EVALUATION OF THE
5,000,000 GALLON STEEL STANDPIPE

“SOUTH STANDPIPE”
EVANSTON, ILLINOIS

FOR

CITY OF EVANSTON
EVANSTON, ILLINOIS

April 10, 2014
13.252.H1539.002
SUBJECT

The subject of this report is the field evaluation of the 5,000,000 gallon steel standpipe in Evanston, Illinois. The tank was owned by the City of Evanston and was known as the "South Standpipe." The field evaluation was performed on April 10, 2014 by Noah M. Peyer, Jesse Jenkins, and Jarred C. Peyer of Tank Industry Consultants. The Owner's representative on the site at the time of the field evaluation Craig Bauer. The stiffener-supported dome roof tank was of welded steel construction. Measurements obtained by the field evaluation indicated the tank was approximately 85 ft in diameter with a shell height of approximately 112 ft 4 in. Cursory calculations indicated the tank was designed using an alternative design basis which includes using higher allowable stresses and joint efficiencies.

OBJECTIVE:

The purpose of this evaluation was to determine the condition of the tank interior, exterior, exposed foundation, and accessories. The purpose of this report is to present the findings of the evaluation and to make recommendations for recoating, repairing, corrosion protection, and maintenance. Budget estimates for the work, anticipated life of the coating and the structure, and the replacement cost of the tank are also included.

AUTHORIZATION:

This evaluation, disinfection, and report were authorized in the Purchase Order Number 16772 dated December 18, 2013.

EXECUTIVE SUMMARY:

The exterior coating system appeared to be in fair to poor condition with extensive areas of topcoating failure on the roof and corrosion present on the shell and roof. Tank Industry Consultants believes that the exterior of the tank should be repainted within the next 2 years. The interior coating system appeared to be in generally fair condition with no significant areas of metal loss noted. Numerous areas of peeled coating were observed on the interior shell. The interior should be repainted within the next 2 years.
ANSI/OSHA and Safety-Related Deficiency: There was an OSHA and safety-related deficiency on this tank:

♦ the paint on the shell ladder safe-climbing device may prevent the proper operation of the device,
♦ the shell ladder safety cage width was dimensionally too small (29 CFR 1910.27(d)(1)(i)),
♦ conduit and cables attached to the shell ladder could interfere with the climber’s use of the ladder side rail (29 CFR 1910.27(b)(2)), and
♦ wiring was exposed at conduit adjacent to the base of the shell ladder.

If the Owner wishes to fully comply with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA and Sanitary Deficiencies: There were sanitary, operational, and AWWA deficiencies on this tank as well:

♦ the discharge end of the overflow pipe was not equipped with protective screening or a flap gate,
♦ the flanged and bolted roof manhole was not locked,
♦ the cover on the flanged and bolted roof manhole was warped,
♦ the vertically oriented screened openings in the flanged and bolted roof manhole neck were not shielded from wind-driven dust and debris,
♦ the screening on the flanged and bolted roof manhole neck was not shielded from wind-driven dust and debris,
♦ the screening on the vent openings in the flanged in bolted manhole neck were painted, and
♦ the vertical screening on the roof vent was not shielded from wind-driven dust and debris.

These deficiencies should be corrected.

The safety-related, sanitary, and operating deficiencies listed above are not intended to be a complete list of deficiencies on this tank. The Owner should refer to the complete report text and accompanying photographs for a complete account of all observed deficiencies.

This evaluation and the reporting of the condition of this tank do not warrant the original structural condition of the tank or any of the original design for seismic loadings. Likewise, recommendations for this tank do not include modifications which may be required for compliance with present structural codes.

PHOTOGRAPHS:

Color photographs were taken of the visible portions of the foundation, the tank interior and exterior and are included as a part of this report. The significant photographs are keyed to the observations.
NOMENCLATURE:

The terms used in describing the various components of steel water tanks are unique to the industry. In fact, the terms vary from firm to firm and from person to person. In an attempt to define the terms used in this report, a sketch of the general type of tank covered is included at the end of the narrative portion of this report. Each horizontal row of steel plates on the tank is referred to as a "shell ring" or "ring." To aid in referencing the shell rings, the bottom ring is referred to as shell ring 1 and the top ring is shell ring 13. Warning: Some appurtenances on this tank may be referred to as erection or rigging attachments, lugs, or brackets. This does not mean that they are safe for rigging. Each attachment for each tank should be evaluated on an individual basis by a structural engineer or an experienced rigger before being used. These devices may have been intended for only the original erectors and painters to use with specialized equipment.

ADHESION TESTS:

All adhesion tests performed during this evaluation were done in general accordance with ASTM D3359. The results are reported herein using the ASTM scale. The ASTM scale is a relative scale to rate adhesion from 0 to 5 with 5 being the best. A table of adhesion test results classification is included with this report following the sketch of the tank.

HEAVY METALS TESTS:

Samples of the exterior and interior coating systems were sent to a laboratory for atomic absorption analyses. The test results were as follows:

<table>
<thead>
<tr>
<th></th>
<th>Cadmium</th>
<th>Chromium</th>
<th>Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mg/kg</td>
<td>mg/kg</td>
<td>mg/kg</td>
</tr>
<tr>
<td>Exterior</td>
<td>&lt;25</td>
<td>&lt;250</td>
<td>&lt;250</td>
</tr>
<tr>
<td>Interior</td>
<td>&lt;25</td>
<td>&lt;250</td>
<td>&lt;250</td>
</tr>
</tbody>
</table>

Tank Industry Consultants performs this test only to determine if there is lead, cadmium, or chromium present in the coating samples. To limit damage to the existing coating, only small areas were tested. The small number of samples taken and the difficulty of retrieving all primer from the steel profile may cause the tests performed to not accurately represent the total coating system. Variations in thickness, types of coatings applied, and the interim cleaning and painting operations will also affect the actual readings. The reliability of the results is also dependent on the amount of primer included in the sample. The Consumer Product Safety Commission specifies that an amount greater than 0.06% lead is considered potentially hazardous. Additional testing to determine the amount of leachable contaminants present in the spent cleaning debris will need to be performed following cleaning operations at the time of repainting. Results from the laboratory analysis are included following the adhesion tables.
ULTRASONIC THICKNESS MEASUREMENTS:

(all readings were taken through coating)

Roof:
  Cap: 0.275 in. to 0.281 in.
  Top Finger: 0.260 in. to 0.263 in.
  Bottom Finger: 0.264 in. to 0.278 in.

