

WATER MAIN TESTING AND ACCEPTANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Hydrostatic testing of potable water mains.

1.2 RELATED SECTIONS

- A. Section 02665 – Potable Water Mains
- B. Section 02675 – Disinfection of Potable Water Mains
- C. Section 02676 – New Construction Water Usage

PART 2 PRODUCTS

2.1 TEST MATERIALS

- A. Furnish all equipment, necessary piping, pipe access taps, pumps, meters, gauges, and required labor for use in testing.

2.2 WATER USAGE

- A. Once the new water mains are connected to the BCWS water system, the Contractor shall coordinate filling, pressure testing, disinfection, and flushing of the new mains.
- B. Any use of BCWS water must be coordinated with BCWS (843 572-4400) in accordance with Section 02676 – New Construction Water Usage. BCWS will set water flow rates and volumes as well as the time and duration of availability.

PART 3 EXECUTION

3.1 GENERAL

- A. Field test the entire length of all new potable water mains and appurtenant structures and devices for tightness as described in this Section. Devices include, but are not limited to, hydrants, curb stops on services without meter boxes, and water services that will be connected to meter boxes without the use of curb stop.

- B. Schedule timing and sequence of testing, subject to the approval of BCWS. Provide BCWS with a minimum of 72 hours notice prior to the start of any test. The Engineer and BCWS representative must observe all tests. The Contractor shall successfully pre-test the system prior to scheduling testing with BCWS.
- C. Repair any leaks discovered during the initial filling of the water mains and during the testing sequence. Repair all known and visible leaks, whether or not the leakage rate is within allowable limits.
- D. Note presence of leaks and repair activities on the test report form for any affected section of water main and provide a copy to the Engineer and BCWS.

3.2 WATER MAIN FLUSHING PROCEDURE

- A. Flush water main section thoroughly at flow velocities greater than 2.5 feet per second, adequate to remove debris from pipe and valve seats.
- B. Exercise valves and hydrants during line flushing to clean out seats. Provide blow-off points, as shown on the drawings, to achieve flushing velocities.

3.3 WATER MAIN PRESSURE TESTING PROCEDURE (PVC & DIP Mains)

- A. Pressure test all sections of the water main and appurtenances subject to internal pressure in accordance with AWWA C600. A section of the water main will be considered ready for testing after completion of all thrust restraint and backfilling.
- B. Provide temporary blocking, bulkheads, flanges and plugs as necessary to assure all new pipe, valves and appurtenances will be pressure tested.
- C. Before applying test pressure, completely expel air from the water mains and all appurtenances. Utilize blow-off points, as shown on the drawings, to expel air as line is filled with water.
- D. Notify the BCWS in accordance with paragraph 2.2 of this Section. Fill pipeline slowly with water from the BCWS system. Utilize an accurate water meter and pump arrangement to pump the line to the specified test pressure.
- E. If water main is tested in sections, ensure that the differential pressure at valves and hydrants does not exceed the manufacturer's pressure rating.

Where necessary, provide temporary backpressure to meet any differential pressure restrictions. Do not operate valves and hydrants in either the opening or closing direction at differential pressures above their rated pressure.

- F. Measure test pressure at the lowest point in the test segment. Maintain test pressure for a minimum of two hours. Provide a test pressure of 150 psi or 1.5 times the working pressure in the finished water main, whichever is greater.
- G. Do not allow a variance in the test pressure of more than 5 psi for the test duration. If the pressure drops more than 5 psi at any time during the test period, line fails and test must restart. If pressure drops below 150psi at any time during testing, line fails and test must restart. Provide an accurate pressure gauge, four inches in diameter, with a range of pressure large enough to allow the specific test pressure to fall in the middle of the range (i.e. for 150 psi test pressure need 300 psi range on gage). Face gradations shall be at 20 psi intervals with tick marks every one psi, or equal approved by BCWS. Failure to provide 1 psi increment gauge at time of testing will constitute failure of test until gauges are acquired, installed and ready for testing. If rescheduling of testing is needed, it will be dependent upon BCWS staff availability.
- H. Definition of Leakage: The quantity of water that is pumped and metered into the test section to maintain test pressure within 5 psi of the specified test pressure for the test duration, plus the quantity of water required to return line to test pressure at the end of the test.
- I. Test Results: Reject test section if the leakage exceeds the limits determined by the AWWA allowable leakage rate as stated in Section C605 and C600 as follows:

Ductile Iron

$$L = \frac{SD(P)^{0.5}}{148,000}$$

PVC

$$L = \frac{ND(P)^{0.5}}{8,223}$$

For the ductile iron pipe equation, “L” is the allowable leakage in gallons per hour, “S” is the length of water main tested in feet, “D” is the nominal diameter of the water main in inches, and “P” is the test pressure in pounds per square inch (psi).

