

**Division 15 Watermains**  
**Appendix A**

**PROCEDURE FOR WATERMAIN  
PRESSURE TESTING AND CHLORINATION**

March 27, 2009

The following testing and chlorination procedure shall be strictly followed during the construction of new watermains within the City of Wyoming.

Procedure:

1. All communication between the City and the Contractor shall be channeled through one individual representing each party, i.e. City Project Inspector and Contractor project foreman. All other communication should be minimized and considered “un-official”.
2. Prior to any watermain construction, a source sample shall be collected using AWWA approved means for sampling water. The source sample may be from an existing hydrant (use a cap with a sampling tap), house spigot, or a direct watermain sampling tap. After the source sample is verified as potable water, the watermain construction can proceed.
3. The Contractor may be required to install a corporation stop and copper gooseneck for sampling and pressure testing. Upon completion of all testing, the Contractor should be required to remove the corporation stop and plug the watermain.

Watermain anchoring and restraint shall be adequate for the testing pressures, and provisions for flushing the mains without damage to surrounding property shall be made in advance.

4. Before any testing can proceed, a total watermain flush is required. Flushing time will depend on length and size of watermain (see attached charts). All watermains shall be flushed a minimum of thirty (30) minutes.

The Contractor shall provide a place for all discharged flushing water. The Contractor shall furnish blow-off plugs, standpipes, hand valves, bends, connecting pieces and fire hose as needed to prevent damage and soil erosion for testing and chlorination of the new watermains. All required sleeves shall be furnished by the City.

The Contractor shall retain all watermain material they furnish. The placement, removal and salvage of all watermain material, including the sleeves, shall be included in the watermain construction. No special payment will be made for this work.

5. After the watermain has been flushed and allowed to stand full for entrained air to be removed or absorbed, the main shall be subject to hydrostatic testing at a pressure of one hundred fifty (150) pounds per square inch, two hundred (200) pounds per square inch on fire lines. Pressure tests are

performed on the basis of lost pressure versus time. Without further admission of water, air, or other disturbances of conditions in the line, the pressure test shall be observed for two (2) hours. If during the two-hour period the pressure in the watermain drops below 145 (195 on a fire line) pounds per square inch, the test shall be declared a failed test. The watermain being tested shall pass pressure test prior to proceeding to step six (6), Chlorination test.

The Contractor may make follow up pressure tests after a failing pressure test on the main to try to locate leaks in an effort to expedite the Public Works Department procedures, but this test will in no way be substituted for the initial or final acceptance Public Works Department tests. All Contractor testing is exploratory in nature, and shall be done under the supervision of the project inspector. The Contractor shall not turn any valves except in an emergency.

6. The original chlorination test should follow a total watermain flush. A chlorine solution of a maximum of twenty five (25 ppm) parts per million should be injected after the watermain flush. A high range test kit (AWWA C651) can be used to verify the chlorine content.
7. After twenty four (24) hours of chlorine contact, the watermain should be flushed entirely of this concentrate. (NOTE: It is the responsibility of the Contractor to furnish hoses and an area of discharge for the chlorinated water.)
8. The first sample is taken with the chlorine residuals recorded by the Owner. Twenty-four (24) hours after the first sample, a second sample from the same sampling point will be taken with the chlorine residuals being recorded. All samples will be a representative sample of the water in the new watermain.
9. All samples will be taken to the City of Wyoming Laboratory for testing by City of Wyoming personnel. (The Contractor is responsible for all costs of transporting and testing of water.) The test results are considered final.
10. Test results are communicated from the lab to a contact person at the City. The Project Inspector shall promptly relay the notification of test results to the Contractor's liaison. A passing test must be achieved prior to granting approval to connect the new watermain into the existing system. A failing test results in re-chlorination at the sole expense of the Contractor, using the following steps:
  - A. Re-flush the watermain (doubling the time periods shown on attached chart) and re-chlorinate at a maximum of twenty five (25 ppm) parts per million with a contact time of forty eight (48) hours.
  - B. The chlorine residual should be recorded after the first twenty four (24) hours. If the chlorine residual has dropped more than fifteen (15 ppm) parts per million from the original amount, the watermain shall be re-chlorinated continuously until the chlorine residual stabilizes in the watermain. Upon completion of this, a resample from the watermain will be taken as previously outlined in step 8.
  - C. In the case of a third failing test, the Contractor shall, at his expense, clean the watermain by approved mechanical means until the watermain is clear of any build up or waste. It should be the Contractor's responsibility to notify the Owner when they have completed this process and they are

ready for a retest. The Contractor should perform the required cleaning activities within a reasonable period of time. Failure to do this should constitute an inability to clean the watermain and it should be removed and reconstructed.

D. After the Contractor cleaning, the Owner should again flush the watermain (tripling the time period shown on attached charts). A chlorine solution of a maximum twenty five (25 ppm) parts per million should be administered with a phosphate additive for forty eight (48) hours.

E. Residuals should be taken after twenty four (24) hours and again, chlorine should be added until stabilization is maintained.

F. Samples should be taken as done previously in step 8. If the test results return as a failure, the Contractor shall be required to remove and relay the watermain at their expense.

11. The Contractor shall NOT add any type of disinfectant or other additive without written permission from the Owner. If permission is granted, the Owner will furnish all materials. The Contractor may witness any or all of testing procedures.

Subject to prior approval by the Engineer, pipe, fittings or offsets that have not been subjected to the chlorination test must be cleaned of all dust, dirt, or other deposits and then carefully swabbed with a chlorine solution containing fifty (50 ppm) parts per million of chlorine, immediately before installation.