Shell:
  Ring #13: 0.316 in. to 0.322 in.
  Ring #12: 0.329 in. to 0.332 in.
  Ring #11: 0.410 in. to 0.416 in.
  Ring #10: 0.417 in. to 0.434 in.
  Ring #9: 0.514 in. to 0.529 in.
  Ring #8: 0.614 in. to 0.617 in.
  Ring #7: 0.697 in. to 0.717 in.
  Ring #6: 0.798 in. to 0.824 in.
  Ring #5: 0.890 in. to 0.913 in.
  Ring #4: 0.952 in. to 0.971 in.
  Ring #3: 1.042 in. to 1.045 in.
  Ring #2: 1.151 in. to 1.153 in.
  Ring #1: 1.286 in. to 1.289 in., bottom

Bottom Plate: 0.298 in. to 0.304 in.

OBSERVATIONS:

A. Foundation and Site

SITE:
  Size: approx. 200 ft x 265 ft
  Fence:
    Type: chain link w/ 6 strands of barbed wire
    Height: 7 ft
  Gates:
    Number: 2
    Northwest Gate: 18 ft wide
    East Gate: 20 ft wide
    Locked: yes

Nearest Structures:
  Type: cabinet platform
  Direction: southwest
  Distance: approx. 20 ft

  Type: brick building
  Direction: south
  Distance: approx. 35 ft
Type: pump/garage building  
Direction: southeast  
Distance: approx. 55 ft

Nearest Overhead Power Lines:  
Direction: south  
Distance: approx. 22 ft

FOUNDATION:  
Type: concrete ringwall  
Projection Above Grade:  
North: 6 in. to 16 in.  
South: 10 in. to 15 in.  
East: 2 in. to 17 in.  
West: 10 in. to 15 in.  
Grout: 1 in. to 1-3/4 in.  
Sealant: none visible  
Fiberboard: none visible

1. **Site Location**: The tank was located at the intersection of Hartley Avenue and Cleveland Street in Evanston, Illinois. The site was located in a residential area. The nearest overhead power lines were located south of the site. (See photos 2-4)

2. **Site Conditions**: The tank site was covered with gravel and dirt appeared to be graded to provide adequate drainage away from the foundation. There was a storm drain north of the tank. Miscellaneous equipment was stored on the site, including unused pipe sections that were stored around the base of the tank. Large piles of dirt were present on the site. Cabinets attached to a platform were located to the southwest, a building was located to the south, and a pump/garage building was located to the southeast. Numerous stumps and bush remains had been cut-off just above grade immediately surrounding the foundation. (See photos 1, 5-8, 10, 14)

3. **Foundation**: The tank foundation appeared to be a concrete ringwall. Cracks, spalling, and chips were observed in the foundation. Grass had grown through some of the spalls. Aggregate was exposed in numerous areas. The foundation exhibited and/or exceeded the AWWA recommended 6 in. to 12 in. projection above grade except on the east side of the tank. No coating was visible except overspray from the shell coating. (See photos 9-13)

4. **Grout**: There was a pad of grout between the tank bottom plate and the concrete foundation. The grout was in fair condition with minor cracks and voids noted. No sealant was located at the grout-to-bottom plate interface. (See photos 10, 13, 17)
B. **Exterior Surfaces**

**DESCRIPTION:**
- **Construction:** welded steel
- **Diameter:** approx. 85 ft
- **Shell Height:** approx. 122 ft 4 in.
- **Shell Rings:** 13
- **Roof Type:** stiffener-supported dome

**ANCHOR BOLTS:**
- **Number:** 32
- **Size:** 1-1/4 in. diameter

**Chairs:**
- **Width:** 3 in.
- **Height:** 12 in.
- **Side Plates:** 2-1/2 in. x 5 in. x 11 in. x 7/8 in., thick
- **Top Plates:** 5 in. x 6-3/4 in. x 1 in., thick

**BOTTOM PLATE PROJECTION:** 3 in. to 3-1/4 in. from shell

**SHELL MANHOLES:**
- **Number:** 2
- **Locations:** north and southeast sides of shell ring #1
- **Type:** flanged and bolted
- **Size:** 24 in. diameter
- **Neck:** 9-1/4 in. projection from shell x 1/2 in. thick
- **Flange:** 32-3/4 in. projection x 7/8 in. diameter
- **Bolts:**
  - **Number:** 28
  - **Size:** 7/8 in. diameter x 3 in. long
- **Cover:**
  - **Size:** 32-3/4 in. diameter x 7/8 in. thick
  - **Hinged:** yes, exterior

**OVERFLOW PIPE:**
- **Size:** 12 in. diameter
- **Visible Air Break:** approx. 16 in.
- **Protective Screening:** 2 layers mesh
- **Brackets:**
  - **Size:** 3 in. x 1/2 in., flat bar x 8-1/2 in. long
  - **Spacing:** approx. 6 ft 8 in.
PILASTERS:
   Number:  8
   Size:  3 ft x 5 ft 7 in.
   Bottom Manholes:
      Type:  bolted
      Size:  24 in. square
      Cover:  25-1/4 in. square x 1/4 in. thick
      Locked:  yes
   Top Manholes:
      Size:  29-1/2 in. square
      Bolts:  12
   Interior Stiffeners:
      Number:  14 per pilaster
      Size:  4 in. x 4 in. x 1/4 in., angle
   Ladder Pilaster Access:
      Size:  2 ft 5 in. x 6 ft 10-1/2 in.
      Cover:  2 ft 6 in. x 7 ft
      Locked:  yes, w/ sensor
      Top:
         Size:  30 in. square
         Type:  hinged

SHELL LADDER:
   Number of Rungs:  120
   Width:  16 in.
   Side Rails:  2-1/2 in. x 3/8 in., flat bar
   Rung Size:  3/4 in. square
   Spacing:  12 in. on center
   Toe Room:  7-7/8 in.
   Brackets:
      Construction:  welded to shell, bolted to ladder w/ 3/4 in. diameter bolts
      Size:  5 in. x 3/8 in., angle x 9-1/4 in. long
      Spacing:  approx. 8 ft
   Safe-Climbing Device:  notched-tubular rail
   Safety Cage:
      Depth:  27-1/2 in.
      Width:  26 in.
   Vertical Bars:
      Size:  1-1/2 in. x 1/4 in., flat bar
      Number:  7
      Spacing:  9 in. to 9-1/8 in.
   Horizontal Bars:
      Size:  2 in. x 1/4 in., flat bar and 4 in. x 1/4 in., flat bar
      Spacing:  48 in.
PLATFORM:
   Location: around top of shell
   Type: steel grate floor
   Safety Railing:
      Handrail:
         Height: 48 in.
         Size: 1-5/8 in. diameter
      Uprights: 3 in. x 3 in. x 1/4 in., angle
      Mid-Rail: 2-1/2 in. x 2-1/2 in. x 1/4 in., angle
      Toe Bar:
         Size: 6 in. x 4 in. x 3/8 in., angle
         Height: 4 in. above platform

