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Storage Tank Operations & Maintenance Checklist

Finished water storage is critical to the efficient operation of water distribution systems. The major purposes of storage are to provide (1) storage volume for daily equalization and flow balancing; (2) fire flow volume; (3) pressure to the distribution system; and (4) for emergency situations including hurricanes, power failures, etc.

Finished water storage tanks impact water quality. Systems that have water quality compliance issues frequently also have high water age and poorly maintained storage tanks. Problems resulting from high water age can include: depletion of chlorine residual; formation of disinfection by-products; bacteriological hits in the distribution system; corrosion leading to lead / copper leaching; increased color, odor, and taste; blackwater formation from sulfates converted by sulfide bacteria; or nitrification by bacterial conversion of ammonia when chloramines are used. Using the recommendations found in this document can minimize all these problems.

FRWA recommends that you use this checklist as a supplement to your O&M Manual and Preventive Maintenance Logs for your system. This checklist is designed to comply with FDEP Rule 62-555.350(2) FAC that encourages and requires operators and suppliers of water to *"keep all necessary public water system components in operation and maintain such components in good operating condition so the components function as intended."*

Why should you perform tank inspection?

1. Inspections are required by the Florida Department of Environmental Protection.
2. Proper tank inspections and follow-up preventative maintenance ensure your tanks are in good working order and keep system officials aware of the tank conditions – with this knowledge maintenance / repair can be budgeted and scheduled in a timely manner.
3. Proactive preventative maintenance will ensure your customers with uninterrupted quality service (or minimize any interruptions).

When should you conduct tank inspections?

1. Operators should at least visually look over the tanks daily or **WEEKLY** when performing rounds.
2. A monthly or **QUARTERLY** inspection by the operator should be conducted to prevent emergencies, see the inspection checklist on page 3.
3. FDEP requires **ANNUAL** removal of *accumulated sludge and biogrowths* from tanks per Rule 62-555.350(2) FAC., see the inspection checklist on page 5.
    - The rule also states any *blistering, chipped, or cracked coatings and linings* on the TANK INTERIOR *shall be rehabilitated or repaired.*
    - Evidence of these activities should be placed in the Log Book and O&M Logs. Thus annual inspections are vital and more frequent inspections (monthly / quarterly) are highly recommended.
4. FDEP requires tanks to be *cleaned at least once every **FIVE YEARS** to remove biogrowths, **calcium or iron / manganese deposits**, and sludge from inside the tanks*, see the inspection checklist on page 7.
    - Additionally the rule states an engineering inspection is required for structural and coating integrity per Rule 62-555.350(2) FAC.

The major types of Potable Water Tanks are:

1. Ground Storage Tanks (GST)
2. Elevated Storage Tanks (EST)
    a. Standpipes (a type of elevated storage)
3. Hydropneumatic Tanks (HT)

Ground Storage Tanks: GSTs are generally designed using direct or high service pumps and located on ground level. In hilly country they might be set in the side of a hill and act much like elevated storage tanks. The GST or clearwell acts as a hydraulic buffer between the source of water and the distribution system. Water storage tanks may be constructed of reinforced concrete, prestressed concrete, steel, glass coated steel, or other suitable material, depending upon the function of the tank, economic factors, AWWA Standards, and regulatory agency requirements.

Elevated Storage Tanks: ESTs are tanks are generally constructed of steel, raised high above the ground and supported by legs or a pedestal. They and are usually found located within in the distribution system close as possible to high demand areas. Gravity and the weight of the water provide a steady pressure on the water system. The water level in the tank is controlled by an altitude valve. This valve prevents the tank from overfilling and sometimes is used to control the flow of water out of the tank into the water distribution system in the reverse flow direction. Since the tank bulb is made of steel, it is important to protect the steel from corrosion that is expedited by the oxygen contained in the water. These tanks are typically supplied with magnesium anodes that hang below the water surface and are electrically connected to the sides of the tank. The magnesium protects the submerged portion of the tank from corrosion. When inspecting a tank, it is important that these anodes are inspected and replaced as needed and that all electrical connections are secure.

