

SECTION 02667 - TESTING AND DISINFECTION OF HYDRAULIC STRUCTURES

City of San Diego, CWP Guidelines

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes cleaning, flushing, and testing, of all hydraulic structures and appurtenant piping, and disinfection of [indicated hydraulic structures and appurtenant piping] for reclaimed water [and potable water], including conveyance of test water and all disposal thereof.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 02666 Water Pipeline Testing and Disinfection
 - 2. Section 03300 Cast-in-Place Structural Concrete

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ANSI/AWWA B300 Hypochlorites
 - 2. ANSI/AWWA B301 Liquid Chlorine
 - 3. ANSI/AWWA C652 Disinfection of Water-Storage Facilities
 - 4. APHA/AWWA/WPCF Standard Methods for the Examination of Water and Wastewater

1.4 TESTING PLAN

- A. The following shall be submitted in compliance with the shop drawing requirements of Section 01300:
 - 1. A testing schedule, including proposed plans for water conveyance, control, disinfection, and disposal shall be submitted in writing for approval a minimum of [14] days before testing is to start. The submittal shall include the methods to determine evaporation loss and the CONTRACTOR'S plan for the release of water from structures after testing and disinfection has been completed.

PART 2 -- PRODUCTS

2.1 MATERIALS REQUIREMENTS

- A. Temporary valves, bulkheads, or other water control equipment and materials shall be as determined by the CONTRACTOR. No materials shall be used which would be injurious to the structure or its future function.
- B. Chlorine for disinfection shall be in the form of liquid chlorine, sodium hypochlorite solution, or calcium hypochlorite granules or tablets.
- C. Liquid chlorine shall be in accordance with the requirements of ANSI/AWWA B301. Liquid chlorine shall be used only:
 - 1. In combination with appropriate gas flow chlorinators and ejectors;
 - 2. Under the direct supervision of an experienced technician;
 - 3. When appropriate safety practices are observed.
- D. Sodium hypochlorite and calcium hypochlorite shall be in accordance with the requirements of ANSI/AWWA B300.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Except as otherwise indicated, potable water for testing will be furnished by the CONTRACTOR who shall also make necessary arrangement for conveying the water to the points of use.
- B. All hydraulic structures and appurtenant pressure piping for [potable and] reclaimed water shall be tested and shall be disinfected where indicated. Disinfection shall be accomplished by chlorination. All chlorinating and testing operations shall be done in the presence of the CONSTRUCTION MANAGER.
- C. In the case of a reservoir, testing and disinfecting operations shall be combined.
- D. Disinfection operations shall be scheduled by the CONTRACTOR as late as possible during the contract time period so as to assure the maximum degree of sterility of the facilities at the time the WORK is accepted by the OWNER. [Bacteriological testing will be performed by a certified testing laboratory appointed and paid for by the OWNER. Results of the bacteriological testing shall be satisfactory to the State Department of Health or other appropriate regulatory agency.]
- E. If industrial paint finishes or other protective coatings are to be applied to the interior surfaces of the hydraulic structure, such coatings shall be applied after all testing operations have been completed but prior to disinfection, except that in the case of reservoirs, such coatings shall be applied before the combined testing and disinfecting operations.
- F. Release of water from structures, after testing and disinfecting have been completed, shall be as reviewed by the CONSTRUCTION MANAGER, however, this review shall not relieve the CONTRACTOR of his obligations and responsibilities under this Contract.

3.1 PRELIMINARY CLEANING AND FLUSHING

- A. Prior to both testing and disinfecting, all hydraulic structures shall be cleaned by thoroughly hosing down all surfaces with a high pressure hose and nozzle of sufficient size to deliver a minimum flow of 50 gpm. All water, dirt, and foreign material accumulated in this cleaning operation shall be discharged from the structure or otherwise removed.

3.2 TESTING OF HYDRAULIC STRUCTURES

- A. **General:** Testing shall be performed prior to backfilling, except where otherwise acceptable to the CONSTRUCTION MANAGER. Testing for concrete structures shall not be performed sooner than 14 days after all portions of structure walls and associated roof systems have been completed. The test shall consist of filling the structure with water to the maximum operating water surface. The rate of filling shall not exceed 24 inches of depth per day. All visible leakage shall be repaired.