ROOF LADDER:
   Number of Rungs: 40
   Width: 16 in.
   Side Rails: 2-1/2 in. x 3/8 in., flat bar
   Rung Size: 3/4 in. square
   Spacing: 12 in. on center
   Safe-Climbing Device: none

ROOF OPENINGS:
   Manhole #1:
      Size: 24 in. diameter
      Type: hinged
      Curb: 4-1/2 in.
      Welded: exterior only
      Overlap: 2 in.
      Locked: yes

   Manhole #2:
      Type: flanged and bolted
      Curb:
         Height: 13 in.
         Screened Openings: 5 in. tall
      Cover: 33 in. diameter x 1/4 in. thick
      Locked: no

   Roof Vents:
      Number: 4
      Type: clog-resistant
      Neck Height: 12 in. to 15 in.
      Neck Diameter: 18 in.
      Screen:
         Horizontal: fine mesh
         Vertical: expanded metal
      Cover: 48 in. diameter
EXTERIOR COATING AND METAL CONDITION:

<table>
<thead>
<tr>
<th>Coating Thickness</th>
<th>Approx. % Failure to</th>
<th>Adhesion</th>
<th>Metal Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>Underlying Coating</td>
<td></td>
<td>Typical</td>
</tr>
<tr>
<td>Shell</td>
<td>0.5 mils to 21.5 mils</td>
<td>12 mils</td>
<td>1%</td>
</tr>
<tr>
<td>Roof</td>
<td>8 mils to 17 mils</td>
<td>11 mils</td>
<td>40%</td>
</tr>
</tbody>
</table>

**Key to Table**

- Adhesion 5 (very good) T = Topcoat to Underlying Coating Neg. = negligible
- 4 (good) S = Primer to Steel
- 3 (fair) 2 (poor)
- 1 (very poor) 0 (very poor)

1. **Exterior Coating Condition**: The coating on the exterior of the tank appeared to be in fair to poor overall condition with extensive topcoating failure observed on the roof. There were also areas of corrosion on the shell and roof. The shell coating exhibited good adhesion to the underlying coating while the roof coating exhibited very poor adhesion to the underlying coating.

2. **Bottom Plate**: The tank bottom plate extension appeared to be in fair condition at the time of the field evaluation. Peeled coating and corrosion were present on the bottom plate projection. Metal loss up to 1/16 in. deep was observed in the bottom plate projection. (See photos 13, 15-18)

3. **Anchor Bolts and Chairs**: The tank was equipped with 32 anchor bolts and chairs. The coating on the anchor bolts and chairs had peeled, and minor corrosion was noted. Debris was observed in and around some of the chairs. One of the anchor bolts and chairs was located in the base of the ladder pilaster, and the most extensive peeled coating, corrosion, and rust staining were observed on this chair. (See photos 14, 19-21, 44)

4. **Shell Condition**: The contour of the tank shell was good as no significant discontinuities were observed at the time of this field evaluation. The coating appeared to be in fair condition with topcoating and corrosion observed in areas. The coating had been touched-up previously, and runs and debris were present in the coating. Vines had grown-up and were touching the lower shell. Mildew was also noted on the lower shell. The coating exhibited good adhesion to the underlying coating. Two unused nameplate brackets were located on shell ring #1 above the north shell manhole. (See photos 23-25, 27-33)

5. **Shell Manholes**: The tank was equipped with two flanged and bolted circular manholes located on the southeast and north sides of the tank. The shell plate around each of the manholes was equipped with a circular reinforcing plate. The manhole covers were equipped with hinged supports located on the exterior of the tank. Peeled coating and corrosion were observed on the manhole covers and necks, and there was mildew noted. (See photos 24-26)

6. **Overflow Pipe**: There was a sanitary deficiency noted: the discharge end of the overflow pipe was not equipped with protective screening or a flap gate. The overflow pipe exited through the top shell ring and extended down one of the pilasters along the shell and discharged above a
concrete splash pad which was located below the bottom of the pilaster. The pipe was equipped with an above grade air break. The discharge was not equipped with protective screening or a flap gate to prevent the ingress of insects into the tank. The overflow pipe was equipped with welded brackets, and peeled coating, corrosion, and rust staining were visible on the pipe and brackets. (See photos 37-42)

7. **Pilasters**: Eight pilasters were located around the exterior of the shell. Each of the pilasters contained a bolted cover manhole at ground level and a hinged cover manhole at the platform. The exterior shell ladder was located in one of the pilasters and light fixtures extended up this pilaster. Some of the fixtures were not illuminated. A locked access door was located at the base of the pilaster containing the shell ladder. An antenna equipment warning sign was posted on the pilaster adjacent to the access door. Eighteen pair of screened vent openings were located in the pilaster which contained the ladder. Fourteen welded angle stiffeners were located on the interior of each pilasters. There was peeled coating and corrosion noted on the visible interior pilaster surfaces. Cables extended up the pilasters to the antenna equipment on the platform. (See photos 34-36, 40-44, 46, 48, 50-52)

8. **Shell Ladder**: There were safety and OSHA deficiencies noted: (1) the paint on the safe-climbing device may prevent the proper operation of the device, (2) the 26 in. width of the ladder safety cage did not meet the minimum required 27 in., (3) conduit and cables attached to the ladder which could interfere with the climber’s use of the ladder side rail, and (4) the wiring was exposed at conduit adjacent to the base of the ladder. The ladder was equipped with a notched-tubular safe-climbing device. However, the paint on the device may prevent it from operating properly. The shell ladder was located within one of the pilasters. The ladder was welded to brackets which were welded to the shell. The shell ladder and brackets appeared to be in nearly their original structural condition at the time of this field evaluation. There were cables and conduits which extended up the ladder, and wiring was exposed at a junction box immediately adjacent to the base of the ladder. (See photos 43-45, 48-49)

9. **Platform**: A platform was located around the top of the shell. The platform floor consisted of a steel grate, and its safety railing consisted of welded angle and pipe members. Fifteen antennas were attached to the safety railing of the platform. Cables projected above openings in the platform floor. The platform coating was in good overall condition although rust staining and corrosion were noted. (See photos 47, 50-55)

