



## ARKANSAS DEPARTMENT OF HEALTH – ENGINEERING SECTION

### GUIDANCE FOR WATER STORAGE TANK INSPECTIONS

May 4, 2023

#### KEY POINTS

1. Finished water storage tanks shall have a comprehensive inspection including both the inside and outside of the tank completed at least once in any given 5 year period.
2. An inspection report with color photos and/or video shall be provided to the water system and a copy of the inspection report with color photos and/or video shall be provided to the Engineering Section of the ADH.
3. Minor repairs should be made as a part of the inspection with both before and after repair color photos and/or video included in the inspection report.

#### GENERAL

Most, but not all, public water systems (PWS) have one or more water storage tanks. Many water storage tanks have roofs that are well above ground level and have significant access and safety issues that must be addressed in order to inspect the upper exterior, roof and inner portions of the tank. During Sanitary Surveys, Arkansas Department of Health Engineering Section (ADH) staff may climb tanks that are less than 24 feet high and inspect the upper exterior and roof. Note that ADH staff is not required to climb onto the roof of any tank or inspect any part of a PWS if they feel that they can't safely access the area, including the tank interior.

Given the potential for sanitary hazards to exist on the roofs or portions of water storage tanks that are not easily inspected, and guidance from AWWA standards and manuals of practice, ADH is requiring PWS's to have their water storage tanks inspected at least once during any 5 year period. PWS staff, if capable and has access to adequate safety equipment and procedures, may do the inspections or a third party tank inspector may be used. Failure to have inspections done is considered a significant deficiency and will likely result in enforcement action by ADH.

Water storage “tanks” includes distribution and plant site storage tanks, clearwells, pump wells, backwash tanks, and any other structure such as chemical feed vaults, final mixer vaults, and flow splitting or control structures which contain finished water. Pressure (Hydropneumatic) tanks that have 20 PSI or greater pressure continuously at the top of the tank are excluded since any hole in the pressure tank will result in leakage out of the tank, not into the tank. ADH does recommend that hydropneumatic tanks be inspected on a routine basis to ensure the integrity of the tank is maintained.

### INSPECTOR QUALIFICATIONS

At this time, ADH has not set minimum qualifications for tank inspectors. However, the PWS shall determine that an inspector has adequate knowledge to safely inspect the tank prior to the tank inspection. The PWS is ultimately responsible for ensuring the sanitary conditions of water storage tanks that are actively connected to the drinking water distribution system.

At a minimum, the inspector shall be familiar with and knowledgeable of:

1. Sanitary Assessment. Sanitary requirements including, but not limited to ADH Rules and Regulations Pertaining to Public Water Systems, GLUMRB (Ten State) standards for tanks and accessories, AWWA tank standards, and AWWA M42.
2. Structural Assessment. Assessing the structural condition of the tank and its accessories. Note that it is possible for a tank or tank accessory to be so deteriorated that it is not safe to fully inspect the tank. The inspector does not have to be a registered engineer but does need to have the ability to generally assess the structural condition of the tank and to recognize areas or issues that are significant enough so that a follow up inspection by a registered engineer with experience in the structural design of water tanks is needed.
3. Coatings (Paint) Assessment. Assessing the condition of paint or other coatings and determining if the coating is still protective against corrosion, estimating the remaining useable life of the coating, and estimating the percentage of coating failure on a given surface.
4. Safety (OSHA) Assessment. Assessing the condition of the tank and accessories and being familiar with safety (OSHA) requirements including, but not limited to, confined space entry, personal protective equipment, walking / working surfaces, and hazardous energy (lock out/tag out).
5. Security Assessment. Assessing the tank, the tank site facilities, and how unauthorized persons are discouraged from accessing the tank and tank site.

