.5
10	0.8	1.3	2.1
12	1.1	2.3	3.4
13 3/8	1.2	2.5	3.7
14	1.4	2.8	4.2
16	1.7	3.3	5.0
18	2.2	4.3	6.5
20	2.8	5.5	8.0
22	3.5	7.0	10.5
24	4.5	8.9	13.3
26	5.0	10.0	15.0
28	5.5	11.1	16.8
30	6.3	12.7	18.2
32	7.0	14.3	21.5
34	8.0	16.2	24.3
36	9.0	18.0	27.0
42	12.0	23.1	35.3
48	15.0	27.0	43.0
54	18.5	31.4	51.7

3.0 Pneumatic Testing

3.1 Guidelines

CAUTION: Pneumatic testing should not be used unless the Owner and the responsible Project Engineer specify pneumatic testing or approve its use as an alternative to hydrostatic testing, Piping system pressure testing using pneumatic *testing is not recommended.*

WARNING: Compressed air or any pressurize gas used as a test medium may present severe hazards to personnel near lines being tested. Take extra personnel protection precautions when a gas under pressure is used as the test medium.

WARNING: *Explosive Failure.* Piping system rupture during pneumatic pressure testing may result in the explosive, uncontrolled movement of system piping or components, or parts of components. Keep personnel a safe distance away from the test section during testing. Pneumatic testing (testing with a gas under pressure) should not be considered unless one of the following conditions exist:

The piping system is so designed that is cannot be filled with liquid; or

The piping system service cannot tolerate traces of a liquid testing medium.

The testing medium should be non-flammable and non-toxic. the test pressure should not exceed the maximum allowable test pressure for any non-isolated component in the test section.

Leaks may be detected using mild soap and water solutions (detergents should be avoided), or other acceptable leak detecting fluids, applied to the joint. Bubbles indicate leakage. After leak testing, all soap solutions or leak detecting fluids should be rinsed off the system with clean water.

3.2 High Pressure Procedure

For continuous pressure rated pipe systems, the pressure in the test section should be gradually increased to not more than one-half the test pressure, then increased in small increments until the required test pressure is reached Test pressure should be maintained for ten (10) to sixty (60) minutes, then reduced to the design pressure rating, and held for such time as required to examine the system for leaks.

3.3 Low Pressure Procedure

For pipe and components rated for gravity flow, intermittent low pressure, or low-pressure service, the required test pressure should be maintained for ten (10)minutes to sixty (60) minutes, but not more than sixty (60) minutes. Leakage inspections may be preformed during this time. If the test pressure remains steady (within 5% of the target value) for the test time, no leakage is indicated.

Test **pressure ratings must not be exceeded.** See ASTM F1417, Standard Test *Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air* for more information.

4.0 Initial Service Testing

4.1 Guidelines

An initial Service test may be acceptable when other types of tests are not practical, or when leak tightness can be demonstrated by normal service, or when performing initial service tests of other equipment. An initial service test may apply to systems where isolation or temporary closures are impractical, or where checking out pumps and other equipment affords the opportunity to examine the system for leakage prior to full scale operations.

4.2 Procedure

The piping system should be gradually brought up to normal operation pressure for at least ten (10) minutes. During this time, joints and connections should be examined for visual evidence of leakage.

5.0 Non-Testable System

5.1 Guidelines

Some systems may not be suitable for pressure testing. These systems may contain components *that* cannot be isolated, or temporary closures may not be practical, Such systems should be carefully inspected during and after installation.

Inspections such as visual examination of joint appearance, mechanical checks of bolt for joint tightness, and *other* relevant examinations should be performed.