For the PVC pipe equation, “L” is the allowable leakage in gallons per hour, “N” is the number of joints in the length of water main tested, “D” is

the nominal diameter of the water main in inches, and “P” is the test pressure in pounds per square inch (psi).

- J. If the leakage test result is unacceptable, locate and repair the cause of the failed test, and then retest the affected portion of the water main. Repair leaks in accordance with paragraph 3.1 of this Section.

3.4 WATER MAIN PRESSURE TESTING PROCEDURE (HDPE Mains)

- A. All HDPE for both water and sewer shall be sized using DIPS(Ductile Iron Pipe Size) and not IPS(Iron Pipe Size) unless specifically approved by BCWS.
- B. The hydro-test method is ASTM F2164, Standard Practice for Field Leak Testing of Polyethylene Pressure Pipe Systems Using Hydrostatic Pressure. This test is a “pressure rebound method” and is referenced in the AWWA M55 (2020), PE Pipe- Design and Installation. This test will be applicable to both water and sewer mains using HDPE piping.
- C. Provide a test pressure of 150 psi or 1.5 times the working pressure in the finished water main, whichever is greater and is taken at the lowest point in elevation along the pipe’s test section. Restrain test section against movement. Fill slowly to remove air and maintain test pressure for 4 hours; add makeup water as needed to keep the pressure constant; water amount is not monitored. Reduce pressure by 10 psi and monitor pressure for 1 hour. If the pressure remains steady within 5% of the target value for 1 hour, leakage is not indicated, and the line is considered to pass hydrostatic testing.

3.5 FINAL ACCEPTANCE

- A. No pipeline installation will be accepted until all known and visible leaks have been repaired in accordance with paragraph 3.1 of this Section.
- B. BCWS will conduct a final walkthrough inspection after all testing is complete normally in conjunction with walkthrough inspection of sewer infrastructure and only when site is ready. Should items not be ready for final inspection, BCWS does reserve the right to reschedule until all fully addressed. This is a final acceptance inspection, not a punch list generator. Minimum requirements for walkthrough inspection are below.
 - 1. All curbing in and cleaned with applicable markings applied so that field curb markings are visible
 - 2. All weather reasonable access roads must be rocked and curbed (If applicable) prior to any testing, and ready for pavement before final walkthrough.

3. Final grading complete within utility locations
 4. All property corner frontage staked
 5. All drainage easement frontage staked
 6. All BCWS Utility Easement frontage staked where applicable
 7. Record drawings brought to inspection by Engineer/Engineering Rep
 8. All water services on property corner/property line as called out on plans within BCWS UE
 9. All water services staked at least 18" above grade and tied to t-post
 10. All water services on sidewalk side stubbed up at least one foot beyond sidewalk location
 11. All water valves accessible, tracer wire in appropriate place, with full telescopic boxes installed, and all concrete collars set to grade
 12. All fire hydrants set to grade/bury depth line and facing the correct way
 13. Water pressure and flow will be checked on every service and all valves should be on in the project including hydrant isolation valves. All hydrants will be operated as well as blow offs during walkthrough.
- C. Certify that all testing has been successfully completed and items noted on walkthrough inspections are fully corrected. Line will only be scheduled for flushing after items above are complete and all closeout documentation submitted per Appendix F27. Certify that all required flushing and pressure testing has been successfully completed before final acceptance of BCWS.
- D. If newly installed line has successfully passed testing after construction but fails to receive a permit to operate issued by SCDES within 1 year, BCWS will require the line be hydrostatically tested again, disinfected, flushed and receive passing bacteriological samples prior to final acceptance.
- E. Prior to BCWS Engineering field staff completing a final walkthrough inspection with the EOR, it is required by the Engineer of Record(EOR)/Stakeholder/Contractor to submit a copy of a signed off checklist covering all walkthrough inspection items identified on BCWS Final Inspection Checklist posted on county website located at the following website.
<https://bcws.berkeleycountysc.gov/departments/engineering/eng-panels/>

At minimum signatures on this checklist should include the EOR and contractor responsible for preparing the site for final inspection.

END OF SECTION