6. Minor Repairs. Making minor sanitary repairs to the tank or tank accessories as a part of the inspection. Although this is rarely done during inspections on a nationwide basis, given the safety issues and difficulty in accessing some parts of tanks, ADH wants minor repairs done and documented as a part of the inspection process. The tank inspector should have an assortment of hand tools, #24 mesh screen, padlocks, etc., onsite prior to starting the tank inspection. Examples of minor repairs would include but are not limited to:
  - a. installing a pad lock on a roof hatch,
  - b. replacing a damaged or missing screen on a roof vent,
  - c. moving a cathodic plate access hole cover back into position and securing in position so that a watertight seal is achieved,
  - d. temporary repair of a hole in the tank to prevent water or insects from entering the tank until a permanent repair can be made.

There are multiple methods of accomplishing the tank inspection. The tank can be taken out of service, drained, and inspected, a float down method may be used, and divers and/or ROV's may be used. The ADH's "Policy for Maintaining Water Quality – Underwater Storage Tank Inspection & Cleaning" must be complied with when using float down, diver, or ROV inspection methods.

## REPORT REQUIREMENTS

A written report is required for each tank inspection. Electronic versions in PDF or other common formats are acceptable to ADH. The reports shall include color photos and/or color video that documents the conditions (good or bad) of the tank. There are no ADH requirements on report forms or formats so long as all required information is provided.

The original report shall be provided to the PWS and a copy of the report including color photos and/or color video shall be provided to ADH by the PWS or by the inspector.

The word "photo" is interchangeable with the word "video". The intent is photographic documentation either as standalone photographs or as a part of a video recording. Either is acceptable so long as the condition being documented is visible to the person reviewing the photo or video. The reason for the photos is so that persons that did not climb the tank can see the condition of the tank.

The PWS must keep the tank inspection report on file for a minimum of 10 years.

## Report Basics

Reports shall include:

1. Inspection Company Name, Address, Telephone number, email address.
2. Signature by inspector or by company staff responsible for inspection work.
3. Date of Inspection.
4. Public Water System Name and Tank Name.
5. Nominal volume of tank.
6. Location of the tank, either a map, street address, or directions from a street or highway intersection.
7. Photo or plan drawing of the tank.
8. Data plate information from tank.
9. Sanitary assessment of the tank (see below).
10. Structural assessment of the tank (see below).
11. Coatings (Paint) assessment (see below).
12. Safety (OSHA) assessment (see below).
13. Security assessment (see below).
14. Miscellaneous assessment (see below).
15. Minor Repairs (include before and after photos).
16. Photo and/or Video documentation of the features and conditions of the tank site and the entire tank including the interior, exterior, and all features.
17. Findings and recommendations.

## Sanitary Assessment

The tank and its accessories shall be constructed and maintained in a manner which protects the water quality. This means excluding rainwater, runoff, dirt, insects, birds, and animals including humans from entering the tank. It also includes an assessment of the mixing and turnover of water in the tank. Water in a tank can stratify due to temperature differences in the water already in the tank and the water being put into the tank, or from solar heating. Without adequate mixing and turnover, the water in the tank can stratify with layers of warm water on top of colder water. The warmer upper layers of water can stay in the tank, lose disinfectant residual, grow bacteria and/or other microorganisms, and potentially increase disinfection by-products such as THM's or HAA5's.

1. Vents
  - a. For each vent, document the size, type and condition of the vent with photos.

- b. Document the size of the screen with a ruler or object of known size such as a coin in the photo. If there is a coarse screen protecting the insect screen, note it in the report.
- c. Document the condition of the existing, or missing, insect screen. If damaged or missing, it should be replaced with #24 mesh stainless steel or other #24 mesh corrosion resistant screen. Document that the missing or damaged screen was repaired or replaced in a photo.
- d. Document with photos that the cover or shroud over the vent screen extends down to at least the bottom of the screen.
- e. Document that the design of the vent excludes roof or other runoff water, insects, birds, and animals. Document the design of the vent excludes rainwater including rainwater splashing off the roof, and dust to the extent possible.
- f. Document the height of the bottom of the air intake above the roof or other nearby flat surface (should be 24 inches or more to minimize rain splashing).
- g. Finial Ball vents were used on old "Witch Hat" and other conical tanks. The original design of most finial balls allows rainwater, insects, and small birds or bats to enter the tank. Unless properly constructed and screened with #24 mesh, most finial ball vents will be a significant deficiency. Document the design, construction, and condition with photos.

