# SECTION 400515 PRESSURE TESTING OF PIPING

## PART 1 - GENERAL

A. Description

This section specifies the cleaning and hydrostatic and leakage testing of pressure piping for pumping stations and water distribution and transmission mains.

B. Related Work Specified Elsewhere

1. Disinfection of Piping: 331300.

2. Manual Valves: 400520.

C. Submittals

1. Submit shop drawings in accordance with the General Conditions and Section 013300.

2. Submit test bulkhead locations and design calculations, pipe attachment details, and methods to prevent excessive pipe wall stresses.

3. Submit five copies of the test records to the Owner's Representative upon completion of the testing.

D. Test Pressures

Test pressures for the various services and types of piping are shown in the subsection on “Test Pressure and Test Fluids” in Part 3.

E. Testing Records

Provide records of each piping installation during the testing. These records shall include:

1. Date and times of test.

2. Identification of pipeline or pipeline section tested or retested.

3. Identification of pipeline material.

4. Identification of pipe specification.

5. Test fluid.

6. Test pressure at low point in process pipeline, or pipeline section.

7. Remarks: Leaks identified (type and location), types of repairs, or corrections made.

8. Certification by Contractor that the leakage rate measured conformed to the specifications.

## PART 2 - MATERIALS

### A. Vents and Drains for Aboveground Piping

Install vents on the high points of aboveground piping, whether shown in the drawings or not. Install drains on low points of aboveground piping, whether shown in the drawings or not. Provide a valve at each vent or drain point. Valves shall be 3/4 inch for piping 3 inches and larger and 1/2 inch for piping smaller than 3 inches.

### B. Manual Air-Release Valves for Buried Piping

Provide temporary manual air-release valves at test bulkheads for pipeline test. Construct the pipe outlet in the same manner as for a permanent air valve and after use, seal with a blind flange, pipe cap, or plug and coat the same as the adjacent pipe.

### C. Test Bulkheads

Design and fabricate test bulkheads per Section VIII of the 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% of yield strength of the bulkhead material at the bulkhead design pressure. Include air-release and water drainage connections.

### D. Testing Fluid

1. Testing fluid shall be water.

2. For potable water pipelines, obtain and use only potable water for hydrostatic testing.

3. Submit request for use of water from waterlines of Owner 48 hours in advance.

4. The Contractor may obtain the water from the City of Santa Maria at the City's rate of charges.

E. Testing Equipment

Provide calibrated pressure gauges, pipes, bulkheads, pumps, chart recorder, and meters to perform the hydrostatic testing.

PART 3 - EXECUTION

A. Testing Preparation

1. Pipes shall be in place, backfilled, and anchored before commencing pressure testing.

2. Conduct pressure tests on exposed and aboveground piping after the piping has been installed and attached to the pipe supports, hangers, anchors, expansion joints, valves, and meters.

3. For buried piping, the pipe may be partially backfilled and the joints left exposed for inspection during an initial leakage test. Perform the final pressure test, however, after completely backfilling and compacting the trench.

4. Provide any temporary piping needed to carry the test fluid to the piping that is to be tested. After the test has been completed and demonstrated to comply with the specifications, disconnect and remove temporary piping. Do not remove exposed vent and drain valves at the high and low points in the tested piping; remove any temporary buried valves and cap the associated outlets. Plug taps or connections to the existing piping from which the test fluid was obtained.

5. Provide temporary drain lines needed to carry testing fluid away from the pipe being tested. Remove such temporary drain lines after completing the pressure testing. Drain the pipes after they have been tested.

6. Prior to starting the test, the Contractor shall notify the Owner's Representative.

B. Cleaning

1. Before conducting hydrostatic tests, flush pipes with water to remove dirt and debris. Maintain a flushing velocity of at least 3 fps for water testing. Flush pipes for time period as given by the formula

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

in which:

T = flushing time (seconds)
L = pipe length (feet)

2. For pipelines 24 inches or larger in diameter, acceptable alternatives to flushing are use of high-pressure water jet, sweeping, or scrubbing. Water, sediment, dirt, and foreign material accumulated during this cleaning operation shall be discharged, vacuumed, or otherwise removed from the pipe.

