

SECTION 02501

DISINFECTION OF WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

2.1 SECTION INCLUDES

- A. Procedures for disinfecting new and repaired water distribution systems. All new water mains and repairs made to the existing distribution system shall be disinfected before they are placed in service utilizing the procedures outlined herein and as recommended by the American Water Works Association (AWWA) C651 - Standard For Disinfecting Water Mains.
- B. Disinfection of new water mains shall be in accordance with AWWA C651-Continuous Feed Method only.

2.2 RELATED SECTIONS

- A. Section 02221 - Removal of Existing Hydrants and Gate Valves
- B. Section 02502 - Testing of Water Distribution Systems
- C. Section 02510 – Pre-stressed Concrete Cylinder Pipe
- D. Section 02513 - Copper Pipe and Fittings
- E. Section 02514 - Ductile Iron Pipe and Fittings
- F. Section 02515 - Polyvinyl Chloride (PVC) Pipe and Fittings
- G. Section 02516 - High Density Polyethylene Pipe and Fittings
- H. Section 02517 - Chlorinated Polyvinyl Chloride (CPVC) Pipe and Fittings
- I. Section 02518 - Valves and Hydrants
- J. Section 02519 - Water Services

2.3 REFERENCES

- A. American Water Works Association, AWWA C651, *AWWA Standard for Disinfecting Water Mains*.
- B. American Public Health Association, American Water Works Association and Water Pollution Control Federation, *Standard Methods for the Examination of Water and Wastewater*.
- C. Other standards or test methods referenced in the Project Manual or Specifications.

2.4 SUBMITTALS

- A. A formal statement in writing to the Engineer that all crews responsible for installation and repairs within the distribution system have been properly trained and are aware of prescribed construction practices and disinfection procedures to avoid contamination to the distribution system.
- B. The name of competent person(s) responsible for the disinfection processes and performing the required bacteriological sampling. The Engineer shall approve the procedure in advance.
- C. Certificate of compliance that the independent commercial laboratory performing the bacteriological sampling analyses is certified with the State Department of Environmental Protection and U.S. Environmental Protection Agency for analyzing public drinking water supplies.
- D. Certified results for all bacteriological sampling prior to restoring or placing the distribution system into service.
- E. For each section of pipe to be chlorinated, the Contractor shall inform the Engineer in writing of the locations for taps to be installed and utilized for the procedure.

2.5 QUALITY ASSURANCE

A. Qualifications & Certifications

- 1. The Contractor shall employ trained personnel aware of the need to carefully observe prescribed construction practices and disinfection procedures in order to prevent contamination to the distribution system.
- 2. The competent person(s) responsible for the disinfection processes and bacteriological sampling shall be familiar with AWWA C651-Standards for Disinfecting Water Mains and experienced with the Continuous Feed Method of disinfection. The Engineer shall approve disinfection procedures in advance.
- 3. Bacteriological sampling shall be made in full accordance with AWWA C651 and under the supervision of the Engineer.
- 4. An independent commercial laboratory certified for analyzing public drinking water supplies by the State Department of Environmental Protection and U. S. Environmental Protection Agency shall analyze all bacteriological samples and provide certified results to the Engineer and/or Owner for review prior to restoring or placing the system into service.

2.6 PROJECT/SITE CONDITIONS

- A. The general procedure for disinfection and analyses is described in PART 2 - EXECUTION of this section. If project conditions warrant the need for special disinfection procedures the Contractor must obtain prior written approval from the Engineer.

PART 2 PRODUCTS

2.1 MATERIALS

- A. The forms of chlorine used in the disinfection operations shall conform to ANSI/AWWA B300. Materials Safety Data Sheets (MSDS) for the disinfectant shall be readily available for reference. The competent person responsible for the disinfection operation shall be fully trained and equipped to handle any emergency that may arise.