## 2. Hatches

- a. Document the condition and construction of each hatch with photos.
- b. Hatches below the water level should have a gasket and be bolted shut. Have a spare gasket on hand prior to unbolting the hatches with gaskets below the overflow level. Document that the hatch was/was not leaking prior to opening and that the hatch is/is not leaking after being bolted shut and when the tank water level is at the normal high water level.
- c. Hatches above the water level should be of "shoebox" construction. The hatch cover should hang down over the rim of the hatch a minimum of 2 inches. The rim of the hatch shall be a minimum of 4 inches above the roof of the tank. For tanks with roofs at or near grade, the rim on the hatch shall be a minimum of 24 inches above grade. Document the design and condition of each hatch with photos.
- d. Hatches above the water level should be of "shoebox" construction and shall have a gasket to exclude insects between the hatch cover and the rim of the hatch. Document the condition of the existing, or missing, gasket with photos. If needed, repair or replace the gasket, and document the minor repair with photos.

- e. The use of flush hatches with gutters and drains is not acceptable since the gutter or drain may clog up and this type of hatch is generally not insect proof. Also, the discharge end of the drainpipe may become an access point for insects and/or rodents.
  - f. Older tanks may have "tomb stone" type hatches which usually don't have 4" or taller curbs and usually the hatch does not have an overhang or curb on the low side. This style of hatch is normally a significant deficiency.
  - g. Hatch designs should not rely on caulking to exclude water and insects.
3. Overflow
- a. Document the construction and condition of each overflow with photos.
  - b. Overflow piping must stay above grade and terminate in an air gap with the invert of the pipe 1 to 2 feet above grade (higher is acceptable if the discharge end of the overflow is accessible for inspection or repair while standing on the ground). Overflow piping that terminates high enough above grade to not be accessible while standing on the ground is considered a deficiency and the piping shall be extended down to discharge 1 to 2 feet above grade as a part of the next tank painting or major rehabilitation project.
  - c. Overflows shall terminate with an air gap over a concrete pad, rip-rap, or a grated opening into a drainage structure. The goal is prevention of erosion during overflow events.
  - d. The overflow should be located so that overflowing water is easily visible and will be noticed.
  - e. Overflows shall terminate in a tight closing flap valve or duckbill style valve and/or shall be screened with #24 mesh. A coarse screen such as #4 mesh is recommended as a support on the discharge side of the #24 mesh screen.
  - f. An Overflow without an insect screen and without a tight closing flap or duckbill valve are considered a significant deficiency.
  - g. The overflow piping shall discharge with an air gap above the flood level.
4. Cathodic Protection system.
- a. Document the construction and condition of each cathodic protection system access hatch, hand hole, and associated bolts with photos.
  - b. A cathodic protection system access hatch or hand hole that is not sealed watertight and may or does allow rainwater or roof runoff to enter the tank is considered a significant deficiency.
  - c. For cathodic protection system access holes which do not have a 4" or taller curb, if the cathodic protection system will remain in service, 4" high curbs welded to the tank roof if steel or otherwise sealed to the roof on other roof

materials shall be installed during the next major tank painting or rehab project. If the cathodic protection system will not remain in service, the cathodic protection system and associated bolt holes shall be welded shut on steel roofs or otherwise permanently sealed watertight on other roof materials.

5. Drain

- a. Tanks shall have a drain unless the drain outlet elevation will be below the normal water level of nearby surface water.
- b. Tank drains shall not directly connect to sanitary sewers or storm sewers.
- c. Tank drains and isolation valving shall allow draining of the tank without loss of system pressure.
- d. A tight closing flap valve or coarse screen is recommended on the discharge of the tank drain. Lack of a flap valve or coarse screen could be a deficiency depending on other factors/conditions affecting the drain and discharge.
- e. Document the type of drain and the discharge point with photos.