10. **Roof Ladder**: A ladder extended from the platform to near the center of the roof. The roof ladder was welded to brackets which were welded to the roof. The roof ladders and brackets appeared to be in nearly their original structural condition at the time of this field evaluation. (See photo 63)

11. **Roof Condition**: The contour of the roof was irregular as evidence of trapped water was located near the perimeter of its circumference. The roof coating was in fair to poor condition. The topcoating had peeled and checked extensively, and corrosion was noted. There were runs and debris in the coating, and it exhibited very poor adhesion to the underlying coating. Twenty-three threaded and plugged couplings were located in the roof, and there was corrosion on the couplings. (See photos 56-62)

12. **Roof Manholes**: There were sanitary and AWWA deficiencies noted: (1) the flanged manhole cover was not locked, (2) the cover on the flanged manhole was warped, (3) the vertically oriented screened openings in the manhole neck were not shielded from wind-driven
dust and debris, (4) the screening on the flanged manhole neck was not shielded from wind-driven dust and debris, and (5) the screening on the vent openings were painted. The roof was equipped with two roof manholes. One of the manholes was equipped with a hinged and locked cover while the other manhole was flanged and equipped with a bolted cover. The manholes were welded on the exterior only. There were five screened openings in the flanged manhole neck. The screening was painted and clogged. There was corrosion noted on the interior surfaces of the hinged cover manhole and on the neck, flange, and cover of the flanged manhole. (See photos 47, 64-68)

13. **Roof Vents:** There was a sanitary deficiency: the vertically oriented screening on the vents was not shielded from wind-driven dust and debris. The roof was equipped with four clog-resistant vents. The pallets and visible screening on the vents appeared to be in adequate condition. There was corrosion on the underside of the vents around the screening. (See photos 69-74)

C. **Interior Surfaces**

**ROOF SUPPORT STRUCTURE:**
Radial Stiffeners:
   Number:
      Inner: 37
      Outer: 22
   Size: 5 in. x 3 in. x 3/8 in., angle
   Circumferential Stiffener: 6-1/4 in. x 4 in., I-beam

**TOP SHELL RAIL:**
   Location: roof-to-shell connection
   Size: 5-1/4 in. x 5/8 in., flat bar
   Construction: fully welded to interior

**CATHODIC PROTECTION:** none

**OVERFLOW:**
   Inlet Type: funnel
   Location: approx. 5 in. below roof-to-shell connection

**INLET/OUTLET PIPE:**
   Size: 24 in. diameter
   Projection: 1-1/2 in. above floor
   Mud Guard:
      Size: 6 in. tall
      Removable: yes
INTERIOR COATING AND METAL CONDITION:

<table>
<thead>
<tr>
<th></th>
<th>Coating Thickness Range</th>
<th>% Failure to Adhesion</th>
<th>Metal Loss</th>
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<tr>
<td></td>
<td></td>
<td>Primer</td>
<td>Rust</td>
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</tr>
<tr>
<td>Roof</td>
<td>13 mils to 26.5 mils</td>
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<td>Neg.</td>
<td>3 S</td>
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<tr>
<td>Shell</td>
<td>14.5 mils to 24 mils</td>
<td>50%</td>
<td>Neg.</td>
<td>3 T</td>
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<tr>
<td>Floor</td>
<td>19 mils to 27.5 mils</td>
<td>-</td>
<td>-</td>
<td>4 T</td>
</tr>
</tbody>
</table>

Key to Table

Adhesion: 5 (very good), 4 (good), 3 (fair), 2 (poor), 1 (very poor), 0 (very poor)
T = Topcoat to Underlying Coating
S = Primer to Steel
Neg. = negligible

1. **Interior Coating Condition:** The interior coating system appeared to be in generally fair condition with no significant areas of corrosion or metal loss noted. However, numerous areas of peeled coating were observed on the shell. The interior evaluation was restricted by the presence of ice on the floor. The interior coating exhibited fair to good adhesion to the underlying coating and fair adhesion to the steel.

2. **Roof Condition:** The coating on the roof plates appeared to be in good overall condition with no significant areas of corrosion observed. The roof support structure consisted of two sets of intermittently welded radial stiffening members and a circumferential stiffener welded around the radial stiffener ends. Corrosion and minor rust staining were noted along the flange of some of the stiffeners. (See photos 75-82)

3. **Shell Condition:** The coating on the interior shell appeared to be in fair overall condition. There were extensive areas of peeled topcoating noted but only a few random areas of corrosion and rust staining observed. A few large blisters were also present in the shell coating. There was a steel flat bar welded around the shell-to-roof connection. (See photos 83-88)

4. **Overflow Pipe:** The overflow pipe was equipped with a funnel-type inlet. The location of the overflow inlet was such that the top capacity level was below the roof-to-shell connection. (See photo 77)

5. **Bottom Plate Condition:** Much of the floor was not visible at the time of the field evaluation due to the presence of ice. The visible floor coating appeared to be in fair condition with small spots of corrosion noted. No significant areas of metal loss were observed. (See photos 89-96)

6. **Inlet/Outlet Pipe:** The tank was equipped with an inlet/outlet pipe which projected above the floor. The pipe was equipped with a removable mud guard. (See photos 97-98)
RECOMMENDATIONS:

A. Foundation and Site

1. Site Maintenance: The site should be regraded so that the top of the entire foundation projects a minimum of 6 in. to a maximum of 12 in. above grade on all sides and so that proper drainage away from the foundation continues. The bush remains and stumps should be removed from around the base of the foundation, and the vines should be removed from around the base of the tank and should not be allowed to encroach on the foundation, bottom plate, anchor bolts and chairs, and lower shell in the future.

2. Tank and Site Security: Water tanks have been defined by some courts under certain circumstances as attractive nuisances. As such, there may be a significant potential liability to the Owner for injury to persons on the tank and tank site, even if access is not authorized. Recent events have prompted the entire water industry to consider measures that inhibit intentional acts that could threaten the water supply. A review of the security requirements for the tank and site is recommended to confirm that the existing measures are consistent with the Owner’s security requirements for their water system. Primary tank and site security should be focused on eliminating, preventing, and detecting unauthorized access to the tank. Such security measures might include routinely and periodically verifying all doors, manholes, and gates are locked, and all exterior ladders have suitable deterrents. Other security measures might include installing no-trespass signs, site lighting, motion detectors, surveillance cameras, alarms on gates, doors, and tank manholes, and arranging more frequent site visits by law enforcement agencies.

3. Foundation: Any unsound concrete should be chipped to sound material and the concrete should be brush-off blasted. Any deteriorated areas or voids found should have a bonding agent and a vinyl emollient modified concrete patching mortar applied to build up the surface to its original contour. The concrete should then be painted with a concrete sealer. The vegetation should be removed from the spalls in the foundation.