> Standpipes: Are a type of elevated tank used in the distribution system to provide water pressure with little storage capability (except for large diameter tanks). Gravity and the weight of the water provide a relatively steady pressure on the system. Standpipes are basically a tall thin ground storage tank. The lower portion may not be allowed as elevated storage. Only the portion 81-feet in height (equivalent to 35 psi) above the highest connection should be counted as available elevated storage.

Hydropneumatic Tanks: Hydropneumatic Tanks are designed to use air pressure in the upper portion of the tank to exert pressure on the water providing pressure in the distribution system, and reduce the number of times the well pump turns off and on – they are not storage vessels as such, do not provide storage capacity, and should not be used to provide fire protection purposes. *Recommended Standards for Water Works*[1] (aka Ten States Standards) also states clearly that, *"hydropneumatic tank storage is <u>not to be permitted</u> for fire protection purposes."* (paragraph 7.2) [emphasis added]. However the Insurance Services Office (ISO) allows fire protection rating to be evaluated if the water system can meet the demand for the duration of the fire. Generally speaking the Florida Department of Environmental Protection does NOT mandate systems to provide fire protection, as this issue is not a water quality issue, but it gets involved with the system components as they are related to water quality, capacity and supply. The recommended water to air ratio is approximately two-thirds water to one-third air. The lack of sufficient air in a hydropneumatic tank will result in rapid start-stop cycling of the pump and pressure surges on piping, valves, fittings, and equipment -- damage has resulted in some cases. As a result of this water to air ratio only about 1/3 of the hydropneumatic tank volume can be considered operational storage.

Vandalism and Unauthorized Entry: FDEP requires that breaches in security (any unauthorized entry into a storage tank site) to be reported within 2 hours of discovery to the State Warning Point (800) 320-0519. Thus it is important that security be maintained at water storage tank sites. Often storage tanks are located in remote areas and are attractive spots for vandals or kids who like to climb up to the top of a tank and/or use them for painting graffiti. Unfortunately, they are also a likely place for easy terrorist access to drinking water for adding contaminants that could reach customers. For this reason security breaches must always be taken very seriously and considered as a threat to the water's safety. When a security breach has occurred and access could have been made to the water, the water in the tank must be held there until the water safety can be evaluated. DEP should be immediately contacted and will assist with this analysis. Site security consists of two main components, deterrence and detection. Installing gates, fences, locks, alarms and security lighting provides deterrence.

[1] *"Recommended Standards for Water Works"* as incorporated into FDEP Rule by 62-555.330(3), F.A.C.

QUARTERLY

Storage Tank O&M Inspection Checklist

Also see instructions on the backside of this checklist. FRWA recommends that systems conduct a QUARTERLY Sanitary / Safety Inspection of ALL tanks (this should take just a few minutes per tank, a bit more for elevated tanks) – if you haven't set dates aside for the quarterly inspection we suggest using February 15, May 15, August 15, and November 15. This inspection can be performed by the water operator, and is primarily a visual inspection. The purpose of the physical inspection is to determine the condition of the tank and to ensure its longevity.

