

**DIVISION 33 - UTILITIES**  
**SECTION 33 13 00 - DISINFECTION OF RECLAIMED WATER UTILITY DISTRIBUTION**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. This Section Includes:
  - 1. Provisions for Disinfection of Reclaimed Water Utility Distribution Piping
- B. Related Work:
  - 1. Section 33 11 00 – Reclaimed Water Utility Distribution Piping
  - 2. Section 33 08 10 – Testing of Reclaimed Water Utility Distribution

**1.02 REFERENCES**

- 1. American Water Works Association
  - a. AWWA B300, Standard for Hypochlorites.
  - b. AWWA B301, Standard for Liquid Chlorine.
  - c. AWWA C651, Disinfecting Water Mains.
  - d. AWWA Manual M12, Simplified Procedure for Water Examination.

**1.03 SUBMITTALS**

- A. Submit in accordance with requirements of Section 01 33 00.
- B. Product Data: Submit procedures, proposed chemicals, number of samples, and treatment levels.
- C. Test Reports: Bacteriological test results
- D. Certificate: Certify that reclaimed water distribution system meets or exceeds specified requirements.

**1.04 QUALITY ASSURANCE**

- A. Bacteriological Tests:
  - 1. See AWWA Standard C651, Sections 7 and 8.
    - a. Number of Samples Required: Two samples or as directed by the Owner.

**1.05 DELIVERY, STORAGE AND HANDLING**

- A. Transport, handle and store disinfection products specified in a manner recommended by the respective manufacturer to prevent contamination and deterioration of products.
- B. When handling disinfection products, due caution is advised. Comply with safety precautions identified in Material Safety Data Sheets.

**1.06 JOB CONDITIONS**

- A. Environmental Requirements:
  - 1. Testing and disinfection of water mains is not to be performed if the air temperature is expected to fall below 35° F or as directed by the Authority.
  - 2. Keep interior of pipe clean. Close open end of pipe with a watertight plug anytime pipe laying is not in progress.

**PART 2 - PRODUCTS****2.01 MATERIALS**

- A. Hypochlorites: AWWA Standard B300.
- B. Liquid Chlorine: AWWA Standard B301.

**PART 3 - EXECUTION****3.01 DISINFECTION**

- A. General: Before being placed in service, all reclaimed water pipe installed shall be disinfected by chlorination. Disinfection shall be accomplished after the pipe has been flushed and passed hydrostatic testing.
- B. Form of Chlorine for Disinfection: Either of the following methods may be followed upon approval of the Authority.
  - 1. Liquid chlorine: Prepare a 1% hypochlorite solution from a stock hypochlorite solution. Ten gallons of a 1% hypochlorite solution can be prepared by mixing 0.8 gallons of a 12.5% hypochlorite solution with 9.2 gallons of water.
  - 2. Calcium Hypochlorite Solution: Prepare a chlorine-water solution of 1 percent (1%) available chlorine using granular calcium hypochlorite, and this solution shall be injected or pumped into the pipeline. A chlorine-water solution of 1 percent available chlorine may be prepared by mixing approximately one (1) pound of calcium hypochlorite with eight (8) gallons of water.
- C. Preparation:
  - 1. Preliminary Flushing: Prior to disinfection, flush the section of pipeline being disinfected as thoroughly as possible with the water pressure and outlets available.

DIVISION 33 – UTILITIES

SECTION 33 13 00 – DISINFECTION OF RECLAIMED WATER UTILITY DISTRIBUTION

2. Flush after the pressure and leakage tests have been completed.

D. Disinfection:

1. Apply the hypochlorite solution to the water main with a chemical feed pump. For small applications, the solution may be prepared in a barrel, and then pumped into the main with a hand pump, such as a hydraulic test pump. Apply at a dosage rate such that the chlorine concentration in the water in the pipe is a minimum of 25-mg/l free chlorine. The following table gives the amount of calcium hypochlorite and the quantity of one percent (1%) hypochlorite solution required to produce a 25 mg/l chlorine concentrate in 100 feet of pipe.

