



Underwater Storage Tank Inspection & Cleaning Guidance for Maintaining Public Water Supply Storage Quality¹

Iowa Department of Natural Resources

Numerous companies offer the services of inspecting finished water storage tanks using underwater methods such as divers or remote operated vehicles (ROV). The department does not have specific rules governing the methods for cleaning or inspecting water storage tanks but does have rules for disinfection and sampling following cleaning, inspection, and maintenance of storage tanks (AWWA Standard C652-11 and Ten States Standards 2012 Edition adopted by reference at 567 IAC 43.3 (2)“a” in 2018). It is the responsibility of the public water supply to ensure that that the water being served to its customers is safe and meets the requirements of the rules contained in 567 IAC Chapters 40-43. This document serves as guidance for maintaining drinking water standards during an underwater tank inspection or cleaning event as outlined in section 4.4 of AWWA Standard C652-11. These guidelines do not apply to newly constructed tanks, or tanks which are removed from service and drained for cleaning or inspection. AWWA Standard C652-11 should be referenced for these situations.

Only experienced qualified contractors should be used. Contractors must follow all applicable federal, state, and local regulations and be willing to explain their diver safety and disinfection procedures. Improperly disinfected divers, inspectors, and equipment can contaminate the water and pose a risk to public health and safety. Additionally, tank sediment may contain microorganisms which, if re-suspended during the inspection or cleaning, has the potential to cause contamination of the water. Observing and measuring water quality and taking the appropriate actions if drinking water standards are not maintained, including the notification of customers is the responsibility of the water utility.

I. Notifications

- A. As a courtesy, the utility is encouraged but not required to provide advance notification of the proposed tank entry to customers served by the affected tank in a manner appropriate for the area and the utility.
- B. Notice to the DNR is not required unless a Precautionary Boil Advisory is issued per section III.A or IV of this guidance document. To report a boil advisory or for general questions contact the appropriate DNR Field Office:

FO1 (Manchester): 563-927-2640

FO2 (Mason City): 641-424-4073

FO3 (Spencer): 712-262-4177

After Hours Emergency Response Hotline: 515-725-8694

FO4 (Atlantic): 712-243-1934

FO5 (Des Moines): 515-725-0268

FO6 (Washington): 319-653-2135

II. Tank Isolation

- A. Isolation of the storage tank during underwater inspection or cleaning is strongly recommended and may be required for safety reasons. Also, by removing the storage tank from service, it may reduce the potential for any contamination entering the system, and allows for decontamination, if it should become necessary. 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, if possible. If a storage facility is

¹ The Iowa Department of Natural Resources (DNR) has prepared this guidance to assist facilities in complying with public water supply regulations. This document is intended solely as guidance, cannot be used to bind the DNR and is not a substitute for reading applicable statutes and regulations. This guidance was based on AWWA C652-11 Disinfection of Water Storage Facilities and Ten States Standards for Water Supplies 2012 Edition. This guidance is only meant to address the sanitary quality of the water before and after tank entry and is 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.

not isolated, the DNR does recommend that the storage tank be capable of being isolated in the event damage or contamination occurs necessitating removal of the tank from service under emergency conditions. Thus, the necessary equipment, such as valves, to remove the storage tank from service must operate properly. This requires that the equipment be exercised routinely and system operators be familiar with the isolation procedure.

III. Monitoring

- A. Before Entry – the chlorine residual of the tank contents shall be measured and recorded by the contractor or water utility. Samples should be taken from several depths, if possible. If the chlorine residual is less than 0.5 mg/L free chlorine or 2.0 mg/L total chlorine if chloraminating, sufficient chlorine solution or granules should be added to raise the residual in the tank to the levels described above. Residuals should not exceed 4 mg/L. The system should also measure and record turbidity if they have the equipment to do so.

If the system does not normally disinfect and/or cannot meet the above disinfection requirements prior to entry and the tank cannot remain isolated from the system until negative bacteriological analysis from a state of Iowa certified drinking water laboratory is obtained, the system must consult with the department to determine if a precautionary boil advisory is warranted. (Note: it is the general policy of the department under this situation to require a precautionary boil advisory for the distribution area served by the tank according to the Iowa Main Break and Depressurization Guidance (IDNR Form 542-0535). When issued, the precautionary boil advisory is to remain in effect until the work is completed and acceptable water quality can be verified through bacterial sampling).

- B. After Entry – it is necessary to ensure that water quality has not degraded and that sufficient chlorine residuals are maintained at or above the levels established in section III.A. The following steps shall be taken:
- i. For tanks that have been isolated:
 - Following completion of the work, residual chlorine and turbidity of the tank (if applicable) shall be measured and recorded
 - If the residuals have dropped during the work, chlorine residuals in the tank should be restored to a minimum 0.5 mg/L free chlorine or 2.0 mg/L total chlorine if chloraminating prior to collecting bacteria samples
 - At least two bacteriological samples must be collected at 24-hour intervals and analyzed for coliform bacteria by a state of Iowa certified laboratory and be free of coliform bacteria prior to placing the tank back into service
 - ii. For tanks that are not isolated during the work or cannot remain isolated until bacteriological sampling can be completed:
 - Residual chlorine and turbidity of the tank (if applicable) shall be measured and recorded every four hours or more frequently while work is being done inside the tank and following completion of the work to ensure residuals remain above 0.5 mg/L free chlorine or 2.0 mg/L total chlorine if chloraminating
 - Sufficient chlorine solution or granules should be added at the end of each interval to raise the residuals to the levels described above
 - Following completion of all work and verification of chlorine residuals, at least two bacteriological samples must be collected at 24-hour intervals and analyzed for coliform bacteria by a state of Iowa certified laboratory and be free of coliform bacteria

IV. Acceptable Quality

- A. As long as the conditions in section III are met, a boil advisory is not required unless system pressures have dropped to zero in the water distribution system during the inspection process or unsafe bacteria sample results are obtained after the completion of the work after the tank has been returned to service.
- B. If testing shows the presence of coliform bacteria in a tank that has been returned to service, a Precautionary Boil Advisory for the distribution area served by the tank must be instituted according

to the *Iowa Main Break and Depressurization Guidance* (IDNR Form 542-0535). This guidance is available at www.iowadnr.gov/ws-publicnotice. The situation should be evaluated by qualified personal and appropriate action taken. The Precautionary Boil Advisory is to remain in effect until bacteriological samples from the tank and the distribution system are negative (coliform absent).

- C. When surface water plant clearwells or ground storage tanks are inspected and cleaned, turbidity analysis must be done in addition to disinfectant residual analysis. Water exceeding 1.0 NTU must not be released to the system. Please note that inspection of tanks that are used to meet contact time requirements (CT), may require additional measurement and surveillance to ensure the system meets CT requirements. Systems are encouraged to consult with their respective DNR Field Office prior to inspection of a CT tank.

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 and 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 exterior 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 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.