6. Roof to sidewall connection

- a. Document with photos how the roof of the tank is attached to the sidewalls of the tank.
- b. For most welded steel tanks, the roof is continuously welded to the sidewall and is a watertight seal unless damaged or severely corroded.
- c. On older "Witch Hat" style tanks, the roof may be continuously welded to the sidewalls, but the roof may be connected to the sidewalls with bolts, brackets, or clips. Any gap between the roof and the tank sidewall which will allow water or insects to enter the tank is a significant deficiency.
- d. For concrete tanks, if there is a crack where the roof joins the sidewalls, the crack shall be sealed watertight with caulk or similar materials.

7. Mixing

- a. Document the existence or absence of tank features designed to improve mixing inside the tank including, but not limited to: separate inlets and outlets, inlet riser piping, or active mixing systems. Document mixing features with photos.
- b. For wet inspections, document the disinfectant residuals at the top of the water level, and on the first tap on piping entering or leaving the tank. Also, sample and document from other taps or access points on the tank. Include the sample results in the report.
- c. For tanks without mixing features, the tank shall be upgraded with mixing features the next time the tank is taken out of service for painting or other major rehabilitation.

- d. Powered active mixing systems shall be designed to protect the sanitary condition of the tank from the roof/shell penetrations for power and support cables.
8. Interior Posts and Walls
- a. Tanks may have interior support posts, columns, or walls. Document the condition of the posts, columns, or walls. Provide photos.
9. Structural
- a. Document the structural condition of the entire tank including the foundation. Include photos of key structural features or issues.
  - b. If significant structural or potentially significant structural issues are found, unless the inspector is qualified to design repairs, the inspection report should recommend a follow up inspection by a licensed Professional Engineer with experience in the structural design of water tanks.
10. Coatings (Paint)
- a. Determine and document the condition of the coatings and if they are still protective against corrosion or not.
  - b. Estimate the remaining useable life of the coatings.
  - c. Estimate the percentage of coating failure on a given surface.
  - d. If significant coating failure has occurred, document the presence / absence of pitting, the amount of pitting, and the depths of pits.
  - e. Document the condition of the coatings with photos.
11. Safety (OSHA)
- a. The ADH does not enforce OSHA regulations. In Arkansas, the Arkansas Department of Labor and OSHA are responsible for enforcement of OSHA regulations. However, tank inspection reports should document compliance or non-compliance with OSHA regulations.
  - b. The OSHA 2016 revisions to the Walking Working Surfaces regulations require existing facilities to come into compliance with the regulations by 2036.
  - c. Many (potentially most) existing tanks in Arkansas are not in full compliance with OSHA regulations. Since modifications to meet OSHA regulations may damage the existing paint and a good paint job on a tank can last 20 or more years, we recommend bringing the tank into full compliance with the OSHA regulations prior to or concurrent with a re-painting or rehabilitation project.
  - d. Does the tank have railings at least in the vicinity of the ladder, hatches, and vents? Document with photos.
  - e. How tall is the railing and does the railing have a top rail, mid rail, and toe board. What is the condition of the railing? Document with photos.



- f. Is the roof access ladder compliant with OSHA dimensions (Spacing of rungs, width of rungs, offset from tank, clearance from other objects, clearance from cables / wiring / antennas? Document with photos.
- g. How high above the roof does the ladder extend and do the rails flare out to allow access past a safety climb system? How high above grade does the ladder start (ADH recommends 10 to 14 feet) and are there items that could be used as a climbing aid to reach the bottom of the ladder? Document with photos.
- h. Does the ladder have a cage, gate, or guard? Is the gate or guard locked shut? Document with photos.
- i. Does the ladder have a safety climb system? If so, what type cable or rail? What is the condition of the safety climb system? Does the top of the safety climb system extend high enough to allow a climber to stand on the roof of the tank prior to disconnecting from the safety climb system? Document with photos.
- j. Are there antennas on the tank that may pose a radiation hazard? If so, is there a warning sign near the ladder? Do antennas and ancillary equipment hinder access to or functionality to the tank or its components (Hatch, vent, ladder, overflow, level indicator, etc.? Document with photos.