4. Grout Maintenance: All loose grout should be chipped away to solid material when the tank is empty. Any shim plates which can be easily removed should be taken out. Any voids in the grout should be filled with a nonshrinking, nonstaining, structural grout material. The grout should be placed as far back under the bottom plate as possible and squared off vertically with the edge of the bottom plate. Any gap between the steel bottom plate and the grout should be filled with a flexible sealant.

5. Antennas: The number and placement of the antennas, cables, and other associated equipment mounted on this tank will complicate the repainting of the tank. If left in place the antennas, cables, and related equipment may be damaged even though steps are taken to protect the components from blasting and other work related activities. Leaving this equipment in place will also increase the cost and duration of the project. If possible, it is recommended that the antennas and antenna cables be removed prior to the work and reinstalled at the completion of the project. At a minimum, the equipment should be de-energized during work to minimize the workers exposure to radio frequencies (RF). The contract between the Owner and the antenna companies will need to be reviewed to determine if removal and de-energization is possible and who bears responsibility for the cost and liability of the equipment removal. If possible, lease requirements regarding all equipment relocation should be written in advance of all rehabilitation operations. If the equipment cannot be removed, it will
need to be determined who bears the cost and liability for removing or replacing any equipment that becomes damaged during work operations. Additional considerations during work operations will also be required including worker exposures to RF emissions which may shorten workdays; how to place and construct containment to prevent fugitive dust emissions; and adequately cleaning and painting in the hard to reach areas created by the locations of this equipment.

6. Overhead Power Lines: All overhead power lines within 40 ft of the tank should be relocated underground in order to prevent potential electrical shock to personnel working on the tank. The relocation of the power lines should be performed in accordance with the National Electric Code (NEC) guidelines.

B. Exterior Surfaces

1. Life of the Exterior Coating: The exterior coating system appeared to be in fair to poor condition with extensive areas of topcoating failure on the roof and shell and roof. Tank Industry Consultants believes that the exterior of the tank should be repainted within the next 2 years. Due to the extent of coating failures and corrosion observed, completely cleaning and recoating the exterior is recommended. For added color and gloss retention a zinc/polyurethane/flourourathane system could be applied.

2. High Strength Steel: Any welding or cutting should be performed taking into account the tank appeared to be constructed using high strength steel.

3. Coating Testing: Prior to preparation of specifications for the cleaning and coating of the exterior of the tank, samples of the exterior coating system should be subjected to laboratory analysis to test for ingredients which may at that time be subject to regulations concerning their handling and disposal.

4. Cleaning: When the exterior is to be cleaned, all varieties of containment should be investigated. Containment of the wind-blown debris and paint droplets may be required due to the proximity of the adjacent residences.

5. Recommended Coating System:

   a. Complete Cleaning and Repainting: The optimum long-life coating system presently available for this site is an epoxy-polyurethane coating system. Properly formulated and applied polyurethanes have good resistance to condensation, mildew, and chipping. The polyurethanes also have excellent color and gloss retention and the longest expected service life of any of the common exterior tank coatings. The typical life of a properly applied epoxy-polyurethane coating system is approximately 15 to 20 years. These coatings are also presently manufactured to meet current VOC requirements.

   b. Coating Application: The entire roof exterior should be cleaned to the equivalent of an SSPC-SP 6, Commercial Blast Cleaning and have an epoxy-primed, epoxy intermediate and polyurethane finish coating system applied. However, care must be taken during the application of this particular coating system because this coating does have poor dry-fall characteristics, and
potential damage to the surrounding property must be taken into consideration. The polyurethane coatings also require close monitoring of temperature and humidity during application.

6. **Effective Service Life**: Tank Industry Consultants defines the life of a coating as the amount of time before repainting becomes necessary due to coating failure and corrosion. During the coating life the Owner should expect the coating to lose its gloss, start to chalk, show signs of weathering, and possibly some rust staining. Future touch-up may be required on isolated coating failures. If aesthetics are a concern, the Owner may have to topcoat the repainted tank prior to the end of the expected service life. However, future topcoating would be less expensive than complete cleaning and recoating and could delay the next complete cleaning and repainting for many years.

7. **Other Systems**: With air emission volatile organic compounds (VOC) restrictions being put in place around the nation, alternative coating systems may become available which would be viable options for this tank. The Owner should review the available systems prior to preparing specifications for the recoating project.

8. **Coating Curing**: It would be more economical to paint the tank exterior at the same time the interior is painted, since the tank must be drained while the exterior is painted, and the applied coatings cure. This will also reduce mobilization and observation costs.

9. **Rehabilitation Schedule**: To obtain the lowest possible prices for the work outlined in the recommendations, the Owner should have the specifications prepared and the work bid in the spring, with the work scheduled to start in early summer (if possible).

10. **Grinding and Bracket Removal**: Any unused brackets or erection lugs should be removed prior to the exterior repainting. Any weld burrs, weld spatter, or erection scars should be ground off to provide a smooth surface for the application of the coating.

11. **Anchor Bolts**: After abrasive blast cleaning, the anchor bolts, chairs, and nuts should be examined for deterioration. If deterioration is found and the anchor bolts are mild steel, the deteriorated areas of the anchor bolts should be repair welded as necessary. Dirt, debris, and grass clippings can accelerate corrosion and should not be allowed to accumulate in the anchor bolt chairs.

12. **Chime**: Due to the extent of corrosion and metal loss noted, the chime should be carefully evaluated after abrasive blast cleaning as significant areas of metal loss will require repair.

13. **Electrical Apparatus**: All unused electrical conduit, fixtures, electrical metering equipment, antennas, and control cabinets should be removed from the tank and tank site. All required equipment should be repaired and maintained in accordance with the National Electric Code (NEC). The exposed wiring at the uncovered junction box should be covered.

14. **Existing Shell Manholes**: At the time of recoating and repairs, the gaskets for the shell manholes should be replaced.

15. **Overflow Pipe**: The discharge end of the overflow pipe should be equipped with a new screened, counter-weighted flap gate or elastomeric check valve to prevent the ingress of birds, small animals and insects into the tank.
16. **Exterior Ladders:** The safety cage is not required on a ladder with a safe-climbing device. To reduce cleaning and painting costs and future maintenance costs and because the existing shell ladder safety cage was not OSHA compliant, it should be removed. The paint should be removed from the shell ladder safe-climbing device and its proper operation verified. Alternatively, the safe-climbing device could be replaced.

