

# **Guidelines for Maintaining Water Quality - Underwater Storage Tank Inspection & Cleaning<sup>1</sup>**

## **Engineering Section / Arkansas Department of Health & Human Services**

These guidelines concern the maintenance of water quality during an underwater tank inspection or cleaning by divers, remote operated vehicles (ROV), or rafts. They do not apply to newly constructed tanks, or tanks which are removed from service and drained for cleaning or inspection.

Improperly disinfected divers, inspectors, and equipment can contaminate the water. Additionally, tank sediment may contain microorganisms which, if resuspended during the inspection or cleaning, can cause contamination of the water.

Observing and measuring water quality, and taking the appropriate actions if water quality is not maintained, including the notification of customers, is the responsibility of the water utility. Advanced notice to the Engineering Section, ADHHS is to be made by the utility of the proposed date of an underwater inspection or cleaning. The availability of Engineering Section staff for onsite water quality measurements is not guaranteed.

### **I. Public Notification**

A. Notification of the proposed tank entry is to be provided to customers served by the affected tank in a manner appropriate for the area and the utility.

### **II. Tank Isolation**

A. Isolation of the storage tank during underwater inspection or cleaning is strongly recommended and may be required for safety reasons. If operational conditions necessitate an underwater inspection or cleaning without isolation, then the work should be done during periods when positive flow into the storage tank is maintained, or flow rates into or out of the tank are minimal.

### **III. Water Quality Monitoring**

- A. Before entry - the chlorine residual and turbidity of the tank contents shall be measured and recorded by the water utility. Samples should be taken from several depths, if possible. At least one bacteriological sample shall also be collected from the tank, analyzed by a certified laboratory, and test negative for coliform bacteria (coliform absent). If the chlorine residual is less than 0.5 mg/l, sufficient chlorine solution or granules shall be added to raise the residual to at least 0.5 mg/l but not to exceed 3 mg/l.
- B. After entry – the chlorine residual and turbidity of the tank shall be measured and recorded at the same locations and at least one bacteriological sample collected and analyzed for coliform bacteria.

### **IV. Acceptable Water Quality**

- A. Water returned to the distribution system from a tank which has undergone an underwater inspection or cleaning must meet one of the following criteria:
1. If the tank is isolated: A negative bacteriological analysis (coliform absent) from a certified drinking water lab; and after-entry chlorine residual and turbidity measurements that show no degradation when compared to the before-entry measurements.
  2. If the tank is not isolated: After-entry chlorine residual and turbidity measurements that show no degradation when compared to the before-entry measurements, as determined by an onsite Engineering Section, ADHHS representative. The water utility shall also collect and submit a

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<sup>1</sup> These guidelines are modeled on AWWA C652-02 *Disinfection of Water Storage Facilities* and are only meant to address the sanitary quality of the water before and after tank entry. They are not meant to provide guidance on safety issues for confined space entry and diving operations. Because of the hazardous nature of this work, contractors must comply with all federal, state, and local regulations and safety requirements.

sample from the tank for coliform analysis to a certified drinking water laboratory, the results of which (24-48 hrs later) must be negative (coliform absent).

Degradation is defined as a reduction in the chlorine residual by 0.2 mg/l or more, or a turbidity increase of 2 NTU or more.

- B. If after the tank entry the water fails to meet these criteria, the utility shall immediately:
1. Isolate the tank, reestablish the chlorine residual in the water in the tank, and collect subsequent bacteriological samples until the results are negative (coliform absent); or,
  2. Issue a Boil Water Advisory (BWA) for the distribution area served by the tank. BWA to remain in effect until bacteriological samples from the tank and the distribution system are negative (coliform absent).

#### **V. Equipment and Personnel Requirements**

- A. All equipment to be used shall be available for inspection.
- B. All equipment exposed to water shall be dedicated for potable water storage facilities only and shall be stored in a manner that prevents both chemical and bacteriological contamination.
- C. All equipment shall be constructed and maintained so that water quality is not affected.
- D. Divers shall be completely encapsulated with no bare skin exposed. There shall be no contact of the mouth or head with the water.
- E. Diving clothing shall be of the dry-suit type, in good condition, and free from tears or other imperfections that may impair the integrity of the suit.
- F. Float down inspectors must wear a dry suit that can be properly disinfected.
- G. Unless explicitly approved by the utility to do so, divers or ROV's shall not disturb tank sediment.
- H. All personnel entering a storage tank shall be free of communicable disease and shall not have been under a physician's care within the previous 7 day period. No person who knowingly has an abnormal temperature or symptoms of illness shall work in a storage tank.

#### **VI. Disinfection of Equipment**

- A. All equipment exposed to water shall be suitable for disinfection.
- B. Before opening, the access hatch and its immediate area shall be cleaned of all loose dirt and debris.
- C. A diver and clothing shall be disinfected after the diver is suited up and on top of the tank.
- D. A solution of 200 mg/l available chlorine shall be applied to all surfaces immediately prior to entry to the water. Application can be by submersion, spray, sponge, or brush and shall remain in contact with the solution for at least 30 minutes. Any excess, runoff, or spillage is to be controlled so that it does not enter the storage tank.
- E. Any equipment that makes contact with the roof shall be re-disinfected prior to entering the tank.

#### **VII. Certifications**

- A. The contractor shall have a comprehensive safety manual on site which addresses all potential hazards for the particular storage tank. The manual shall include certifications for onsite employees for diving, OSHA confined space entry, first aid, and CPR.
- B. The contractor shall have a method and equipment readily available for extraction and lowering of an injured diver.

#### **VIII. Logistics**

- A. A pre-job meeting involving the contractor and water utility representatives shall be held to ensure that the personnel understand the inspection or cleaning procedures, the configuration of the reservoir, disinfection procedures, maintenance of water quality, and the consequences if such quality is not maintained.

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