OPERATION & MAINTENANCE MANUAL FOR BOLTED STEEL TANKS: COMPLETE INSTALLATION

SITE INSPECTION

Check for and remove any debris that may have accumulated on the tank exterior. Of particular concern is debris that is in contact with the tank shell, floor or appurtenances attached to the tank. It is imperative that all chimes (horizontal joints), particularly bottom chimes, be routinely cleaned and maintained free of water, dust and/or soil accumulation. Due to the properties found in some soils, the floor of the tanks should never come into contact with the surrounding grade. Failure to perform this portion of the operation and maintenance program will result in the termination of any warranty that the tank may contain.

FOUNDATION INSPECTION

A. Concrete Ring Wall and Slab Foundation
   1. Annually examine foundation to make sure that no fractures have developed. Fractures or other distortion can cause eccentric loadings on the steel tank and could lead to structural damage or failure.
   2. Perform a thorough check at base of tank to ensure:
      a) That there are no voids or gaps between tank bottom and foundation due to foundation settlement.
      b) That anchor bolts (if used) are tight.

B. Foundations on Granular Berm
   1. Annually examine foundations to make sure that no wash-outs have developed under the grade band. Sufficient water drainage away from the tank should always be maintained. The tank bottom should always be maintained at 6” minimum above the surrounding grade.
   2. Keep site clear of vegetation growth within five feet of tank.
   3. Keep site clear of tree growth within thirty feet of tank.

TANK INSPECTION

A. Shell Seams
   Check the following monthly for the first three months and every six months thereafter:
   1. Check all seams for any distortion that may have occurred from undue structural stress. When any such distortion is noted, review the situation with your general contractor and consult with Superior Tank Co., Inc.
   2. Check all seams for any signs of leaks. If a leak is detected, check tightness of all bolts within 1-square foot area of leak.
   3. Random check tightness of bolts in all seams.
   4. Check for foreign material on tank shell, such as mud, oil, etc.; clean as required.
B. Roof Structure
   Every six months check roof for foreign material that may have been blown on roof, or left by workers adding appurtenances, servicing or repairing tank.

C. Exterior Corrosion Inspection
   1. After the first year in service inspect exterior tank coating. After the first year inspection, the exterior tank coating should be inspected on a continuous basis. The costs of these inspections and the repairs to the coating system is standard and should be borne by the customer, unless a maintenance contract has been entered into with STCI for the maintenance of the tank. Failure to perform the routine inspections and corrections thereof will result in the termination of any warranty that the tank may contain. See “Painting Recommendations.”

D. Interior Corrosion Inspection
   2. After the first year in service, drain Tank and inspect coating. If the cost of draining Tank is too high, send in certified diver to inspect coating. After the first year inspection, the Tank coating should be inspected every 3 – 4 years thereafter. If a great amount of sediment is present, Tank should be drained and the sediment should be removed. The costs of these inspections and removal of sediment and the repairs to the coating system will be borne by the customer. Failure to perform the routine inspections will result in the termination of any warranty that the tank may contain. See “Painting Recommendations.”

E. Tank Flanges, Nozzles, Manways, Etc.
   1. Annually inspect for leaks around all fittings.

INTERIOR TANK INSPECTION

Every three to five years (or as tank use dictates) drain tank and inspect for the following:
Note: Remove sediment that has collected on tank floor and flush out tank completely. Do not use shovels or other tools that may scratch the coating surface.

1. Check complete interior, including roof support structure, for signs of corrosion that may need to be repaired.
2. Check coating for wear caused by moving action to liquid stored in tank. If coating shows excessive wear - re-paint where required.
3. Inspect and tighten nuts on bottom of tank.
4. If painting is required, refer to “Painting Recommendations.”
5. Check all interior appurtenances for wear or damage and repair as required.
6. Inspect roof support structure for any distortion that may have occurred from undue structural stress.
7. If inside repairs have been made, be sure all materials, equipment and tools have been removed before putting tank back in operation.
8. For water tanks it may be necessary to disinfect tank before putting tank back in operation. Check local codes and procedures for correct disinfecting of tank.
SERVICING OF APPURTENANCES

A. Thief hatches (pressure/vacuum valves) and free flowing vents.
   1. Thief hatches
      Annually inspect and wipe clean the seat ring and gasket. Check valve for free
      movement. In extreme cold climates, inspect often for icing caused by condensation.
      Clean screen of all debris that may have collected in it. Check for screen deterioration.
      Replace if required.
   2. Free Flowing Vent
      Annually or sooner, as required by local conditions, clean screen of any and all debris
      that may have collected on the screen. Check screen wire for deterioration and
      replace if required. In extreme cold climates check for screen icing over due to
      freezing.