Category & Description of Work	Comments OK / Observations / Concerns	Inspection Date	Operator Initials
Vandalism & Security ~ Check fences, gates, locks, warning signs, site visibility, lighting and etc.			
Foundation ~ Inspect for structural damage in tank foundation.			
Has the foundation started cracking, shifting or spalling? Are cracks sealed or are weeds growing thru cracks? Are nuts, bolts & guy wires tight and intact?			
Tank Exterior ~ Look for degrading coatings & increased structural damage in tank walls.			
Inspect for wall cracking, shifting, leaks particularly around bottom of tank, fittings, and pipes			
Look for problems with protective coating – note any visible rust, blistering, chipped, or cracked coatings			
Overflow Line – purposely overflow tank to ensure that the line is clear, unobstructed, and operable.			
Drain Lines – ensure clean and unobstructed			
Check Ladders, Fences, and Gates – ensure all are secured / locked			
Roof / Top of Tank ~ Inspect coatings & structural condition of tank roof.			
Inspect vents – ensure are working properly & screens are intact (24 mesh) to prevent the entry of insects, birds and other animals			
Check Manway Hatches – ensure all are secured / locked, do not leak, and are working properly			
Check Ladders, Walkways & Safety Equipment			
Inspect for low spots on the roof, which would allow ponding, rust spots, and for any structural deficiencies			
Check if aircraft warning lights are operable			
Tank Interior ~ Take a look inside the tank for changes in water, coatings, or structure.			
Inspect Water in Tank – determine if there is any floating debris, insects, birds, nests, or an oily film, an indicator of water quality			
Inspect Water in Tank – check actual water level in tank against gauge level			
Inspect Tank Interior Surface – determine if there is build up of developing biogrowths or corrosion			
Look for problems with protective coating – note any blistering, chipped, or cracked coatings			
Inspect Cathodic Protection if provided, see back			
Hydropneumatic Tanks ~ Look for degrading coatings, rust & increased structural damage in tank and foundation.			
Check Air / PRV on hydropneumatic tank – ensure orifice and workings are clean			
Are sight glass & pressure gauge working properly?			
Ensure air / water ratio properly balanced and check compressor operation and high / low settings			
Preventive Maintenance			
Schedule preventive maintenance on any item found during QUARTERLY inspection			

AWWA Periodic Operator Inspection. [2]

Although it is important that the periodic professional inspections (5-year engineering inspections per rule 62-555.3350(2) FAC) be performed on tanks, some critical portions of the tanks should be inspected by the water system operators. The factors in the following paragraphs should be CHECKED AT LEAST ONCE A MONTH, OR WEEKLY IF POSSIBLE; however, any elevated inspection should be conducted only by experienced climbers equipped with the proper safety equipment.

Foundations. The foundations and surrounding earth should be examined for any signs of settlement. The concrete should also be observed for crumbling, deep cracking, and exposed reinforcing steel. If any of these conditions is found, the tank should be professionally inspected at the earliest opportunity.

Leaks. The exterior of the water-bearing surfaces should be examined, and any leaks—or rust streaking that could have been caused by tank leaks—should be reported. (Corrosion products often seal leaks, leaving only rust streaks as evidence of the leak.) The tank should be inspected by a professional structural engineer familiar with water tank construction as soon as possible after the leak is discovered. Although some leaks may not cause structural problems, potential catastrophic tank failures can be avoided if the visible leaks are properly investigated and repaired.

Cathodic Protection. If the tank has been equipped with an automatic impressed-current cathodic protection system, the system's supplier should inform the tank owner of what meter readings are acceptable. The operator should check these meters and inform the supplier of any significant changes.

Exterior Corrosion. Any exterior corrosion, especially where metal loss is apparent, should be evaluated by a professional engineer familiar with the construction of water-storage tanks. If the operator notices a change or severe worsening of the exterior corrosion patterns, he or she should bring this to the attention of the engineer. Special areas to observe are anchor bolts and nuts, rods, and rod pins and clevises.

Vandalism. The locks on ladders and access doors should be checked to prevent vandalism.

Ladders, Platforms, and Lighting. As the tank is accessed, the ladders and any ladder platforms should be inspected for noticeable metal loss. Any such metal loss should be inspected professionally. If the ladder extends up an "interior dry" area, such as is found on singlepedestal elevated tanks and on some large-capacity multiple-column tanks, the access door to the area should be kept locked, and the interior dry area should be sufficiently lighted. Broken or missing lightbulbs should be replaced. If the ladder extends up the exterior of the tank, the ladder should be equipped with a locked guard to prevent unauthorized access to the tank exterior and roof.

Overflow, Manholes, and Vents. The items that most directly affect how sanitary the tank is are the overflow, manholes, and vents. In 1993, a Salmonella outbreak in a public water system was traced to contamination (bird droppings and feathers) entering a tank through an improperly designed and constructed manhole and improperly maintained vent screens.

