

SECTION 40 80 01
PROCESS PIPING LEAKAGE TESTING

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Testing Plan:
 - a. Submit prior to testing and include at least the information that follows:
 - 1) Testing dates.
 - 2) Piping systems and section(s) to be tested.
 - 3) Test type.
 - 4) Test pressure as indicated on the Piping Schedule on the Drawings.
 - 5) Method of isolation.
 - 6) Calculation of maximum allowable leakage for piping section(s) to be tested.
2. Certifications of Calibration: Testing equipment.
3. Certified Test Report.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PREPARATION

- A. Notify Contracting Officer in writing 5 days in advance of testing. Perform testing in presence of Contracting Officer.
- B. Pressure Piping:
 1. Install temporary thrust blocking or other restraint as necessary to protect adjacent piping or equipment and make taps in piping prior to testing.
 2. Prior to test, remove or suitably isolate appurtenant instruments or devices that could be damaged by pressure testing.
 3. New Piping Connected to Existing Piping:
 - a. Isolate new piping with grooved-end pipe caps, spectacle blinds, blind flanges, or as acceptable to Contracting Officer.
 - b. Test joint between new piping and existing piping by methods that do not place entire existing system under test load, as approved by the Contracting Officer.

4. Items that do not require testing include: Piping between wetwells and wetwell isolation valves, Equipment seal drains, tank overflows to atmospheric vented drains, and tank atmospheric vents.
 5. Test Pressure: As indicated on Piping Schedule.
- C. Test section may be filled with water and allowed to stand under low pressure prior to testing.
- D. Gravity Piping:
1. Perform testing after service connections, manholes, and backfilling have been completed between stations to be tested.
 2. Determine groundwater level at time of testing by exploratory holes or other method acceptable to the Contracting Officer.
 3. Pipe 42 Inches Diameter and Larger: Joint testing device may be used to isolate and test individual joints.

3.02 HYDROSTATIC TEST FOR PRESSURE PIPING

- A. Fluid: Clean water of such quality to prevent corrosion of materials in piping system.
- B. Exposed Piping:
1. Perform testing on installed piping prior to application of insulation.
 2. Maximum Filling Velocity: 0.25 foot per second, applied over full area of pipe.
 3. Vent piping during filling. Open vents at high points of piping system or loosen flanges, using at least four bolts, or use equipment vents to purge air pockets.
 4. Maintain hydrostatic test pressure continuously for 30 minutes, minimum, and for such additional time as necessary to conduct examinations for leakage.
 5. Examine joints and connections for leakage.
 6. Correct visible leakage and retest as specified.
 7. Leave pipe full of water after repair of leaks.
- C. Buried Piping:
1. Test before backfilling.
 2. Expel air from piping system during filling.
 3. Apply and maintain specified test pressure with hydraulic force pump. Valve off piping system when test pressure is reached.
 4. Maintain hydrostatic test pressure continuously for 2 hours minimum, reopening isolation valve only as necessary to restore test pressure.
 5. Determine actual leakage by measuring quantity of water necessary to maintain specified test pressure for duration of test.

6. Maximum Allowable Leakage:

$$L = \frac{SD(P)^{1/2}}{148,000}$$

where:

- L = Allowable leakage, in gallons per hour.
- S = Length of pipe tested, in feet.
- D = Nominal diameter of pipe, in inches.
- P = Test pressure during leakage test, in pounds per square inch.

7. Correct leakage greater than allowable, and retest as specified.

3.03 PNEUMATIC TEST FOR PRESSURE PIPING

A. Do not perform on:

1. PVC or CPVC pipe.
2. Buried and other non-exposed piping.

B. Fluid: Oil-free, dry air.

C. Procedure:

1. Apply preliminary pneumatic test pressure of 25 psig maximum to piping system prior to final leak testing, to locate visible leaks. Apply soap bubble mixture to joints and connections; examine for leakage.
2. Correct visible leaks and repeat preliminary test until visible leaks are corrected.
3. Gradually increase pressure in system to half of specified test pressure. Thereafter, increase pressure in steps of approximately one-tenth of specified test pressure until required test pressure is reached.
4. Maintain pneumatic test pressure continuously for minimum of 10 minutes and for such additional time as necessary to conduct soap bubble examination for leakage.
5. Correct visible leakage and retest as specified.

D. Allowable Leakage: Piping system, exclusive of possible localized instances at pump or valve packing, shall show no visual evidence of leakage.

E. After testing and final cleaning, purge with nitrogen those lines that will carry flammable gases to assure no explosive mixtures will be present in system during filling process.

3.04 HYDROSTATIC TEST FOR GRAVITY PIPING

- A. Testing Equipment Accuracy: Plus or minus 1/2-gallon water leakage under specified conditions.
- B. Maximum Allowable Leakage: 0.16 gallon(s) per hour per inch diameter per 100 feet. Include service connection footage in test section, subjected to minimum head specified.
- C. Exfiltration Test:
 - 1. Hydrostatic Head:
 - a. At least 6 feet above maximum estimated groundwater level in section being tested.
 - b. No less than 6 feet above inside top of highest section of pipe in test section, including service connections.
 - 2. Length of Pipe Tested: Limit length such that pressure on invert of lower end of section does not exceed 30 feet of water column.
- D. Infiltration Test:
 - 1. Groundwater Level: At least 6 feet above inside top of highest section of pipe in test section, including service connections.
- E. Piping with groundwater infiltration rate greater than allowable leakage rate for exfiltration will be considered defective even if pipe previously passed a pressure test.
- F. Defective Piping Sections: Replace or test and seal individual joints, and retest as specified.

3.05 FIELD QUALITY CONTROL

- A. Test Report Documentation:
 - 1. Test date.
 - 2. Description and identification of piping tested.
 - 3. Test fluid.
 - 4. Test pressure.
 - 5. Remarks, including:
 - a. Leaks (type, location).
 - b. Repair/replacement performed to remedy excessive leakage.
 - 6. Signed by Contractor and Contracting Officer to represent that test has been satisfactorily completed.

END OF SECTION