### Preventative Measures:

The AWWA recommends the following preventive measures, which shall be followed during the construction of watermains and fire lines:

1. Precautions shall be taken to protect the interiors of pipes, fittings, and valves against contamination. Pipe delivered for construction shall be stored so as to minimize entrance of foreign material. All openings in the pipeline shall be closed with a water tight plug when pipe laying is stopped at the close of day's work or for other reasons, such as rest breaks or meal periods.
2. Delay in placement of delivered pipe invites contamination. The more closely the rate of delivery is correlated to the rate of pipe laying, the less likelihood of contamination.
3. Contractor should consider capping and plugging the ends of all pipe stored on the construction site.

### Testing Costs:

All costs associated with the pressure testing and chlorination of watermains will be billed to the Contractor.

### Defective Watermain:

Any Defects, Cracks, or Leakage that may develop or that may be discovered, either in the pipe or in the body of the castings when the City furnishes the pipe, due to the negligence of the Contractor, or leakage in joints shall be promptly corrected by the Contractor at his own expense and to the satisfaction of the Engineer. Bell leak clamps shall not be used to abate leaking joints on new watermains.

If any such defects, cracks, or leakage are not due to the negligence of the Contractor, then the City will furnish whatever pipe or special castings which are necessary to replace the defective parts. The Contractor at his own expense, shall remove such defective parts and install the new pipe and special castings furnished by the City for that purpose.

“Leakage” is defined as the quantity of water to be supplied into the newly laid pipe necessary to maintain the specified leakage test pressure after the pipe has been filled with water and air expelled.

### Cold Weather Testing Requirements:

The following methods apply during periods of testing and chlorinating watermain during cold temperature:

1. All hydrants shall be wrapped and insulated from freezing. If additional heat sources are required, the Contractor shall furnish all necessary materials at the contractor’s expense.
2. The Contractor shall provide a heated shelter to accommodate all testing equipment, including but not limited to: test hydrants, jumper hoses, pumps, and any supplies needed to pressure test and chlorinate watermains.
3. During periods of below-average temperatures, the City reserves the right to suspend testing and chlorinating activities until it is determined by the Engineer that said weather conditions will not impact the integrity of the testing and chlorinating process.

## Flushing Requirements:

### 1. Watermains

Required Flow at Openings to Flush Watermains with 40 psi Residual Pressure (AWWA C651-86, Table 3)

Pipe Diameter (inches)	Flow Required to Produce 2.5 ft/s Velocity (gpm)		Size of Tap (inches) Number of Taps on Main		Number of 2 1/2 inch Hydrant Outlets
	1		1 1/2	2	
4	100	1	-	-	1
6	200	-	1	-	1
8	400	-	2	1	1
10	600	-	3	2	1
12	900	-	-	3	2
16	1600	-	-	4	2

With a forty (40) psi pressure in the main with the hydrant flowing to atmosphere, a two and a half (2-1/2") inch hydrant outlet will discharge approximately one thousand (1000 gpm) gallons per minute and a four and a half (4-1/2") inch hydrant outlet will discharge approximately two thousand five hundred (2500 gpm) gallons per minute.

The number of taps on the main is based on discharge through five (5') feet of galvanized iron (GI) pipe with one ninety (90°) degree bend.

### 2. Firelines

Required Flow at Openings to Flush Firelines (1992 NFPA 24, Table 8-8.2)

Pipe Diameter (inches)	Flow Required to Produce 10.0 ft/s Velocity (gpm)
4	400
6	900
8	1600
10	2400
12	3500

# Testing and Chlorination Billing

Test/Procedure	Estimated Time for Test (Billed at ACTUAL LENGTH OF TEST)	Billing Percentage		
		City Bid Watermain Project	Private Fire Line	Private Watermain
Source Sample*	2 Hr	0%	0%	0%
1st Pressure Testing	5 Hrs	0%	100%	100%
Additional Pressure Tests	5 Hrs	100%	100%	100%
1st Chlorination	4 Hrs	0%	100%	100%
2nd Chlorination	5 Hrs	100%	100%	100%
3rd Chlorination	6 Hrs	100%	100%	100%
Turn Valves/Test	2 Hrs	0%	100%	100%
Sample Delivery/Test	2 Hrs	0%	100%	100%

Billing Rates:

Regular Time	\$ 135.00	M-Th 7:00am-5:00pm
Overtime	\$ 150.00	M-Th 5:00pm-7:00am
Overtime	\$ 150.00	Fridays & Saturdays
Double Time	\$ 180.00	Sundays and Holidays

\* If collection of the Source Sample is require to be re-done due to no fault of the City, Contractor will be billed 2 hours for re-sampling.

Billing Example: Private watermain project;  
 Source Sample: Collect Source Sample, Deliver Sample  
 Turn Valves: (2hr) Pressure Test, (1hr) Chlorination Tests, (1hr) Put into service  
 Pressure Test: (5 hr) Pressure Test extends beyond Normal Business hours by 3.0 hours  
 Chlorination: Watermain Passess Chlorination on 1st test

	No Charge	Reg Time	OT	DT	Total
	\$ -	\$ 135.00	\$ 150.00	\$ 180.00	
Source Sample	2.00				\$ -
Sample Delivery		2.00			\$ 270.00
Turn Valves (Total)		4.00			\$ 540.00
Pressure Test		2.00	3.00		\$ 720.00
1st Chlorination		3.50			\$ 472.50
Sample Delivery		2.00			\$ 270.00
2nd Chlorination					\$ -
Sample Delivery					\$ -
3rd Chlorination					\$ -
Sample Delivery					\$ -
					<b>\$ 2,272.50</b>