Overflow. In order to keep insects, birds, and animals from entering the tank, the overflow screen, flap gate, or both, must be in place and must seal tightly. FRWA recommends that the tank be intentionally overfilled to clear the overflow pipe and ascertain if it is blocked and working properly. Overflow pipes should not extend directly into storm sewers or streams without an adequate air gap to prevent a possible cross-connection or backflow. The overflow brackets should also be inspected to uncover any broken or cracked brackets or welds. Overflow pipes on tanks are intended for occasional use only. Tanks should not be regularly overflowed, and the overflow should not be used as a visual control for pumps and valves. Extreme overuse of the overflow pipe may damage the pipe or brackets. Trickling overflowing water can freeze and obstruct the overflow pipe.

Manholes. Roof manholes should be equipped with locks to prohibit unauthorized entry into the tank. Tanks that have access tubes leading to the roof should have their roof manholes properly latched to prevent them from blowing open in a strong wind, and any access doors to the tank ladders should be locked. Shell manholes should be properly sealed to prevent leakage or the entry of insects and birds. Special vent designs may be necessary to prevent vents from clogging or freezing over. If an operator suspects that the tank vents have a tendency to become clogged or frozen over, the problem should be addressed by an engineer familiar with water tank vent design.

Wind or Earthquake Damage. If any tornado, major windstorm, or earthquake hits a tank, the tank should be professionally inspected to ensure that no damage occurred to the structure. In addition, operators should routinely look for possible wind or earthquake damage. Such damage on tower-supported tanks may be indicated by cracked coating or welds at the tower connections; broken, bent, or sagging rods; buckled struts; dented or twisted columns; or missing or loose rod pins. If any of these conditions is observed, the tank should be professionally inspected. In addition, it should be noted that tanks in areas at high risk for wind or earthquake damage should be inspected more frequently (every 1 to 3 years) than tanks in low-risk areas.

[2] Excerpted from Chapter 8, AWWA Manual of Water Supply Practices - M42, Steel Water-Storage Tanks, with minor modifications for Florida.

ANNUAL

Storage Tank O&M Inspection Checklist

FRWA recommends that systems conduct an Annual Sanitary / Safety Inspection of ALL tanks – if you haven't set a month aside for the annual inspection we suggest scheduling FEBRUARY or MARCH. This inspection can be performed by the water operator, and is primarily a visual inspection. The purpose of the physical inspection is to determine the condition of the tank and to ensure its longevity.

Category & Description of Work	Comments OK / Observations / Concerns	Inspection Date	Operator Initials
INCLUDE QUARTERLY INSPECTION O&M			
Use Quarterly Checklist from page 3			
Storage Tank Washout	per Rule 62-555.350(2) FAC		
Clean accumulated sludge and biogrowths from all finished water storage facilities – this may involve draining the tank			
Repair or rehabilitate blistered, chipped, or cracked coatings and linings on tank interiors			
Keep records of coatings and linings rehabilitation or repair and cleaning in Logbook and O&M Logs			
Perform Preventive Maintenance			
Complete preventive maintenance on any item found during QUARTERLY / annual inspections – NOW is the time to do this if you haven't already done it.			
Exercise and make sure inlet and outlet valves (including by-pass & check valves) are working.			
Ensure that the altitude valve is properly working and settings are accurate. Grounding strap secure and in-place.			
Calibrate level indicator.			
Check low & high level alarms.			
Remove any trees that may scratch tank / coating or cause foundations to shift due to root growth.			
Treat & reseal any foundation cracks.			
Remove trees, hedges & brush that may impair site security or provide blind spots to tank site.			
Repair fences & gates.			
Replace burnt out light bulbs.			

Also see washout, cleaning, and disinfection instructions on the backside of this checklist.

Annual and 5-Year Tank Washouts & Cleaning. [3]

Tank Washouts. As water is held in the tank, suspended solids settle out of the water into the tank bottom. Without regular washouts, tanks may accumulate large amounts of sediment. Sediment and deposits on tank walls decrease the effectiveness of disinfectant use. In addition, proper inspections cannot be conducted if sediment covers the bottom of the tank. Tanks should be washed out and inspected at least once every 3 years, and where water supplies have sediment problems, annual washouts are recommended. These washouts can be performed by the tank owner's personnel or a maintenance company.