17. **Roof Manholes:** The screened openings in the flanged manhole neck should be sealed. The warped cover should be replaced, and it should equipped with a lock.

18. **Roof Vents:** The vertical screening should be shielded from wind-driven dust and debris.

C. **Interior Surfaces**

1. **Life of the Interior Coating:** The interior coating system appeared to be in generally fair condition with no significant areas of metal loss noted. Numerous areas of peeled coating were observed on the shell. The evaluation of the floor was restricted by the presence of ice. The interior should be repainted within the next 2 years. Any corrosion or metal loss which develops is of even greater concern since the tank appears to have been constructed with a high-strength steel. It is recommended that when the interior is completely cleaned and repainted, an epoxy coating system should be used.

2. **Coating Testing:** Prior to preparation of specifications for the cleaning and coating of the interior of the tank, samples of the interior coating system should be subjected to laboratory analysis to test for ingredients which may at that time be subject to regulations concerning their handling and disposal.

3. **Recommended Interior Coating System:**
   a. **Epoxy Coating System:** The optimum long-life coating system presently available for the interior of water tanks is a two-component epoxy coating system. A 100% solids epoxy coating system should be used on the interior. This coating system should meet the certification criteria of ANSI/NSF 61 and state department of health regulations.
   b. **Coating Application:** When the interior is to be repainted, the entire tank interior should be cleaned to the equivalent of an SSPC-SP 10, Near-White Blast Cleaning and an epoxy coating system applied.
   c. **Service Life:** The typical life of a properly formulated and applied epoxy coating system is approximately 12 to 15 years in immersion service. Tank Industry Consultants defines the life of a coating as the expected service life before repainting becomes necessary due to coating failure and corrosion.

4. **Pit Welding and Pit Filling:** After initial cleaning, all significant pitting which is found should be welded, and all pitting with rough edges that would make the pitting difficult to coat properly should be filled with a solventless epoxy seam sealer.
5. **Rough Edges**: All unused brackets should be removed from the interior and exterior surfaces at the time of the next recoating. Any weld burrs, spatter, scars or rough edges in the steel should be ground smooth to provide a better surface for coating.

6. **Flexible Sealant**: The intermittently welded roof plate lap seams should be sealed with a flexible sealant.
ECONOMIC FACTORS:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Life in Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacement of tank with a new one</td>
<td>$ 6,000,000¹</td>
<td>75+</td>
</tr>
</tbody>
</table>

The following is a complete list of repairs and estimated costs for their respective recommendations found in the RECOMMENDATION section of this report.

<table>
<thead>
<tr>
<th>Item</th>
<th>Sanitary &amp; Safety</th>
<th>Scheduled Maintenance Repairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean and Paint Exterior:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP 6, Complete Clean, Epoxy/Polyurethane System</td>
<td></td>
<td>$ 385,000</td>
</tr>
<tr>
<td>Containment</td>
<td>120,000</td>
<td></td>
</tr>
<tr>
<td>SP 6, Complete Clean, Zinc/Polyurethane/Flourourethane System</td>
<td></td>
<td>430,000</td>
</tr>
<tr>
<td>Containment</td>
<td>120,000</td>
<td></td>
</tr>
<tr>
<td>Paint One Logo</td>
<td></td>
<td>12,000</td>
</tr>
<tr>
<td>Paint Four Logos</td>
<td></td>
<td>36,000</td>
</tr>
<tr>
<td>Contingency to Clean and Paint Pilaster Interiors:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spot Clean and Spot Coat</td>
<td></td>
<td>85,000</td>
</tr>
<tr>
<td>Clean and Paint Interior:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP 10, 100% Solids Epoxy System</td>
<td></td>
<td>530,000</td>
</tr>
<tr>
<td>Cathodic Protection System</td>
<td></td>
<td>18,000</td>
</tr>
<tr>
<td>Grout Repair</td>
<td></td>
<td>3,000</td>
</tr>
<tr>
<td>Foundation Repair</td>
<td></td>
<td>9,000</td>
</tr>
<tr>
<td>Install Overflow Pipe Elastomeric Check Valve</td>
<td></td>
<td>5,000</td>
</tr>
<tr>
<td>Remove Shell Ladder Safety Cage</td>
<td></td>
<td>4,000</td>
</tr>
<tr>
<td>Replace Shell Ladder Safe-Climbing Device</td>
<td></td>
<td>5,000</td>
</tr>
<tr>
<td>Install Roof Ladder Safe-Climbing Device</td>
<td></td>
<td>3,000</td>
</tr>
<tr>
<td>Modify Flanged Roof Manhole</td>
<td></td>
<td>3,000</td>
</tr>
<tr>
<td>Roof Vent Vertical Shields</td>
<td></td>
<td>4,000</td>
</tr>
<tr>
<td>Install Mixing System</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Contingency Items                                                   |                   | 5,000                       | 8,000

Estimates are believed to be a high average of bids that would be received in 2014.

¹ The replacement estimate includes costs associated with new tank fabrication and erection, foundation, painting, and engineering. The budget estimate given does not include costs associated with tank demolition, site acquisition, and distribution interruptions.
The following economic factors include only those work items that the Engineer believes to be the minimum to properly maintain this tank from an operational standpoint. Other items related to safety and risk management should be evaluated by the Owner.

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean and Paint Exterior:</td>
<td></td>
</tr>
<tr>
<td>SP 6, Complete Clean, Zinc/Polyurethane/Flourourethane System</td>
<td>$430,000</td>
</tr>
<tr>
<td>Containment</td>
<td>120,000</td>
</tr>
<tr>
<td>Paint Four Logos</td>
<td>36,000</td>
</tr>
<tr>
<td>Contingency to Clean and Paint Pilaster Interiors:</td>
<td></td>
</tr>
<tr>
<td>Spot Clean and Spot Coat</td>
<td>85,000</td>
</tr>
<tr>
<td>Clean and Paint Interior:</td>
<td></td>
</tr>
<tr>
<td>SP 10, 100% Solids Epoxy System</td>
<td>530,000</td>
</tr>
<tr>
<td>Foundation Repair</td>
<td>3,000</td>
</tr>
<tr>
<td>Install Additional Shell Manhole</td>
<td>8,000</td>
</tr>
<tr>
<td>Install Overflow Pipe Elastomeric Check Valve</td>
<td>5,000</td>
</tr>
<tr>
<td>Remove Shell Ladder Safety Cage</td>
<td>4,000</td>
</tr>
<tr>
<td>Replace Shell Ladder Safe-Climbing Device</td>
<td>5,000</td>
</tr>
<tr>
<td>Install Roof Ladder Safe-Climbing Device</td>
<td>3,000</td>
</tr>
<tr>
<td>Modify Flanged Roof Manhole</td>
<td>3,000</td>
</tr>
<tr>
<td>Roof Vent Vertical Shields</td>
<td>4,000</td>
</tr>
<tr>
<td>Install Mixing System</td>
<td></td>
</tr>
<tr>
<td>Contingency Items</td>
<td>5,000</td>
</tr>
<tr>
<td><strong>Total of Engineer's Recommendations</strong></td>
<td><strong>$1,205,000</strong></td>
</tr>
</tbody>
</table>

