

DIXON

ENGINEERING AND
INSPECTION SERVICES
FOR THE COATING INDUSTRY

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Lake Odessa, MI 48849
Telephone 1-616-374/3221
Fax 1-616-374/7116

July 14, 2016

Town of Leesburg
25 Market St.
Leesburg, VA 20176

Attn: Russell Chambers

Re: 315,000 Steel Reservoir Storage Tank
Preliminary Maintenance Inspection

Dear Mr. Russell

Please find enclosed the above referenced report for the 315,000 gallon steel reservoir water storage tank. The inspection was completed on June 22, 2016. The report consists of: 1) cover page; 2) conclusions and recommendations; 3) detailed report; 4) Field Inspection Report (FIR); 5) photographs and descriptions; and 6) flash drive.

Brief explanation: 1) The cover page is self-explanatory. 2) Conclusions and recommendations explain in short form what was found on the tank and what DIXON recommends for repair and maintenance of the tank. 3) This section is the long report that goes into detail to explain what exactly was found and why DIXON makes the recommendations. 4) Field Inspection Report (FIR) is the form that was completed when the inspection team was on-site and includes the dimensions and conditions of the tank. 5) Photographs and descriptions give the Owner a visual record of the condition of the tank and appurtenances. 6) Flash drive is an Adobe PDF format of the complete report and photos for your convenience.

If you have any questions or concerns, please call me at (616) 374-3221 ext. 402.

Thank you for choosing DIXON for your inspection needs.

FOR DIXON ENGINEERING, INC.,

Shannon Vidika
Project Manager

Enclosures

Members: Steel Structures Painting Council
American Water Works Association
Consulting Engineers Council

Dixon Engineering, Inc.

Preliminary Maintenance Inspection

315,000 Gallon Bolted Reservoir

Leesburg, Virginia

Inspection Performed: June 22, 2016
Report Prepared: June 29, 2016
Reviewed by Ira M. Gabin, P.E.: July 5, 2016

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Dixon Engineering Inc.

1104 Third Ave. Lake Odessa, MI 48849

CONCLUSIONS:

1. The exterior coating is an acrylic urethane system that is in fair condition overall. The coating is moderately faded and the primary modes of deterioration are spot coating failures to the substrate and surface rusting. There are many spot coating failures on the sidewall and roof and complete failure on several roof panels.
2. The wet interior sidewall and roof coating is an epoxy phenolic system that is in fair condition overall. Below the high water line the coating deterioration includes spot failures on the sidewall. Above the high water line, the coating is deteriorating on the roof stiffener edges with corrosion at the bolted connections.
3. The wet interior concrete floor seal coat is in fair condition overall. Primary mode of deterioration is delamination to the concrete.

RECOMMENDATIONS:

1. Complete the recommended work in 1 to 2 years. The coating work is the greatest cost and largest part of the recommendations. The repairs and upgrades should be completed during the next major tank rehabilitation project when coating work is completed.
2. Abrasive blast clean the exterior to a commercial (SSPC-SP6) condition inside a dust tight flexible frame containment system, and recoat with a polyurethane coating system. The estimated cost is \$100,000 plus \$60,000 for containment.
3. Abrasive blast clean the entire wet interior to a near-white metal (SSPC-SP10), condition and apply an epoxy system. The estimated cost is \$100,000.
4. Abrasive blast clean the interior piping to a commercial (SSPC-SP6) condition and apply an epoxy system. The estimated cost is \$10,000.
5. Coat the foundation to help prevent further deterioration. Cost would be incidental to exterior coating.
6. Repair the cracks in the foundation. The estimated cost is \$2,000.
7. Weld the roof stiffener connections at the sidewall. The estimated cost is \$15,000.

COST SUMMARY:

Repaint Exterior	\$100,000
Containment	60,000
Repaint Wet Interior	100,000
Repair Foundation Cracks	2,000
Weld Stiffener Connections	15,000
Repaint Interior Piping	10,000
Subtotal	<u>\$287,000</u>
Engineering and Contingencies:	40,000
Total:	<u>\$327,000</u>

Note: Cost estimates have been increased 10% above our data base averages from municipally bid projects (primarily in the Midwest). However, east coast bidding climate and requirements may result in higher bids than these estimates.

