

SECTION 02XXXX**PRESSURE AND LEAKAGE TESTING OF HIGH DENSITY POLYETHYLENE PIPE
AND FITTINGS****1.01 SCOPE OF WORK****A. Summary of Practice of Pressure and Leakage Testing**

1. The section of the piping to be tested is isolated from other parts of the system and properly restrained in order to prevent failure of both the test section and the existing system connected to the test section. Isolated sections of the test section are vented to the atmosphere in order to ensure compressible gases do not remain within the hydraulic test section. The test section is filled with liquid, raised to the test pressure, and allowed to stabilize. The system is then inspected for leakage and the pressure is relieved. Any required repairs or replacements are then performed while the pipe is depressurized.
2. There is no leakage allowance, as properly made heat-fusion joints of HDPE do not leak. However, if any defects or leaks are revealed, they should be corrected and the pipeline retested after a minimum 24 hour recuperation period between tests. Total testing conducted on a section of pipeline shall not exceed eight hours within a 24 hour period.
3. An expansion allowance is allowed as HDPE will expand slightly due to elasticity and Poisson effects. The amount of make-up water (expansion allowance) will vary because expansion is not linear. This procedure compensates for expansion with an initial expansion phase followed by a testing phase as to which the test pressure is reduced suspending expansion. Expansion or contraction due to Poisson effects may disjoin other non-restrained joints, such as bell and spigot joints, so measures must be taken to fully restrain the test section.

B. Style of Testing

1. Conduct hydrostatic pressure testing of installed polyethylene pipe in accordance with ASTM F2164, Standard Field Leak Testing of Polyethylene Pipe and Crosslinked Polyethylene Piping Systems Using Hydrostatic Pressure.
2. It is not permitted to conduct pneumatic leak testing on HDPE in accordance with ASTM F2786, Standard Practice for Leak Testing of Polyethylene Piping Systems Using Gaseous Media Under Pressure (Pneumatic Leak Testing.)
3. Non-pressurized HDPE sewer mains may be pressure tested following ASTM F1417 Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air.

1.02 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM) latest edition:
 - 1. ASTM F2164 - Standard Field Leak Testing of Polyethylene Pipe and Crosslinked Polyethylene Piping Systems Using Hydrostatic Pressure
 - ASTM F2786 - Standard Practice for Leak Testing of Polyethylene Piping Systems Using Gaseous Media Under Pressure (Pneumatic Leak Testing.)

1.03 MATERIALS AND EQUIPMENT

- A. HDPE Materials
 - 1. Polyethylene pipe and fittings 4-65 inch diameter shall be in accordance with AWWA C906-15, material designation code of PE4710, all applicable ASTM standards and be listed on the PPI TR-4 HSB Listing of Hydrostatic Design Basis Listed Materials.
 - 2. Polyethylene pipe ½ -3 inch diameter for main line piping shall be polyethylene pipe (not tubing) in accordance with AWWA C901, material designation code of PE4710 all applicable ASTM standards and be listed on the PPI TR-4 HSB Listing of Hydrostatic Design Basis Listed Materials.
 - 3. Butt fusion fittings shall be made of HDPE material with a minimum material designation code of PE4710, all applicable ASTM standards and shall be listed in current versions of PPI TR-4. Molded and fabricated fittings shall have a pressure rating equal to the pipe unless otherwise specified on the project documents. All fittings shall meet the requirements of AWWA C901, C906 and all applicable ASTM standards. Markings for molded fittings shall comply with the requirements of ASTM D3261. Fabricated fittings shall be marked in accordance with ASTM F2206. Socket fittings shall meet ASTM D2683. Fabricated fittings shall be manufactured using a DataLogger to record fusion time, pressure and temperature, and shall be marked with a unique joint identifier that corresponds to the joint report. A graphic representation of the time and pressure data for all fusion joints made producing fittings shall be maintained for a minimum of five years as part of quality control and will be available upon request of owner. Qualification of the fusion technician shall be demonstrated by evidence of fusion training within the past two years on the equipment to be utilized on this project in accordance with ASTM F2620.
 - 4. Electrofusion fittings shall be made of HDPE material with a minimum material designation code of PE4710 and meet ASTM F1055. Electrofusion fittings shall have a pressure rating equal to the pipe unless otherwise specified on the project documents. All electrofusion fittings shall be suitable for use as pressure conduits and have nominal burst values of four times the working pressure rating of the fitting. Marking of electrofusion fittings shall comply with the requirements of ASTM F1055. All electrofusion fittings shall be properly stored in compliance with the

manufacturers recommendation.

