

APPENDIX A

**SECTION 4: HYDROSTATIC TESTING
EXCERPTED FROM
AWWA C600-93**

**AWWA STANDARD
FOR
INSTALLATION OF DUCTILE-IRON WATER
MAINS AND THEIR APPURTENANCES**

**AMERICAN NATIONAL
STANDARD**

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AMERICAN WATER WORKS ASSOCIATION

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SECTION 4: HYDROSTATIC TESTING

WARNING: The testing methods described in this section are specific for water-pressure testing. These procedures should not be applied for air-pressure testing because of the serious safety hazards involved.

Sec. 4.1 Pressure and Leakage Test

4.1.1 Test restrictions.

4.1.1.1 Test pressure shall not be less than 1.25 times the working pressure at the highest point along the test section.

4.1.1.2 Test pressure shall not exceed pipe or thrust-restraint design pressures.

4.1.1.3 The hydrostatic test shall be of at least a 2-h duration.

4.1.1.4 Test pressure shall not vary by more than ± 5 psi (34.5 kPa) for the duration of the test.

4.1.1.5 Valves shall not be operated in either direction at a 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 a 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.

4.1.1.6 The 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.

4.1.2 Pressurization. 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 1.5 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 lowest 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. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. It is good practice to allow the system to stabilize at the test pressure before conducting the leakage test.

4.1.3 Air removal. Before applying the specified test pressure, air shall be expelled completely from the section of piping under test. If permanent air vents are not located at all high points, corporation cocks shall be installed 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 as required by the specifications.

4.1.4 Examination. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until satisfactory results are obtained.

4.1.5 Leakage defined. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi (34.5 kPa) of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

4.1.6 Allowable leakage. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

In inch-pound units:

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

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)

In metric units:

$$Lm = \frac{SD\sqrt{P}}{715,317}$$

Where:

Lm = allowable leakage, in litres per hour

S = length of pipe tested, in metres

D = nominal diameter of the pipe, in millimetres

P = average test pressure during the leakage test, in kPa

These formulas are based on an allowable leakage of 11.65 gpd/mi/in. (1.079 L/day/km/mm) of nominal diameter at a pressure of 150 psi (1034 kPa).

- 4.1.6.1 Allowable leakage at various pressures is shown in Tables 6A and 6B.
- 4.1.6.2 When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/h/in. (1.2 mL/h/mm) of nominal valve size shall be allowed.
- 4.1.6.3 When hydrants are in the test section, the test shall be made against the main valve in the hydrant.
- 4.1.7 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 Sec. 4.1.6, repairs or replacements shall be accomplished in accordance with the specifications.
 - 4.1.7.1 All visible leaks are to be repaired regardless of the amount of leakage.