INSPECTION:

On June 22, 2016, Dixon Engineering, Inc., performed a preliminary maintenance inspection on the 315,000 gallon wastewater treatment plant bolted sludge reservoir owned by the City of Leesburg, Virginia. Purposes of the inspection were to evaluate the interior and exterior coating's performance and life expectancy; assess the condition of metal surfaces and appurtenances; review safety and health aspects; and make budgetary recommendations for continued maintenance of the tank. All recommendations with budgeting estimates for repairs are incorporated in this report. The inspection was performed by Lee Jamison, Project Manager. The inspector was assisted by Frankie Spratto, Staff Technician. Scheduling and arrangements for the inspection were completed through Russell Chambers. A source of water for cleaning was provided by the City.

TANK INFORMATION:

The tank was built in 1993 by Tec Tank with an estimated height to high water line of 32 feet. The tank is bolted construction and last coated in 1993 by Tec Tank during construction.

CONDITIONS AND RECOMMENDATIONS:

EXTERIOR COATING CONDITIONS:

The coating system is an acrylic urethane system. The coating is in fair condition overall, it is beginning to chalk and fade and there is loss of gloss. Surfaces have faded due to exposure to ultraviolet light, which is a normal occurrence for an exterior coating system. There are several coating failures.

The sidewall coating is in fair condition with only a few failures. Primary method of deterioration is spot coating failures to the substrate. The gasket at the sidewall bolted connection is in fair condition with cracking. There is some rust streaking coming from the bolted connection.

The roof coating is in poor condition with numerous failures. There is complete coating failure on several roof panels likely from poor shop painting. Primary methods of deterioration are spot coating failures to the substrate and surface rusting. The gasket at the roof bolted connection is in fair condition with cracking. There is some rust streaking coming from the bolted connection.

EXTERIOR COATING RECOMMENDATIONS:

Plan and budget for total exterior coating removal and recoating in approximately one to two years. Fading will continue and more rust spots will occur decreasing the tank's aesthetic appearance.

Remove the existing coating by dry abrasive blast cleaning the steel to a commercial (SSPC-SP6) condition and apply a polyurethane system. All blast work would be performed inside a dust tight flexible containment system using negative air pressure.

The coating system would consist of a full prime coat on the bare metal, a full coat of epoxy, followed by a two full coats of polyurethane. The polyurethane system offers excellent abrasion resistance with high gloss and sheen retention. The expected life of this system is fifteen years. The system can be recoated again in fifteen years, and a second time approximately fifteen years after the first recoating, extending the total life of the coating to approximately forty five years before total removal would be necessary again. The tank would be removed from service during the coating project. This is necessary to reduce condensation on the tank's surface. Polyurethane coatings have a minimum temperature requirement for application and are sensitive to moisture during the curing process. If moisture is present during the curing process, the appearance will become cloudy with little or no gloss. The estimated cost to abrasive blast clean and recoat with an epoxy polyurethane system is \$100,000 plus \$60,000 for containment.

WET INTERIOR COATING CONDITIONS:

The coating is an epoxy phenolic system that was applied by Tec Tank during construction in 1993.

The roof coating is in fair condition overall, with the primary areas of deterioration bolted panel seams, the stiffener edges, and in the crevices. The roof contains bolted panel seams that have started to rust and streak. Staining is typical for a tank of this construction. Staining in the lap seams is not a concern, but should be monitored during future inspections for corrosion growth. Edge corrosion on the stiffeners is typical but should be corrected before structural loss of steel occurs. The bolt connection plates that connect the stiffeners to the sidewall are in poor condition with coating delamination. The plates are extensively corroded with steel loss.

The sidewall coating is in fair condition with several failures. Primary method of deterioration is spot coating failures from age and crevice corrosion at bolt edges.

The concrete floor coating is in fair condition with several failures. Primary method of deterioration is delaminated topcoat.