Draining the Tank. Draining a tank may not be as easy as it first appears. Many times the valves are difficult to find; or once found, they may be inoperable. Therefore, before work crews are scheduled to wash out a tank, it is a good idea not only to map the valves in the distribution system, but also to physically find and turn the necessary valves to block the tank off from the system and then drain the tank. Some tanks may be equipped with drain valves located in the wall or riser of the tank to facilitate tank drainage.

Operating While the Tank Is Out of Service. Many cities, towns, and municipalities neglect to inspect their tanks because of a fear of operating without the tank. Proper operation while the tank is out of service usually requires that a relief valve be installed on a hydrant so that pressure fluctuations do not cause portions of the distribution system to become overpressurized. In addition, local businesses and individuals may need to be notified when a tank is going out of service so that temporary large uses of water (e.g., lawn watering or equipment washing) can be scheduled for other days, leaving the municipality with fire protection capacity. In some areas, portable pressure tanks may be available for limited storage.

Annual Removing Accumulated Sludge & Biogrowths from inside the tanks might be accomplished by draining the tank and with low-volume, moderate-pressure (2,400 psi) pumps, fire-fighting equipment, or other means into the tank without entering the tank.

Five-Year Tank Cleaning to Remove Biogrowths, Calcium or Iron/Manganese Deposits, and Sludge from inside the tanks must be accomplished by draining the tank and with low-volume, moderate-pressure (2,400 psi) pumps, fire-fighting equipment, or other means. The water should be sprayed on all surfaces to remove as much residue as possible. In areas where water pollution due to sedimentation is a problem or where strict local environmental regulations apply, it may be desirable to isolate the sediment and washout water and properly dispose of it, instead of allowing it to enter a storm sewer or nearby streams. In addition, care should be taken to prevent large amounts of sediment from entering the tank piping because pipes could be clogged, leading to valve damage. If the tank is equipped with aluminum cathodic protection anodes, it is possible for many of these anodes to fall and remain in the tank. These anodes should also be removed at the time of the washout.

Summary of Tank Chlorination Methods.

Disinfecting the Tank. The disinfection of water-storage facilities should be done in accordance with AWWA C652, Standard for the Disinfection of Water-Storage Facilities. This standard offers three chlorination methods by which the disinfection can be accomplished. The objective of chlorination is to kill bacteria and other microorganisms after cleaning or installation and prior to testing. The disinfection process can take from a few hours to a few days to complete. Three (3) chlorination methods are acceptable to super-chlorinate tanks:

Method 1 ~ Fill tank and add chlorine to 10 mg/L and allow to sit – with Chlorine Bleach & Tablets for 24 hours, or with Chlorine Gas for 6 hours. Reduce to 2 mg/L prior to allowing water into water system.

Method 2 ~ Swab all tank surfaces with 200 mg/L chlorine for 30 minutes. Fill tank and allow to sit with chlorine residual greater than 3 mg/L for 3 to 6 hours.

Method 3 ~ Fill with 50 mg/L chlorine and allow to sit for 24 hours with chlorine residual greater than 2 mg/L.

Note: all must pass 2 consecutive coliform tests.

Cleaning and Chlorination Methods Steps:

1. Cleaning, scrubbing, pressure washing and so forth.
2. Complete rinsing of debris and cleaning chemicals out of the unit.
3. Refilling with super-chlorinated water. The level of chlorine dose depends on method described above and in the AWWA Standard.
4. Holding in super-chlorinated water for a minimum of 3-hours or 24-hours, depending on the method used.
5. Properly and legally disposing flushing and super-chlorinated water to ensure that no environmental damage occurs.
6. Final Flushing until chlorine measurement to no higher than that generally prevailing in the system.
7. Bacteriological Tests are necessary for any unit that holds or contacts finished potable water after final flushing and prior to being put in service.
8. Repetition of Procedure. If the initial disinfection, or subsequent disinfections, fail to produce satisfactory samples, the main shall be reflushed, rechlorinated, and resampled until satisfactory results are obtained.