B. Non-HDPE Components

1. Non-HDPE components, such as end caps, valves, etc., that are used to isolate the test section from other parts of the system in order to perform the test are required to be rated for pressures equal to or greater than the test pressure applied to the test section. These non-HDPE components must be properly restrained while conducting the pressure test.
2. Air release valves must be installed at the high points of the test section to allow for the release of any air or gases within the pipe prior to performing the required hydraulic pressure testing.
3. Pumping equipment used to pressurize the test section during the pressure testing should be of adequate capacity to fill, pressurize and test the section within the allotted time for the test.
4. A pressure monitoring gage is recommended to be connected to the test section at the lowest point to ensure the highest pressure is recorded within the test section. The combination of pump pressure and pressure at higher elevations will be recorded at the lowest point of the test section. Constant monitoring of the pressure during testing is required. A datalogger with a pressure recording transducer can be attached to the pressure gage to record pressure readings during the test. Additional gauges capturing the quantity of water used to fill prior to initial pressure testing and make up water during testing are required.

1.04 EXECUTION

A. Safety

1. Take the necessary safety precautions to ensure the test is conducted safely during the entirety of the testing period. Persons operating near the test string should be familiar with pressure testing and understand the safety precautions necessary to perform the test safely.
2. The test section should be supervised at all times during pressure testing.
3. Failure of the HDPE pipe string may result in sudden, violent, uncontrolled and dangerous movement of the system piping, components or parts of the components.

B. Restraint against movement

1. Measures should be taken to ensure all parts and components of the pipe section under pressure testing should be restrained from movement either through the use of partial backfill or adequate above ground restraint methods.

C. Pre-test preparation and set-up

1. HDPE pipe materials are rated at temperatures of 73°F or less. Pressure testing at higher temperatures will require de-rating of the pipe and fittings in accordance with the manufacturer's recommendations.
2. Prior to testing, all heat fusion joints are to be completely cooled and allowed to cool beyond the required rough handling time.
3. The pipe string and components required to be tested should be flushed, pigged or otherwise cleaned to remove dirt and debris that may damage parts or components involved in the pressure testing.

D. Maximum test pressures

1. The maximum test pressure should not exceed the Owner's or Engineer's recommendations.
2. System operating pressures often refer to the actual pressure that the municipal water and wastewater pipeline systems experience during actual operation.
3. System design pressures often refer to the pressure rating of the HDPE pipeline that will be installed within the municipal water and wastewater pipeline system. HDPE pipe utilized in municipal water and wastewater systems often have higher rated design pressures than the operating pressures of the pipe systems they are installed within.
4. System operating and system design pressures are not always equal. It is necessary to establish if there is a difference between system operating and system design pressures. The Owner or Engineer will make a determination if the system operating pressure or system design pressures will be used to perform pressure and leakage tests on the pipe string.
5. The maximum test pressure for HDPE shall not exceed 1.5 times the system design pressure when lower pressure rated components or devices are not present. The maximum test pressure for HDPE shall not exceed the pressure rating of the lowest pressure rated components when they are present.

E. Test duration

1. The test duration required to pressurize, stabilize, hold test pressure and depressurize shall not exceed 8 hours. If retesting is necessary, the test section shall be depressurized for a minimum of 8 hours prior to restarting.
2. Prior to pressurizing, all components must be inspected to be in proper working conditions, all components of the test section shall be vented to atmosphere and all low pressure lines not part of the test section shall be disconnected from the test section.

F. Hydrostatic Test Procedure

1. The test section shall be filled slowly with liquid and all air is purged from the system. It is important to take steps to ensure all air is purged from the

system. The flow velocity of liquid within the test section should not exceed the capacity of air to be purged from the system or the allowable design velocity of the pipe.

2. The test section should be allowed to come to temperature equilibrium between the pipe string and the fluid within the pipe.
3. When the test section is filled with fluid and purged with air, the pressure within the test section shall be gradually increased to the required test pressure. Make-up water should be allowed to fill the test section to maintain the required pressure due to expansion of the test section.
4. Once the pipe has stabilized, the pressure should be reduced 10 psi and the pressure monitored for 1 hour. The pressure should not be increased nor makeup water added to the test section during the observation period.
5. If not leakage occurs or if the internal pressure remains within 5% of the test phase pressure, the pressure test has passed.

G. Post test submittals

1. All records kept during pressure testing shall be provided to the Owner and Engineer.
2. Pressure test reports shall include the test liquid, backflow prevention devices, if used, weather conditions and ambient temperature at site of testing, test pressure, types of test gauges, location of test gauges including location distances and elevations, gauge calibration records, test pressures recorded, any adjustments made such as makeup water, etc, description of leaks or failures, date and time, and operator performing the pressure test.

END OF SECTION