- B. **Leakage Test and Repairs:** After the structure has been filled, the water loss leakage test shall be performed as follows:

1. An initial water level reading shall be made. Seven days following the initial reading, a second reading shall be made.
2. The structure shall be considered to have passed the test if water loss during the 7-day period, as computed from the two water level readings, does not exceed 0.2 percent of the total volume of water in the structure, after allowance is made for evaporation loss.
3. If intermediate readings or observed leakage indicate that the allowable leakage will be exceeded, the test may be terminated before the end of the 7-day period and appropriate action taken to correct the problem before commencing a new 7-day test period.
4. Should the structure fail to pass the test, the test shall be repeated for up to 3 additional 7-day test periods.
5. If, at the end of 28 days, the structure still fails to pass the leakage test, the CONTRACTOR shall empty the structure as acceptable to the CONSTRUCTION MANAGER and shall examine the exterior and interior for evidence of any cracking or other conditions that might be responsible for the leakage. Any cracks shall be repaired and sealed with polyurethane sealant in accordance with Section 03300. Any evidence of leakage shall be repaired. Following these operations, the CONTRACTOR shall again test the hydraulic structure. In the case of a reservoir, the retesting shall again be combined with disinfection, exclusive of the spraying operation.

- C. **Acceptance:** The structure will not be accepted as completed until the water loss leakage test is passed and all visible leakage repaired.

3.3 TESTING OF APPURTENANT PIPING

- A. Piping appurtenant to hydraulic structures shall be tested as specified in Section 02666.

3.4 DISINFECTION OF HYDRAULIC STRUCTURES AND APPURTENANT PIPELINES

- A. Disinfection of hydraulic structures shall be performed in accordance with the requirements of ANSI/AWWA C652 using a combination of chlorination Methods 2 and 3 as modified herein.
- B. **Chlorination:** A strong chlorine solution (about 200 mg/l) shall be sprayed on all interior surfaces of the structure. Following this, the structure shall be partially filled with water to a depth of approximately one foot. During the partial filling operation, a chlorine-water mixture shall be injected by means of a solution-feed chlorinating device in such a way as to give a uniform chlorine concentration during the entire filling operation. The point of application shall be such that the chlorine solution will mix readily with the inflowing water. The dosage applied to the water shall be sufficient to provide a chlorine residual of at least 50 mg/l upon completion of the partial filling operation. Precautions shall be taken to prevent the strong chlorine solution from flowing back into the lines supplying the water. After the partial filling has been completed, sufficient water shall be drained from the lower ends of appurtenant piping to ensure filling the lines with the heavily chlorinated water.
- C. **Retention Period:** Chlorinated water shall be retained in the partially filled structure and appurtenant piping long enough to destroy all non-spore-forming bacteria, and in any event, for at least 24 hours. After the chlorine-treated water has been retained for the required time, the free chlorine residual in the structure and appurtenant piping shall be at least 25 mg/l. All valves shall be operated while the lines are filled with the heavily chlorinated water.
- D. **Final Filling of Structure:** After the free chlorine residual has been checked, and has been found to satisfy the above requirement, the water level in the structure shall be raised to its final elevation by addition of [potable] water. Before final filling is commenced, the quantity of heavily-chlorinated water remaining in the structure after filling the piping shall, unless otherwise acceptable to the CONSTRUCTION MANAGER, be sufficient to produce a free chlorine residual of between 1 and 2 mg/l when the water level is raised to its final elevation. After the structures have been filled, the strength of the chlorinated water shall be determined. If the free chlorine residual is less than 1 mg/l, an additional dosage shall be applied to the water in the structure. If the free chlorine residual is greater than 2 mg/l, the structure shall be partially emptied and additional [potable] water added to produce a free chlorine residual of 1 to 2 mg/l. In no case shall water be released prior to the expiration of the required retention period.

3.5 BACTERIOLOGICAL SAMPLING AND TESTING

- A. Disinfected water storage facilities will be sampled and tested by the OWNER in accordance with ANSI/AWWA C652.]

** END OF SECTION **