[3] Ibid.

5-year Engineering Inspection & PM
Storage Tank Checklist per Rule 62-555.350(2) FAC

FDEP requires 5-year Engineering Inspection / Preventive Maintenance on of ALL storage tanks, including conventional hydropneumatic tanks with an access manhole per FDEP Rule 62-555.350(2) FAC. Inspections are important, but waste time and money if preventive maintenance is neglected!

Category & Description of Work	Comments OK / Observations / Concerns	Inspection Date	Operator Initials
Storage Tank Cleaning	per Rule 62-555.350(2) FAC		
Clean / remove biogrowths, calcium or iron / manganese deposits, and sludge from inside ALL storage tanks (at least once every 5-years)			
Engineering Inspection** for structural and coating integrity by personnel under the responsible charge of a professional engineer licensed in Florida.			
Use the checklist below for selecting the best engineer for your system.			
Use the checklist on pages 8 and 9 for determining if the contact / report will include all the information you need.			
Perform Preventive Maintenance			
Replace or Overhaul Air / Pressure Relief Valves on hydropneumatic tanks.[4]			
Complete preventive maintenance on any item found during the 5-year inspection!			

**Note: Also see Attachment A checklist on pages 8 and 9.

Engineering Inspector Selection
Checklist recommended by FRWA

✓	Qualifications Description
	The tank inspection engineer is an Associate FRWA Member.
	The tank inspection engineer is a Professional Engineer licensed in Florida.
	The tank inspection engineer has up-to-date knowledge, specialized training, and practical experience in the design, fabrication, erection, inspection, sanitary integrity, coating, and maintenance of steel and/or concrete water-storage facilities as demonstrated by previous work.
	The tank inspection engineer can and is willing to provide references that you can contact about previous work.
	You have called at least three (3) other water systems that have used the tank inspection engineer – ask for a list of 5+ references and choose 3 to call.
	The tank inspection engineer follows appropriate safety practices, including OSHA and confined space entry.
	The tank inspection engineer has demonstrated knowledge and uses AWWA Manual M42, Standards for Inspecting and Repairing Steel Water Tanks and Elevated Tanks for Water Storage, or ASME Boiler and Pressure Vessel Code for hydropneumatic tanks, or the American Concrete Institute (ACI) 201.1R-95 Guide for Making a Condition Survey of Concrete in Service.
	Ask the tank inspection engineer for a copy of a recently complete inspection report including recommendations.

[4] FDEP requires testing of air or pressure relief valves for hydropneumatic tanks – but since testing is difficult and problematic FRWA recommends that they be overhauled or replaced every 5-years to coincide with the engineering inspection.

Attachment A
5-year Engineering Inspection
Contract Checklist
Important Issues to Be Included and Considered in the Engineering Contract

DISCLAIMER: This list is NOT A LEGAL DOCUMENT OR CONTRACT. It is provided for informational purposes only for delineating Owner's and Engineering Inspector's duties, assignments, and responsibilities with respect to the inspection of the finished water tanks under FDEP Rules. This checklist may be attached to or included an Exhibit or Attachment to Engineering Inspector agreements. FRWA strongly recommends the utilization of contracts that are legal and enforceable in Florida and meets the needs for the operation of the water and wastewater systems. Feel free to modify this checklist as necessary or strikethrough items that are not relevant to your situation. It is important to describe and agree on ALL responsibilities, activities, deliverables, and/or reports that each party will provide.