Tank Industry Consultants has no control over the cost of labor, materials, or equipment, or over the contractors' methods of determining prices, or over competitive bidding, or the market conditions. Opinions of probable cost, as provided for herein, are to be made on the basis of our experience and qualifications and represent our best judgment as design professionals familiar with the design, maintenance, and construction of concrete and steel plate structures. However, Tank Industry Consultants cannot and does not guarantee that proposals, bids, or the construction cost will not vary from opinions of probable cost prepared for the Owner.

Due to the numerous potential scopes of work which exist, the Owner should obtain an updated budget estimate once the final scope of work has been determined. This would enable the Owner to accurately budget monies for additional mobilization costs and damaged coating rehabilitation costs.

Engineering and resident observation costs are not included in the Total of the Engineer's Recommendations because these fees are dependent upon the scope of work to be performed. Tank Industry Consultants performs all facets of the engineering services which would be required for this project. Estimated fees for engineering and resident observation will be furnished upon request.

**CLOSURE:**

**Brief Summation:** The City of Evanston, Illinois has a 5,000,000 gallon standpipe. The exterior coating system appeared to be in fair to poor condition with extensive areas of topcoating failure on the
roof and corrosion present on the shell and roof. Tank Industry Consultants believes that the exterior of the tank should be repainted within the next 2 years. The interior coating system appeared to be in generally fair condition with no significant areas of metal loss noted. Numerous areas of peeled coating were observed on the interior shell. The interior should be repainted within the next 2 years. Proper maintenance after completing the recommendations herein would include periodic washouts and evaluations approximately every 3 to 5 years, and the proper maintenance of the existing ice-resistant cathodic protection system with long-life anodes.

**Contractor Selection:** The work should be performed by a competent bonded contractor, chosen from competitive bids taken on complete and concise specifications. The coatings used should be furnished by an experienced water tank coating manufacturer, supplying the field service required for application of technical coatings.

**Standards for Repairs and Coatings:** All work done and coatings applied should be applied in accordance with NACE, ANSI/NSF Standard 61, the manufacturer's recommendation, AWWA D100 and AWWA D102 (latest revisions), and the SSPC: The Society for Protective Coatings.

**Observation of Work:** Observation of the work in progress by experienced personnel will offer additional assurance of quality protective coating application. Observations can be performed on a continuous basis or spot (critical phase) basis. The actual cost of observation may be less using spot as opposed to full-time resident observation; however, with spot observation it is often necessary for work to be redone to comply with the specifications. This somewhat lowers the quality of the finished product, lengthens the job, and is frequently a cause of conflict between the contractor, Owner, and field technician. Resident full-time observation minimizes the amount of "rework" required.

**Anniversary and Maintenance Evaluations:** An anniversary evaluation should be conducted prior to the end of the one year bonded guarantee. Washouts and coating, structural, sanitary, safety, and corrosion evaluations should be conducted not less than every three years.

**Time Frame:** If the work is not performed within the next 18 months, the structure should be reevaluated prior to the preparation of specifications and solicitation of bids.

**Specifications and Bidding Documents:** The recommendations in this report are not intended to be specifications on which a contractor can bid. Complete bidding documents must include general and special conditions, detailed technical specifications, and other information necessary for the competitive bidding process. To properly protect the interests of the Owner, Contractor, and Engineer; the initial evaluation, the technical specifications, legal portions of the contract documents, and the observation should be performed by the same firm or with close coordination of all parties involved.

**Limitations of Evaluation:** It is believed that the conditions reported herein reflect the condition of the tank as observed on the date of the evaluation, using reasonable care in making the observations, and safety in gaining access to the tank. Should latent defects be discovered during the cleaning of the structure, they should be brought to the attention of the Owner and the Engineer.
Seismic and Wind Loadings: This tank is located in a region of low seismic activity. This evaluation and the reporting of the condition of this tank do not warrant the structural condition of the tank or any of the original design for seismic loadings. Likewise, recommendations for this tank do not include modifications which may be required for compliance with present structural codes. It is possible the tank was erected in compliance with pre-existing industry standards which have since been replaced by more restrictive standards.

Hazardous Materials in Coatings: It should be taken into consideration that Federal, State, and local environmental agencies have placed stricter controls on the removal of lead-based and other heavy-metal based coatings from steel structures by the use of conventional abrasive blasting techniques. The paint and blast residue may be considered to be hazardous waste depending on the concentration of lead or other particles in residue.

Please contact Tank Industry Consultants if you have any questions or comments.

Respectfully submitted,

Tank Industry Consultants

Jennifer Coon, CHMM, CET

Gregory R. “Chip” Stein, P.E.
Managing Principal

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## Classification of Adhesion Test Results

<table>
<thead>
<tr>
<th>Method A – X Cut Tape Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approx. 1.5 in. long cuts at 30 deg. to 45 deg. apart.</td>
</tr>
<tr>
<td>No peeling or removal.</td>
</tr>
<tr>
<td>Trace peeling or removal along incisions.</td>
</tr>
<tr>
<td>Jagged removal along incisions up to 1/16 in. (1.5mm) on either side.</td>
</tr>
<tr>
<td>Jagged removal along most of incisions up to 1/8 in. (3.2mm) on either side.</td>
</tr>
<tr>
<td>Removal from most of the area of the X under the tape.</td>
</tr>
<tr>
<td>Removal beyond the area of the X.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method B – Lattice Cut Tape Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six parallel cuts at 2mm apart.</td>
</tr>
<tr>
<td>The edges of the cuts are completely smooth; none of the squares of the lattice are detached.</td>
</tr>
<tr>
<td>Small flakes of the coating are detached at intersections; less than 5% of the lattice is affected.</td>
</tr>
<tr>
<td>Small flakes of the coating are detached along edges and at intersections of cuts. The area affected is 5% to 15% of the lattice.</td>
</tr>
<tr>
<td>The coating has flaked along the edges and on parts of the squares. The area affected is 15% to 35% of the lattice.</td>
</tr>
<tr>
<td>The coating has flaked along the edges of cuts in large ribbons and whole squares have detached. The area affected is 35% to 65% of the lattice.</td>
</tr>
<tr>
<td>Flaking and detachment worse than grade 1.</td>
</tr>
</tbody>
</table>