B. Nozzles and Connecting Pipes.
   Check for distortion of tank wall at location of attachment of pipe nozzles. This
   distortion could be caused by difference in foundation settlement between tank and
   attaching piping. This distortion must be removed by adjusting pipe supports as
   required.

C. Liquid Level Indicator (Target Reading Type)
   Annually inspect the following:
   1. Check if indicator rides smoothly up and down gage board.
   2. Clean gage board of any foreign material that may inhibit operation.
   3. Remove inspection plate from sheave elbows and check sheave rollers for smooth
      operation.
   4. Check float cable for signs of wear or broken strands.
   5. DO NOT lubricate any part of the liquid level indicator, as this could cause sticking and
      improper operation.
   6. Check that all bolts are tight to prevent wind damage.
   7. In extreme cold climates keep gage board clear of ice buildup.

D. Valves, Sample Boxes, Sight Glass, Pressure Gauges, Etc.
   Annually inspect for smooth and proper operation. Clean and repair as required.

E. Outside Ladder, Cage, and Perimeter Handrails.
   Annually inspect and tighten bolts as required.

F. Lightning Protection
   Annually inspect all lightning rods, wire conductors and clamps for good electrical
   connection.

G. Cathodic Protection System
   Regardless of the type of system employed, it should be checked monthly to insure that it
   is opening properly. A complete inspection of the system must be made on an annual
   basis. For manual systems, this annual maintenance will include readjustment of the
system to insure proper operating levels for the coming year. For systems with aluminum anode material, this service will include the replacement of these rods with new material.

For all manual and automatic systems, the annual inspection should include a potential profile of the submerged structures together with visual and electrical tests to insure proper operation for the coming year.
APPENDIX C

SPARE HARDWARE

It is recommended that spare hardware be kept on hand to cover normal maintenance or emergency situations. Because of the various sizes and types of tanks available, we suggest contacting Superior Tank Co., Inc. for recommended hardware requirements for your particular application. Generally, parts stocked would include:

- Strip gasket - Single Row (type as applicable)
- Strip gasket - Double Row (type as applicable)
- Chime lap gasket
- Radius gasket (types as applicable)
- Caulking
- Special gaskets (per application)
- Bolt - ½" Diameter x 1 ¼" hex head, galvanized, API tank bolt
- Bolt - ½" Diameter x 1" polycapped, round head, galvanized (if applicable)
- Bolt - ½" Diameter x 1 ¼" polycapped, round head, galvanized (if applicable)
- Nut - ½" Diameter hex, galvanized
- Nut - ½" Diameter encapsulated x 1 ¼" high (if applicable)
- Washer - ½" Diameter flat steel, galvanized
- Washer - ½" Diameter rubber-backed steel
- Touch-up paint - (as applicable)

CAUTIONS

A. Accessories - Installation of appurtenances or equipment in or on STCI liquid tanks that would overstress such tanks in any manner will cause voiding the guarantee. If you do not have specific recommendations from STCI where additional loading is involved, you should contact Superior Tank Co., Inc. before installing such appurtenances or equipment.

B. Bolts -
   1. Do not re-use any bolt more than two times, as bolt may stress to the breaking point. It is recommended that nuts be tightened to 50 foot pounds torque.
   2. Do not substitute existing ½” diameter tank bolts with bolts purchased from a local hardware supplier. These are not high tensile strength bolts and may cause tank damage or failure.

C. Washers - 1. Do not re-use rubber-backed steel washers once they have been used.

D. Gaskets - 1. Do not re-use any gasket once it has been removed.

GENERAL

A. When applying new gasket material and caulking, be sure all surfaces are free of dirt, oil, etc.
B. If tank use is changed, be sure specific gravity of liquid being loaded is less than or equal to the liquid previously used or tank damage or failure may occur.