Owner Initials	Engr Initials	Description of Responsibilities, Activities, Deliverables, and/or Reports Each party should acknowledge primarily responsibilities by initialing the appropriate box for the tank inspection:
		The Owner (or authorized representative) of the water system understands that it is ultimately responsible for obtaining the engineering inspection in compliance with FDEP rules and regulations. This responsibility cannot be delegated to the Engineering Inspector per Florida Statute.
		The Owner shall keep a copy of the engineering inspection report ready for FDEP Inspection at all times.
		The Owner has hired the Engineering Inspector to perform the specific duties for the operation of the water system in compliance with FDEP requirements.
		Customer Notifications. Who shall empty the storage tanks(s)? Engineering Inspector or Owner
		The Owner will never ask, require, or put the Engineering Inspector in a position where it must falsify, submit inaccurate reports, records, and so forth, that would impact operations, permit compliance, or the Engineering Inspector's license.
		The Contract should clearly define and describe the following, but is not limited to: ▪ Communications, ▪ Payment / compensation, ▪ Unforeseen Circumstances, ▪ Effective Date, ▪ Insurance, ▪ Emergencies, and ▪ Scope of Services, ▪ Indemnification, ▪ Termination. ▪ Schedule, ▪ Liability,
		The Scope of Services shall list all tanks to be inspected and clearly identify what services and equipment are provided by the Engineering Inspector and what are the Owner's responsibility.
		Scheduling. Is the inspection date and time coordinated? _____
		Customer Notifications. The Owner shall notify all of water users if having the tank off-line could impact water supplies and/or pressures.
		Tank Draining. The Owner shall empty the storage tanks(s) and discharge the water appropriately.
		Tank Isolation. The Owner shall be responsible for tank bypass valving.
		Issue Precautionary Boil Water Notices. The Owner shall issue a PBWN if water system pressure is lost required – Rule 62-555.350(11), 62-555.900(22) & 62-555.335, FAC.
		FH Pressure Relief Valves. The Owner shall be responsible for providing the fire hydrant pressure relief vale while the tank is off-line, and maintaining water service to the system during the inspection.
		Owners Representative. The Owner shall have a representative / certified operator present during tank cleaning and inspection activities. Owner's Representative _____
		Tank Cleaning. Who is responsible to clean / remove biogrowths, calcium or iron / manganese deposits, and sludge from inside of ALL storage tanks? Engineering Inspector or Owner
		Removal of Sludge, Mineral Deposits, and Bio-Growths from Interior of Tank. Who is responsible removal and disposal? Where will it be disposed? Engineering Inspector or Owner

Owner Initials	Engr Initials	Description of Responsibilities, Activities, Deliverables, and/or Reports Each party should acknowledge primarily responsibilities by initialing the appropriate box for the tank inspection:
		Engineering Inspection. The contract states ***how*** the inspection is to be accomplished by personnel under the responsible charge of a professional engineer licensed in Florida following the appropriate ASME, AWWA, or applicable standard. ▪ Visual observation of Interior / Exterior surfaces ▪ Ultrasonic Thickness Gauge measurements of tank walls, roof, and bottom at pre-determined points and points of obvious visual degradation. ▪ Coating Thickness Measurements at pre-determined points and points of obvious visual degradation. ▪ Inspect all welds, joints and connections. ▪ Photograph the entire tank exterior, interior, and report the condition.
		Safety Practices. The contract states that the Engineering Inspector will comply with appropriate safety practices (OSHA & confined space entry) during the tank inspection process.
		Tank Disinfection. Who is responsible to disinfect the tank when the interior inspection is completed? What method of disinfection will be used? Engineering Inspector or Owner
		Tank Refilling. The Owner shall be responsible for tank refilling.
		Bacteriological Sample Collection and Testing. Who is responsible? Engineering Inspector or Owner
		Returning Tank to Service. The Owner shall be responsible for returning the tank to service.
		Hydropneumatic Tank Inspection Standards. The Engineering Inspector uses the following data sheets and standards for existing hydropneumatic tank inspections. ▪ The Engineering Inspector will obtain the vessel data sheets (Form U1-A) registered with National Board by the manufacturer for the existing hydropneumatic tank. ▪ Calculations for maximum allowable working pressure based on current minimum thickness per API-510 – "Pressure Vessel Inspection Code." ▪ ASME Section VIII "Rules for Construction of Pressure Vessels" applies to NEW tanks. However, certain formulas are used to evaluate existing tanks.
		Hydropneumatic Tank Items. Who is responsible? Engineering Inspector or Owner ▪ Install a new rubber gasket in the manway? _____ ▪ Pre-charge the tank with air? _____ ▪ Fill the tank with water and check chlorine levels? _____ ▪ Remove the bypass equipment and drain hoses? _____ ▪ Return the valves and pumps to normal operation? _____ ▪ Replace or overhaul Air / Pressure Relief Valve? _____ ▪ Other? _____
		Tank Inspection Reports. ▪ Number of copies? _____ ▪ Inspection Report signed & sealed by a Florida Registered Professional Engineer? _____ ▪ Detailed description of the condition of the site, tank structure (interior & exterior), coating, and accessories? _____ ▪ Color Photographs? _____ ▪ General recommendations? _____ ▪ Detailed recommendations of repair / rehabilitation tank (interior & exterior)? _____ ▪ Engineer's opinion of the remaining useful life of the tank? _____ ▪ Hydropneumatic Tanks – Calculations for maximum allowable working pressure based on current minimum thickness per API-510 – "Pressure Vessel Inspection Code"? _____ ▪ Engineer's estimate of recommended preventative maintenance costs? _____ ▪ Engineer's opinion if the tank should be rehabilitated or replaced? _____ ▪ Other? _____