<b>CALCIUM HYPOCHLORITE AND CHLORINE SOLUTION REQUIRED TO PRODUCE 25 MG/L CONCENTRATION IN 100 FEET OF PIPE</b>						
Pipe Size Inches	Volume in Cu. Ft.	100-ft. Lbs.	Section Gals.	Amount of Calcium Hypochlorite		1% Chlorine Solution Gallons
				Ounces	Pounds	
6	19.65	1,227	147	3/4	0.046	0.36
8	34.90	2,178	261	1-3/8	0.083	0.65
10	54.28	3,388	406	2-1/8	0.131	1.02
12	78.48	4,899	587	3-0	0.185	1.44
16	139.98	8,738	1,047	5-3/8	0.334	2.60
20	218.06	13,611	1,631	7-3/4	0.486	4.08
24	314.16	19,603	2,350	11-5/32	0.698	5.88
36	706.86	44,108	5,287	25-1/8	1.570	13.23

<b>FEET OF PIPE IN WHICH 1 OUNCE OF CALCIUM HYPOCHLORITE WILL PRODUCE 25 MG/L AVAILABLE CHLORINE</b>							
$\frac{6''}{144}$	$\frac{8''}{79}$	$\frac{10''}{51}$	$\frac{12''}{36}$	$\frac{16''}{20}$	$\frac{20''}{13}$	$\frac{24''}{9}$	$\frac{36''}{4}$

2. Apply the chlorinating agent at the high end of the pipeline section being chlorinated.
3. Pump the chlorine solution slowly into the new pipeline. Chlorine application shall not cease until the entire main is filled with chlorine solution. Measure the chlorine residual at several points along the section of main being disinfected to

---

SECTION 33 13 00 – DISINFECTION OF RECLAIMED WATER UTILITY DISTRIBUTION

---

assure that the proper dosage and distribution of the chlorine solution is obtained.

4. If applicable, exercise great care in manipulating valves so that the strong chlorine solution in the line being treated will not flow back into the adjoining water distribution system.
  5. Retain the chlorinated water in the main for at least 24 hours. All valves and hydrants in the section shall be operated in order to disinfect the appurtenances. At the end of this 24-hour period, the treated water in all portions of the main shall have a residual of not less than 10-mg/l free chlorine.
  6. The chlorine solution shall be thoroughly flushed out prior to placing the new sections of pipe in service. The replacement water throughout the pipeline shall be proven comparable to the quality of water in the existing distribution system.
  7. At no time will valves on the water distribution system be operated without the presence of a duly qualified representative of the Authority.
  8. Discharge the chlorine solution from the water main through available outlets or provide temporary ports for. Inspect the area of the discharge point thoroughly before discharging the chlorine bearing water, since it is extremely toxic and, if allowed to flow into streams, can readily destroy aquatic life.
  9. The Contractor is cautioned that the spent chlorine solution must be disposed of in such a way as not to be detrimental to animal, plant, or fish life. If the possibility of damage of aquatic life is such that special precautions are required, dechlorinate the disinfecting solution before it goes to waste. The chlorine solution may be neutralized by applying sodium thiosulfate in the ratio of two-(2) parts thiosulfate to one (1) part chlorine at the point of discharge.
- E. After final flushing and before each treated water main is placed in service, collect a sample or samples from the end of the line. Test the sample or samples for bacteriological quality in accordance with Standard Methods to show the absence of coliform organisms. Take samples of water that has stood in the main for at least 16 hours after final flushing has been completed. Collect and analyze at least one sample per 1,000 linear feet of new line.
- F. If the initial disinfection fails to produce satisfactory bacteriological samples, the main shall be re-flushed and shall be resampled. If check samples show the presence of coliform organisms, then the main shall be re-chlorinated as specified hereinbefore.

**END OF SECTION**