

M. CLEANING AND DISINFECTION

1. Pigging: All new water mains 4" and larger, installed with the intention of being dedicated to the City or being installed by contract for the City shall be cleaned and flushed with a polyfoam pig prior to chlorination and sanitation. The contractor shall provide the excavation and backfilling required to establish any temporary pig flush assemblies. The contractor shall be responsible for requesting and coordinating all utility locations prior to excavation. A temporary flush for each pig shall be installed by the contractor and removed after pigging is complete. In its place the contractor shall install a standard D.E. cap and flush. The pit shall be constructed in such a manner, and the temporary flush removed, so as to prevent the backflow of dirty water into the new main. It shall be the responsibility of the contractor, under the supervision of CW&L, to flush the pig through. Any excavation, main removal and repair required to extricate a trapped pig shall be the responsibility of the contractor. During the time any excavation is left open, the contractor shall provide all required safety barriers and fencing. When unattended, the area shall be surrounded with poly fencing. Taping off the excavated area is not considered sufficient.

2. Disinfection: Unless otherwise specified by the City's Engineer water mains will be disinfected by the Water Department of the City of Columbia at its expense up to the first sampling. Any subsequent disinfection shall be under the provisions of Paragraph M-4. All phases of disinfection and testing shall meet the latest revision of AWWA Standard C651 and applicable requirements of the Department of Natural Resources. Unless otherwise specified, disinfecting will be by the injection method following the pigging and flushing.

Following the pigging process at a point not more than 10 feet downstream from the beginning of the new main, water entering the new main for the purpose of disinfection shall receive a dose of chlorine fed at a constant rate such that the water will have 25 - 50 mg/L free chlorine. To assure that this concentration is provided, the inspector will measure the concentration at regular intervals. The concentration will not be allowed to fall below 25 mg/L. The chlorinated water shall remain in the main at least 24 hours.

Hypochlorite solutions may be applied to the water main with a gasoline or electrically powered chemical-feed pump designed for feeding chlorine solutions. Feeds lines shall be of such material and strength as to safely withstand the corrosion caused by the concentrated chlorine solutions and the maximum pressures that may be created by the pumps. All connections shall be checked for tightness before the solution is applied to the main. Water to mix and inject chlorine into the pipes for disinfection shall be supplied through the taps provided for the purpose and not the main distribution line valves. The supply taps and connections are the responsibility of the contractor including excavation, backfill, safety and traffic barricades and the coordination for any utility locations prior to excavation. All connections must be in compliance with Columbia Water Department cross connection control standards and must be approved by its inspector prior to commencement of the disinfection process.

**AMOUNT OF CHLORINE CONCENTRATE REQUIRED
for
a 25 mg/l chlorine solution in 100 ft. of pipe**

Pipe Dia (in)	68% Chlorine Granules (lbs)	1% Chlorine Solution (gal)
4	.020	.16
6	.045	.36
8	.080	.65
10	.125	1.02
12	.180	1.44
16	.320	2.60
24	.360	5.76

The table above gives the amount of chlorine granules or solution necessary to reach the minimum required 25 mg/L concentration of chlorine solution in a 100 ft length of a given size pipe. A solution of 1-percent chlorine may be prepared with 1 lb of 68% concentration of sodium hypochlorite or calcium hypochlorite in approximately 12 gallons of

water.

Should disinfection by utilizing granules be specified, then the contractor shall furnish and place disinfecting media, preferably calcium hypochlorite granules with 65% available chlorine, in the mains as pipe is laid. The granules will be added to each section of pipe as it is installed such that there will be a chlorine concentration of approximately 50 mg/L when the pipe is filled. The following table will provide approximately 50 mg/L per 20' section of pipe:

PIPE SIZE	OUNCES OF GRANULES
4"	.13
6"	.3
8"	.5
12"	1.2
16"	2.2
24"	4.8

The granules shall not be allowed to remain in the pipe for an extended period. If the pipe will not be flushed and put in service within two weeks disinfection shall be by Columbia Water & Light using the injection method. Should any section of main fail the required tests for disinfection by using the granules, then further disinfection will be by CW&L using the injection method and pig (if deemed necessary by the City's Engineer). Again the owner will be responsible for time and materials charges by CW&L.

3. Flushing: Valves are to be operated only under the direct supervision of Columbia Water and Light personnel. Only Columbia Water and Light personnel shall operate valves on the existing water system. The super-chlorinated water shall be flushed from the main until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the system. The super-

chlorinated water shall be discharged to the sanitary sewer system serving the area after properly coordinating with and receiving permission from the agency responsible for maintaining that sanitary sewer system.

Consideration may be given to discharging the super-chlorinated water to the ground surface but such discharge must be approved by the Columbia Water and Light Water Main Inspector prior to any discharge. If the inspector determines that the chlorinated discharge may cause damage to the environment (fish life, plant life, physical installations, or other downstream water uses of any type), then a reducing agent must be applied to the water to be wasted. For the super-chlorinated water to be discharged to the ground surface, neutralize thoroughly the chlorine residual remaining in the water. The following neutralizing agents can be used: sulfur dioxide (SO₂), sodium bisulfate (NaHSO₃), sodium sulfite (Na₂SO₃), and sodium thiosulfate (Na₂S₂O₃*5H₂O).

**CHLORINE RESIDUAL NEUTRALIZING TABLE
UTILIZING SODIUM THIOSULFATE**

Residual chlorine concentration(mg/L)	Chlorine discharge flow rate (gpm)	Oz of Sodium Thio-sulfate per gal of water for neutralizing solution	Application rate of neutralizing solution to discharge stream (gpm)
25	50	2.8	.143
50	50	5.6	.143
25	100	2.8	.286
50	100	5.6	.286

The table above gives the ounces of Sodium Thiosulfate per gallon of water required to neutralize various residual chlorine concentrations at 50 and 100 gal / min of discharge with an application rate of .143 and .286 gal/min of the Sodium Thiosulfate solution. Recommended application of the neutralizing agent is with a pump sprayer.

4. Sampling: Bacteriological test samples will be collected by Columbia Water and Light personnel. A sample will be taken after the initial flushing at predetermined sample points. The second sample will be taken 24 hours after the first sample. Both of these samples must pass before the water main will be turned on by Columbia Water and Light.

In the event that the main does not pass its first set of bacteriological tests, then the main will be pigged, flushed, chlorinated and sampled again at the contractor's expense. The contractor shall be responsible for digging up the main, reinserting a pig and reinstalling a pig flush assembly.

Once the pig is flushed, the contractor will reinstall the temporary flush assembly for sampling purposes. The main will then be rechlorinated, flushed, resampled and tested. The contractor will be responsible for any costs incurred by its crews or city forces for second or subsequent disinfection and sampling.