ASTM 3359 Standard Test Methods for Measuring Adhesion by Tape Test

**Tank Industry Consultants**

7740 West New York Street
Indianapolis, Indiana 46214

Telephone – 317/271-3100
FAX – 317/271-3300
# CERTIFICATE OF ANALYSIS

**Disp. Code:** E I M S P  |  **Report Date:** 23-Apr-14  12:50 PM

**Client ID:** TANK_INDUST  
Tank Industry Consultants  
7740 West New York Street  
Indianapolis, Indiana 46214  
**Attn:** Julie White

**Our Lab #** 14004881-001  |  **Your Sample ID:** Exterior Shell

**Your Project #** 13252.H1539.002  |  **Collection Date:** 04/17/14

**Your Project Name:** Paint Samples  |  **Collected By:** Client

**Sample Type:** Paint Chips  |  **Receipt Date:** 04/18/14  09:15

### Total Metals, ICP-AES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Analytical Method</th>
<th>Prep Method</th>
<th>Prep Date</th>
<th>By</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SW846 6010B</td>
<td>SW846 3050B</td>
<td>4/22/2014</td>
<td>amyers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Units</th>
<th>Qual</th>
<th>CAS #</th>
<th>Analysis Date</th>
<th>By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium, Cd</td>
<td>&lt; 25.0</td>
<td>mg/kg</td>
<td>25.0</td>
<td>7440-43-9</td>
<td>04/23/14</td>
<td>kflotz</td>
</tr>
<tr>
<td>Chromium, Cr</td>
<td>&lt; 250</td>
<td>mg/kg</td>
<td>250</td>
<td>7440-47-3</td>
<td>04/23/14</td>
<td>kflotz</td>
</tr>
<tr>
<td>Lead, Pb</td>
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<td>mg/kg</td>
<td>250</td>
<td>7439-92-1</td>
<td>04/23/14</td>
<td>kflotz</td>
</tr>
</tbody>
</table>

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<td>04/23/14</td>
<td>kflotz</td>
</tr>
</tbody>
</table>

**Lab #** 14004881-002  |  **Sample ID:** Interior Shell  |  **Page 1 of 2**

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**ESG Laboratories**  
5940 WEST RAYMOND STREET  
INDIANAPOLIS, INDIANA  46241  
**ORIGINAL REPORT**  
PHONE (317) 290-1471  
FAX (317) 290-1670  
www.ESGLaboratories.com
1. Tank and site.

2. Surrounding area.
3. Surrounding area.

4. Residences around site.
5. Access to site.

6. Miscellaneous items on site.
7. Dirt on site.

8. Piping sections stored on site.

11. Spalling and exposed aggregate in foundation.

12. Exposed aggregate in foundation.
13. Tank foundation, grout, bottom plate, and debris sound base of anchor bolt and chair.

15. Peeled coating and corrosion on bottom plate projection.

16. Peeled coating and corrosion on bottom plate projection.
17. Deteriorated grout, and peeled coating and corrosion on bottom plate.

18. Metal loss in bottom plate projection.
19. Anchor bolt and chair.

20. Anchor bolt and chair.
21. Peeled coating and corrosion on anchor bolt and chair.

22. Debris around base of anchor bolt.
23. Vines on foundation and lower shell.

24. Shell manhole and unused tank nameplate brackets.
25. Peeled coating, corrosion, and mildew on shell manhole cover.

26. Peeled coating, corrosion, and mildew on manhole neck.
27. Abandoned bracket remains on shell above manhole.

28. Corrosion on shell.
29. Peeled coating and corrosion on shell.

30. Corrosion and rust staining on shell.
31. Peeled coating and corrosion on shell.

32. Peeled coating on shell.
33. Shell, pilasters, and platform.

34. Cables extending into pilaster.
35. Pilaster.

36. Cover over pilaster opening.
37. Cover on pilaster access opening and overflow pipe  Note peeled coating and corrosion.

38. Splash pad for overflow pipe discharge beneath pilaster.

40. Overflow pipe in pilaster.
41. Corrosion on overflow pipe bracket and interior pilaster.

42. Peeled coating and corrosion on pilaster interior.
43. Pilaster access door and ladder.

44. Peeled coating and corrosion on anchor bolt chair beneath pilaster ladder, and exposed wiring at adjacent junction box.
45. Pilaster interior, ladder, and painted safe-climbing device.

46. Light fixture in pilaster.
47. Roof manhole, platform, and antenna equipment.

49. Painted safe-climbing device.

50. Access opening at top of ladder pilaster.
51. Peeled coating and corrosion on pilaster access opening, and capped openings adjacent to pilaster access opening.

52. Cable projections adjacent to pilaster access.
53. Antenna equipment on platform safety railing.

54. Antenna equipment on platform safety railing.
55. Corrosion on platform floor.

56. Evidence of trapped water around roof.
57. Evidence of trapped water around roof.

58. Peeled coating and corrosion on roof.
59. Peeled coating and corrosion on roof.

60. Peeled coating and corrosion on roof.
61. Peeled coating and corrosion on roof.

62. Threaded and plugged roof coupling.
63. Roof ladder.

64. Roof manhole.
65. Corrosion on roof manhole interior neck.

66. Roof ladder, flanged roof manhole, and corrosion on roof.
67. Roof manhole/vent.

68. Corrosion around roof manhole flange.
69. Roof vent.

70. Roof vent.
71. Roof vent screening

72. Roof vent screening.
73. Roof vent screening.

74. Roof vent screening.
75. Roof interior and support structure.

76. Roof interior and support structure.
77. Roof interior and support structure. Note overflow inlet funnel.

78. Roof stiffener.
79. Roof stiffener.

80. Corrosion and metal loss on roof stiffener.
81. Corrosion on circumferential roof stiffener.

82. Radial and circumferential stiffeners.
83. Shell interior.

84. Peeled coating and corrosion on shell.
85. Rust staining on shell.

86. Blistered shell coating.
87. Peeled shell coating.

88. Peeled shell coating.
89. Ice on tank floor.

90. Ice on tank floor.
91. Ice on tank floor.

92. Ice on tank floor.
93. Corrosion and ice on tank floor.

94. Tank floor.
95. Tank floor.

96. Corrosion on floor.
97. Inlet/outlet pipe and removable mud guard.

98. Inlet/outlet pipe and removable mud guard.