

SECTION 02502

TESTING OF WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Testing of pipe, castings, fittings, valves and accessories.

1.2 RELATED SECTIONS

- A. Section 02501 - Disinfection of Water Distribution Systems
- B. Section 02513 - Copper Pipe and Fittings
- C. Section 02514 - Ductile Iron Pipe and Fittings.
- D. Section 02518 - Valves and Hydrants
- E. Section 02519 - Water Services

1.3 REFERENCES

- A. American Water Works Association, AWWA C600, AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.
- B. American Water Works Association, A WW A C605, Underground installation of Polyvinyl Chloride (PVC) Pressure Pipe & Fittings for Water.

1.4 SUBMITTALS

- A. Submit for acceptance a list of equipment and personnel to be used for the pressure test.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 TESTS REQUIRED

- A. On completion of the pipeline, it is to be filled with water and tested. Water used for this purpose is to be drawn from the existing water system by the Contractor under the direction of the Engineer and the Water Department.
- B. A pressure test and a leakage test are to be run simultaneously in accordance with ANSI/AWWA C600. Test pressure shall not be less than 1.25 times the working pressure at the highest point along the test section. Test pressure shall not exceed pipe or thrust-restraint

design pressures. The hydrostatic test shall be of at least 2hour duration or until such time as the Engineer indicates acceptance of the pipeline. Test pressure shall not vary by more than ± 5 psi (35 MPa or 0.35 bar) for the duration of the test.

- C. On pipelines where the elevation along the route of construction varies substantially, the Engineer reserves the right to valve off and test portions of the line.
- D. On extensive construction jobs, the Engineer reserves the right to require the testing of individual portions of the line as construction proceeds rather than await completion of the entire project in order to undertake a pressure or leakage test.
- E. Valves shall not be operated in either direction at differential pressure exceeding the rated valve working pressure. Use of a test pressure greater than the rated valve pressure can result in trapped test pressure between the gates of a double-disc gate valve. For tests at these pressures, the test setup should include provision, independent of the valve, to reduce the line pressure to the rated valve pressure on completion of the test. The valve can then be opened enough to equalize the trapped pressure with the line pressure, or fully opened if desired.
- F. Test pressure shall not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.

3.2 TIME FOR MAKING TESTS

- A. No pipeline is to be placed under pressure or subjected to hydrostatic pressure until at least 5 days have elapsed after the concrete thrust blocks have been installed. If high early strength concrete is used in the concrete thrust blocks, the hydrostatic pressure can be applied to the main after 2 days have elapsed from time of construction of the thrust blocks.
- B. The Contractor will be allowed to complete backfilling as hereinbefore specified, prior to undertaking the leakage and pressure tests. The carrying out of backfilling prior to the conducting of the necessary tests will be at the option of the Contractor with the exception of intersections, driveways, crosswalks and other such locations where holding open the trench will adversely affect the public.
- C. Pipelines may be subjected to hydrostatic pressure and inspected for leakage at any convenient time after the trench has been partially backfilled. Partial backfilling shall consist of filling along the center of the pipe length and leaving the joint open for inspection.

3.3 PROCEDURE

- A. After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.25 times the working pressure at the point of testing. Each valved section of pipe shall be slowly filled with water, and the specified test pressure, based on the elevation of the highest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. The system shall be stabilized at the test pressure before conducting the leakage test.

- B. No valve or other control device on the existing water system shall be operated for any purpose whatsoever by the Contractor. No tap or cut-in to the existing water system shall be made by the Contractor without the approval of the Engineer and unless an authorized representative of the Owner is present.
- C. When the Contractor's operations require the adjustment of any hydrant, valves, or other control device on the existing system, the Owner will provide authorized personnel for the purpose of supervising the operation of these control devices. The Contractor will be required to provide the personnel for the operation of these devices.
- D. The operation of connections to the existing system is to be carried out by the Contractor under the direction of the Owner's Authorized Representative.
- E. To allow for proper filling, venting, testing, etc., it will be the Contractor's responsibility to install any corporation stops and/or special fittings which may be required. All such installation will be subject to the approval of the Owner's Authorized Representative.
- F. Foreign materials left in pipelines during installation often results in valve or hydrant seat leakage during pressure tests. Thorough flushing is recommended prior to a pressure test. Flushing should be accomplished by partially opening and closing valves and hydrants several times under expected line pressure, with flow velocities adequate to flush foreign material out of the main, valves and hydrants.
- G. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged or left in place at the discretion of the Owner.

3.4 EXAMINATION UNDER PRESSURE

- A. All exposed pipes, fittings, valves, hydrants, and joints shall be examined carefully during the test.
- B. Any cracked or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure tests shall be repaired or replaced with sound material, and the test shall be repeated until it is satisfactory to the Engineer.

3.5 LEAKAGE TEST

- A. Leakage is defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof to maintain pressure after the pipe has been filled with water and the air has been expelled. Testing shall include all hydrants and hydrant branches. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

- B. No pipe installation will be accepted if the leakage is greater than that determined by the following formula; or greater than 10 gallons/in dia./mile of pipe/24 hours, whichever is less:

$$L = \frac{SD \sqrt{P}}{133,200}$$

Where:

L	=	allowable leakage, in gallons per hour
S	=	length of pipe tested, in feet
D	=	nominal diameter of the pipe, in inches
P	=	average test pressure during the leakage test, in pounds per square inch (gauge)

This formula is based on an allowable leakage of 11.65 gpd/mi/in. of nominal diameter at a pressure of 150 psi.

- C. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gph/in. of nominal valve size shall be allowed.
- D. When hydrants are in the test section, the test shall be made against closed hydrant valves.
- E. Acceptance of Installation - acceptance shall be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than that specified in this section, the Contractor shall, at his own expense, locate and make approved repairs as necessary until the leakage is within the specified allowance.
- F. All visible leaks are to be repaired, regardless of the amount of leakage.

END OF SECTION