C. Testing and Disinfection Sequence for Potable Water Piping

1. Perform required disinfection after hydrostatic testing, except when pipeline being tested is connected to a potable waterline.

2. Locate and install test bulkheads, valves, connections to existing pipelines, and other appurtenances in a manner to provide an air gap separation between existing potable water pipelines and the pipeline being tested. Disinfect water and pipeline being tested before hydrostatic testing when connected to a potable waterline.

D. Length of Test Section for Buried Piping

The maximum length of test section for buried pipe of 12 inches or smaller in diameter is 3,500 feet. The maximum length of test section for buried pipe larger than 12 inches is 1 mile. Provide intermediate test bulkheads where the pipeline length exceeds these limits.

E. Initial Pipeline Filling for Hydrostatic Testing

Maximum rate of filling shall not cause water velocity in pipeline to exceed 1 fps. Filling may be facilitated by removing automatic air valves and releasing air manually.

F. Testing New Pipe Which Connects to Existing Pipe

Prior to testing new pipelines that are to be connected to existing pipelines, isolate the new line from the existing line by means of test bulkheads, spectacle flanges, or blind flanges. After successfully testing the new line, remove test bulkheads or flanges and connect to the existing piping.

G. Hydrostatic Testing of Aboveground or Exposed Piping

1. Open vents at high points of the piping system to purge air while filling the pipe with water. Venting during system filling may also be provided by temporarily loosening flanges.

2. Subject the piping system to the test pressure indicated. Maintain the test pressure for a minimum of four hours. Examine joints, fittings, valves, and

connections for leaks. The piping system shall show zero leakage or weeping. Correct leaks and retest until zero leakage is obtained.

H. Hydrostatic Testing of Buried Piping

1. Where any section of the piping contains concrete thrust blocks or encasement, do not perform the pressure test until at least 10 days after placing the concrete. When testing mortar-lined or PVC piping, fill the pipe to be tested with water and allow it to soak for at least 48 hours to absorb water before conducting the pressure test.

2. Apply and maintain the test pressure by means of a positive displacement hydraulic force pump.

3. Maintain the test pressure for the following duration by restoring it whenever it falls an amount of 5 psi:

| **Pipe Diameter (inches)** | **Hours** |
|---|---|
| 18 and less | 4 |
| 20 to 36 | 8 |
| Greater than 36 | 24 |

4. After the test pressure is reached, use a meter to measure the additional water added to maintain the pressure. This amount of water is the loss due to leakage in the piping system. The allowable leakage volume is defined by the formula

$$L = \frac{HND(P)^{1/2}}{C}$$

in which:

L = allowable leakage (gallons)
H = specified test period (hours)
N = number of rubber-gasketed joints in the pipe tested
D = diameter of the pipe (inches)
P = specified test pressure (psig)
C = 7,400

5. The allowable leakage for buried piping having threaded, brazed, or welded (including solvent welded) joints shall be zero.

6. Repair and retest any pipes showing leakage rates greater than that allowed in the above criteria.

I. Repetition of Test

If the actual leakage exceeds the allowable, locate and correct the faulty work and repeat the test. Restore the work and all damage resulting from the leak and its repair. Eliminate visible leakage.

J. Bulkhead and Test Facility Removal

After a satisfactory test, remove the testing fluid, remove test bulkheads and other test facilities, and restore the pipe coatings.

K. Test Pressure and Test Fluids

1. Testing and design pressures (psig) shall be as listed below:

| **Pipe Service** | **Pipe Material** | **Testing Fluid** | **Design Pressure psi** | **Test Pressure psi** |
|---|---|---|---|---|
| Water | Ductile Iron | Potable water | 130 | 200 |

END OF SECTION