

## SECTION 02610 - PRESSURE TESTING OF PIPELINES

### PART 1 - GENERAL

#### 1.1 WORK INCLUDED IN THIS SECTION

- A. The WORK of this Section includes requirements for hydrostatic and leakage testing of pressure pipelines and appurtenances for transmission and distribution mains.

#### 1.3 SUBMITTALS

- A. The following shall be submitted in compliance with Section 1300.
  - 1. Pressure test bulkhead locations and design calculations, water supply details including backflow preventors, flow meters, valves and drains.
  - 2. Requests for use of water from waterlines of DISTRICT 48 hours in advance.
  - 3. Provide a recent record of pressure gauge calibrations.
  - 4. Provide records of each pipe section during testing. Test records shall include:
    - a. Date of test.
    - b. Identification of pipeline, or pipeline section, tested or retested.
    - c. Identification of pipeline material.
    - d. Identification of pipe specification.
    - e. Test pressure.
    - f. Remarks: Leaks identified (type and location), types of repairs, or corrections made.
    - g. Certification by CONTRACTOR that the leakage rate measured conformed to the specifications.
    - h. Test duration.
    - i. Allowable losses.
    - j. Actual losses.

### PART 2 - PRODUCTS

#### 2.1 TEST BULKHEADS

Design and fabricate test bulkheads per Section VIII of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. Materials shall comply with Part UCS of said code. Design pressure shall be at least 2.0 times the specified test pressure for the section of pipe containing the bulkhead. Limit stresses to 70 percent of yield strength of the bulkhead at the bulkhead design pressure. Include air-release and water drainage connections.

#### 2.2 TEST OUTLETS AND TEMPORARY VALVES

Provide additional outlets and temporary valves for releasing air or apply the test where automatic air valves or other outlets are available in the pipeline. Construct the outlets in the same manner

as for a permanent outlet and after use seal with a blind flange, pipe cap, or plug and coat equal to the adjacent pipe.

### 2.3 TEST FLUID AND TEMPORARY PIPING

Use only potable water for the hydrostatic pressure test. Provide an approved and certified reduced pressure backflow prevention assembly if source of potable water is from public waterlines. Provide temporary piping to convey and dispose of the test fluid used in the pipeline. Disconnect and remove temporary piping after complying with the allowable leakage.

### 2.4 TEST EQUIPMENT

Provide calibrated pressure gauges, pipes, pumps, meters, and other equipment necessary to perform the hydrostatic pressure test.

## PART 3 - EXECUTION

### 3.1 GENERAL

All testing shall be performed in the presence of the DISTRICT. Subject the pipeline and appurtenances to a hydrostatic pressure test after the pipe has been laid and backfilled for required restraint. Allow concrete pipe anchors, collars, encasements and thrust blocks to cure prior to pressure testing. Allow concrete structures to attain the specified 28-day compressive strength prior to testing. Existing facilities will be operated by or under the direction of the DISTRICT only. When the DISTRICT furnishes and installs valves at takeoffs from its existing system, the CONTRACTOR shall omit a length of pipe, provide adequate blocking and test the piping independently of the DISTRICT's existing system. Test shall not be made against DISTRICT furnished or installed valves.

### 3.2 CLEANING

A. In pipelines less than 24-inches in diameter, before conducting hydrostatic tests, flush pipes with water to remove dirt and debris. Maintain flushing velocity of at least 3 fps. Flush pipes for the minimum time period as given by the formula below and as required to thoroughly clear the pipeline of dirt and debris.

$$T = \frac{2L}{3}$$

Where:

T = flushing time (seconds)

L = pipe length (feet)

B. In pipes 24-inches or larger in diameter, clean the pipe using high-pressure water jet, sweeping, scrubbing, or equally effective means. All water, sediment, dirt, and foreign material accumulated during this cleaning operation shall be discharged, vacuumed, or otherwise removed from the pipe.

### 3.3 TESTING AND DISENFECTION SEQUENCE

- A. Perform required disinfection after the completion of hydrostatic testing per Section 2600. Disinfection and hydrostatic testing may be carried on simultaneously upon approval of the DISTRICT.

3.4 LENGTH OF TEST SECTION

- A. Test the pipeline in sections. In any one test, do not exceed more than 2,500 feet, or as directed by the DISTRICT.

3.5 INITIAL PIPELINE FILLING FOR HYDROSTATIC TESTING

- A. Maximum rate of filling with test fluid shall not cause water velocity in the pipeline to exceed 1 fps. Expel air from the pipeline while filling and prior to testing. Provide necessary outlets to fill and test pipeline. When testing cement mortar lined piping, fill the pipe to be tested with potable water and allow it to soak for at least 48 hours to absorb water before conducting the pressure test.

3.6 PRESSURE AND DURATION OF HYDROSTATIC TEST

- A. Before applying the specified test pressure, care shall be taken to release all air within the pipe and appurtenances to be tested. Air shall be released through services, fire hydrants, air releases valves, or other approved locations. The test shall be conducted with valves in the open position.
- B. A five (5) hour hydrostatic test shall be performed after the pipe and all appurtenances have been installed and after any trench backfill compaction with heavy duty compaction has been completed. The hydrostatic test pressure shall be 50 psi above the class rating of the pipe, or 250 psi, whichever is less, or as otherwise directed by the DISTRICT Engineer. Hydrostatic test pressure will be 250 psi at the lowest point of the section being tested but not less than 200 psi at the highest section.

The test pressure shall be applied and continuously maintained by pumping for a period of (4) hrs. During the pumping phase of the test, the test pressure shall be maintained at not less than ninety-five percent (95%) of the specified test pressure at all times.

At the end of the fourth (4th) hour, the pressure shall meet the requirements stated above. Pumping shall then be disconnected for one hour and the drop in pressure shall be recorded. Pumping shall then be resumed to restore the initial test pressure, and the quantity of water pumped into the line shall be accurately measured. The quantity thus measured is the amount of pipe leakage, which shall not exceed the following limits:

1. The allowable leakage for flanged or welded steel pipe or for flanged ductile iron pipe shall be zero.
2. The allowable leakage for polyvinyl chloride (PVC) pipe or for steel or ductile-iron pipe with rubber joints shall be calculated using the following formula

$$\frac{0.4625 \text{ liters} \times \text{nominal diameter of pipe (mm)} \times \text{length of pipe (m)}}{24 \text{ (hrs)} \times 1000 \text{ (m)}}$$

or

$$\frac{5 \text{ gallons} \times \text{nominal diameter of pipe (in)} \times \text{length of pipe (ft)}}{24 \text{ (hrs)} \times 5,280 \text{ (ft)}}$$

If the leakage exceeds the allowable loss, the leak points shall be located and repaired as required by the DISTRICT Engineer. All defective pipe, fittings, valves, and other appurtenances discovered shall be replaced with sound material. Additional disinfection shall be performed as necessary. The Hydrostatic test shall be repeated until the leakage does not exceed the rate specified above. All visible leaks shall be similarly repaired.

The test duration for PVC pressure pipe may be reduced to two (2) hours upon approval of the DISTRICT.

### 3.7 BULKHEAD AND TEST FACILITY REMOVAL

- A. After a satisfactory test, remove test bulkheads and other test facilities, restore the pipe lining and coatings, and fill the pipeline section tested with water and maintain it full until disinfection of pipeline at the completion of the contract. The CONTRACTOR shall assume all responsibility for any damage to the pipeline as a result of pressure imposed during the operations of filling the pipeline with water and conducting the tests.

END OF SECTION