## 12. Security

- a. ADH does not have standards for tank site fences. However, both ADH and the PWS want to discourage unauthorized access, vandalism, theft, and potential injury or death. Document the type and condition of any fencing with photos.
- b. Industry standard fencing is a 6 foot or taller chain link fence with 3 strands of barb wire on top.
- c. Six foot or taller no climb wrought iron or wooden privacy fence is acceptable. The no climb wrought iron is preferable since it does not hide on site activities like a solid fence does.
- d. Fence gates should be kept locked.
- e. Tank site fences should have signage such as “No Trespassing”, “Authorized Personnel Only”, “Keep out” or similar messages. Document any signage with photos.
- f. Signs with 911 address information and a telephone contact number are recommended.
- g. Is there area lighting on the tank site or aircraft warning lights on the tank? For all lighting:
  - i. Does the installation cause a sanitary hazard?
  - ii. Are the lights working?
  - iii. Does the installation generally comply with electrical codes?

- iv. Does the installation comply with OSHA regulations?
- v. Does the installation cause structural issues or coating issues?
- h. Cybersecurity protection should be provided for control and SCADA systems.

### 13. Miscellaneous

- a. The guidance in this policy is in general and applies to common features on most tanks. Some tanks have different design, material, or construction and have additional items that need to be inspected and the condition documented. For any of these items that is applicable to a given tank, document the item and condition with photos.
- b. On bolted and/or riveted tanks, a loose or missing bolt or rivet below the water line will result in a leak out, but above the water line, the leakage may be into the tank. All bolts and rivets above the water line need to be closely inspected. Document any loose or missing bolts or rivets with photos.
- c. Some tanks have geodesic dome roofs. The dome needs to be inspected to make certain all components are still in good condition and that the roof is still keeping contaminants out of the tank. Most of the geodesic dome roofs are aluminum roofs on top of a steel or concrete tank wall. The different materials have different thermal expansion rates and there will be a joint designed to accommodate the different thermal expansions. These joints generally include a section of flexible screening and/or metal flashing /counter flashing that slides on the opposing flashing. These joints need to be inspected to ensure the screen is #24 mesh in good condition and that rainwater and insects are being excluded from entering the tank. Document the condition of the roof with photos.
- d. Many tanks have a mechanical float cable system level indicator. These level indicating systems need to be inspected to ensure they are not allowing rainwater or runoff to enter the tank. The opening for the cable needs to be large enough for the cable to move freely, but small enough to exclude wasps and to the extent possible smaller insects. Consideration should be given to removal of these systems and using pressure transducers or pressure gauges instead. Document the design of the float cable system level indicator with photos including where the cable enters the tank, the pulley boxes and/or covers, the opening where the moving cable enters the piping, and the overall design of the system.
- e. Some tanks have antennas for PWS and/or third-party communications, and some antennas may emit harmful levels of radiation especially if you are close to and in front of the antenna. If the antenna is or may be capable of emitting

harmful levels of radiation, the inspector needs to take precautions such as taking the antenna out of service prior to climbing the tank. Document with photos how antennas and antenna cable is fastened to the tank.

- f. Any other item of interest, unusual tank feature or something that may or does impact the tank and / or the water quality inside the tank.

#### 14. Minor Repairs

- a. Given the safety and access issues on many tanks, ADH Engineering Section wants minor repairs done as a part of the inspection. Examples of minor repairs include, but are not limited to:
  - i. Replacement of a damaged or missing #24 mesh insect screen on a roof vent.
  - ii. Installing a lock on a roof hatch.
  - iii. Moving a cathodic protection access cover back over the center of the hole and tightening the bolt.
  - iv. Temporary patching of a hole in the roof until a permanent repair can be made.
  - v. Document completion of minor repairs with before and after photos.

#### 15. Major Repairs

- a. Any repair, rehabilitation or improvement that is not covered under item 14 above is considered a major repair and requires review and written approval of the project plans by ADH prior to commencement of the work. This review will ensure that adequate sanitary protections and procedures and functional components of the project are included in the plan.