PART 3 EXECUTION

3.1 DISINFECTION

- A. Before being placed into service, all new water pipelines shall be chlorinated using the Continuous Feed Method specified in AWWA C651. The Engineer shall approve the procedure in advance.
 - 1. The Contractor will determine the location of the chlorination and sampling points in the field. The Contractor shall install taps for chlorinating, sampling and expulsion of air and shall uncover, backfill and plug the taps as required.
 - 2. Prior to disinfecting the water main, the main shall be completely filled to remove all air pockets and then flushed to remove particulate. The flushing velocity in the main shall not be less than 2.5 ft/s unless the Engineer and/or Owner determine that the conditions do not permit the required flow to be discharged to waste.

Table 3.1-1 Required flow to flush pipelines (40 psi residual pressure in water main)

| <u>Pipe Diameter (in)</u> | <u>Flow Required to Produce 2.5 ft/s (Approximate velocity in main)</u> |
|---------------------------|---|
| 4 | 100 gpm |
| 6 | 200 gpm |
| 8 | 400 gpm |
| 10 | 600 gpm |
| 12 | 900 gpm |
| 16 | 1600 gpm |

* AWWA C651, AWWA Standard for Disinfecting Water Mains.

- 3. At a point not more than 10 feet downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will not have less than 25 mg/L (PPM) free chlorine throughout the entire section of pipe to be chlorinated.

Table 3.1-2 Chlorine required to produce 25-mg/L concentration in 100 feet of pipe - by diameter.*

| <u>Pipe Diameter (inches)</u> | <u>100% Chlorine (Lbs.)</u> | <u>1% Chlorine Solution (Gals.)</u> |
|-------------------------------|-----------------------------|-------------------------------------|
| 4 | 0.013 | 0.16 |
| 6 | 0.030 | 0.36 |
| 8 | 0.054 | 0.65 |
| 10 | 0.085 | 1.02 |
| 12 | 0.120 | 1.44 |
| 16 | 0.217 | 2.60 |

* AWWA C651, AWWA Standard for Disinfecting Water Mains.

If requested by the Owner or Water Department an optional procedure involving the use of a temporary connection with backflow preventer can be specified for introducing the chlorine to the new main. Some prefer this as opposed to operating an isolation valve in order to flow water down the new main.

- 4. The chlorinated water is to remain in the new pipeline for at least 24-Hours. After a contact time of 24-Hours there should be a free chlorine concentration of not less than 10 mg/L (PPM). During this period, proper precautions are to be taken to prevent this chlorinated water from flowing back into the existing system.
- 5. All valves and hydrants within the treated section shall be operated to ensure disinfection of the appurtenances.
- B. The Tablet Method consisting of placing calcium hypochlorite granules or tablets in the water main as it is being installed and then filling the main with potable water and allowing it to set for a contact period is not acceptable.
- C. The interior of all pipe, fittings and valves used in making a repair or tie-in shall be swabbed or sprayed with a one percent (1 %) hypochlorite solution before they are installed.

3.2 FINAL FLUSHING

- A. Following the chlorination period, all treated water shall be flushed from the lines at their extremities and replaced with water from the distribution system.
 - 1. Flushing the main is to be accomplished at as high a velocity as possible consistent with the ability of the Contractor to collect the discharge water for proper disposal.
 - 2. All treated water flushed from the lines shall be disposed of by discharging to the nearest sanitary sewer or by other approved means provided in AWWA C651.

3. Flushing shall be done in strict conformance with all applicable local, state and federal regulations. No discharge to any storm sewer or natural watercourse will be allowed.

3.3 BACTERIOLOGICAL ANALYSES

- A. After the 24-Hour disinfection period and all chlorine solution has been thoroughly flushed, the bacteriological sampling and analysis of the replacement water may then be performed.
 1. Bacteriological sampling shall be made by the Contractor's competent person(s) in full accordance with AWWA C651- Section 7, Bacteriological Tests and under the supervision of the Engineer.
 2. Analysis shall be performed by an independent commercial laboratory certified by the State Department of Environmental Protection and U.S. Environmental Protection Agency for analyzing public drinking water supplies. All results shall be provided to the Engineer for review.
 3. Two consecutive sets of acceptable samples, taken at least 24-Hours apart are required prior to placing the main into service. Failure of anyone of the bacteriological test samples shall require re-chlorination and retesting by the Contractor.
 4. The line shall not be placed in service until the bacteriological requirements of AWWA C651 are met.

END OF SECTION