CAUTION

Do NOT Repair Hydropneumatic Tanks

From: John R. Sowerby
Sent: Wednesday, August 01, 2012
To: Van Hoofnagle; Don Ehlenbeck,
Cc: Jennifer Porter; Sterling Carroll
Subject: Hydropneumatic Tanks

Van, this is an item that I would like to add to the next PCE agenda. And Don, this is a follow-up to our phone conversation.

Under Item B.6 in the minutes for the November 2011 PCE Meeting, we discuss repairs to ASME Hydropneumatic Tanks. If we become aware of proposed repairs to an ASME tank, or if we discover repairs to an ASME tank during an inspection or sanitary survey, we should…

1. Advise the PWS in writing that repairs to hydropneumatic tanks can affect the structural integrity and pressure-containing capability of the tank.
2. Advise the PWS in writing that repairs to ASME hydropneumatic tanks should conform to ASME code requirements for unfired pressure vessels and the National Board Inspection Code and should be performed by a repair organization holding a National Board certificate authorizing the use of the "R" stamp. (Item 2 applies if the repairs have not yet been performed.)
3. Request in writing that the PWS provide documentation that (a) the repairs to the ASME hydropneumatic tank were performed by a repair organization holding a National Board certificate authorizing the use of the "R" stamp and (b) the repairs to the ASME hydropneumatic tank conform to ASME code requirements for unfired pressure vessels and the National Board Inspection Code.

Items 1 and 3 above should appear as a comment or deficiency on the sanitary survey report unless or until the PWS provides documentation in accordance with Item 3.

Recently, I have been asked a couple of times about repairs to Non-ASME Hydropneumatic Tanks. Our handling of such repairs should be similar to our handling of repairs to ASME tanks. If we become aware of proposed repairs to an non-ASME tank, or if we discover repairs to an non-ASME tank during an inspection or sanitary survey, we should…

1. Advise the PWS in writing that repairs to hydropneumatic tanks can affect the structural integrity and pressure-containing capability of the tank.
2. Advise the PWS in writing that repairs to hydropneumatic tanks should be performed by a repair organization holding a National Board certificate authorizing the use of the "R" stamp or should be inspected for structural integrity by a professional engineer before the repaired tank is returned to service. (Item 2 applies if the repairs have not yet been performed.)
3. Request in writing that the PWS provide documentation that the repairs to the hydropneumatic tank were performed by a repair organization holding a National Board certificate authorizing the use of the "R" stamp or have been inspected for structural integrity by a professional engineer.

Items 1 and 3 above should appear as a comment or deficiency on the sanitary survey report unless or until the PWS provides documentation in accordance with Item 3.

Thanks.

John Sowerby

FRWA concurs with the FDEP. **We warn that any repair to hydropneumatic tanks is dangerous and must be avoided. When a hydropneumatic tank begins to leak it has ALREADY FAILED and MUST be replaced immediately.** (Only ASME trained and experienced personnel working under the supervision of an ASME qualified engineer should work on pressure vessels.)