WET INTERIOR COATING RECOMMENDATIONS:

Remove the coating system by abrasive blast cleaning the metal to a near-white metal (SSPC-SP10) condition and apply an epoxy coating system. The estimated cost to apply the three-coat epoxy system is \$100,000. This cost includes caulking all the interior panel seams, bolts, and nuts.

INTERIOR PIPING CONDITIONS:

There are three pipes in the wet interior of the tank. One is for filling the tank and two for overflow. An opening in the center of the floor drains the tank.

INTERIOR PIPING RECOMMENDATIONS:

Abrasive blast clean the piping to a commercial blast (SSPC-SP6) condition and apply an epoxy system. The estimated cost is \$10,000.

SITE CONDITIONS:

The size of the tank site is average and is fenced. The tank is located at a wastewater treatment plant. There are building and other tanks surrounding the tank.

FOUNDATION CONDITIONS:

Forty-six inches of the foundation is exposed with a 16 inch curb. The exposed foundation is in good condition with some tight cracking, but is not coated.

FOUNDATION RECOMMENDATIONS:

Pressure wash and coat the exposed concrete with an epoxy coating system to help prevent further deterioration. The cost would be incidental to exterior coating.

Repair the cracks in the foundation by routing and filling with a mortar repair system. The estimated cost is \$2,000.

HATCH AND MANWAY CONDITIONS:

The tank has a 24 inch square flip top roof access hatch to the wet interior that is in good condition.

The tank has a 24 inch diameter bolted manway in the sidewall that is in good condition.

VENT CONDITIONS:

The roof vent is a 20 inch flow through design that is in fair condition. The screen is fully intact.

LADDER CONDITIONS:

The tank has an exterior sidewall ladder that starts approximately four feet above ground level, and extends up to a small platform halfway up the sidewall. There is a second ladder on the other side of the platform that extends to the roof. The ladder is caged but there is no fall prevention device.

WET INTERIOR METAL CONDITIONS:

The steel structure is in fair condition above the high water line and in good condition below it.

The interior roof is supported by 28 radial stiffeners that are in fair condition with moderate corrosion in the crevices and at the edges. There are two circular stiffener rings, and two large transverse I-beam supports.

The connections at the sidewall are bolted and in poor condition. The connections at the I-beam supports are bolted and in poor condition. The connection at the center support is bolted and in poor condition. The bolted stiffener connection plates have almost no coating remaining and there is corrosion with steel loss.

The tank contains vertical stiffeners located at the upper sidewall section. They are in good condition and the coating in fair condition.

WET INTERIOR METAL RECOMMENDATIONS:

Weld the roof stiffener connections at the sidewall. The estimated cost is \$15,000.

DIXON ENGINEERING, INC.
STEEL TANK FIELD INSPECTION REPORT
RESERVOIR TANK

DATE: June 22, 2016

OWNER: Town of Leesburg
 CLIENT CODE: 46-55-01-01
 TANK NAME: DSST A
 LOCATION: Street: 1391 E. Market St.
 City: Leesburg
 State: Virginia
 TANK SIZE: Capacity: 315,000 gallons
 Diameter: 41 feet (nameplate)
 Height to overflow (HWL): 32 feet (nameplate)
 Sidewall height: 32 feet
 CONSTRUCTION:
 Type of structure: Reservoir
 Type of roof: Dome
 DATE CONSTRUCTED: 7/1993
 MANUFACTURER: Peabody Tec Tank
 CONTRACT NUMBER: 31195

COATING HISTORY	EXTERIOR	WET INTERIOR
DATE LAST COATED	<u>1993</u>	<u>1993</u>
CONTRACTOR	<u>Peabody TecTank</u>	<u>Peabody TecTank</u>
COATING SYSTEM	<u>Urethane</u>	<u>Epoxy</u>
SURFACE PREPARATION	<u>SSPC-SP6</u>	<u>SSPC-SP10</u>
COATING MANUFACTURER	<u>Unknown</u>	<u>Unknown</u>
COATING SAMPLES	<u>No</u>	<u>No</u>
HEAVY METAL	<u>No</u>	<u>No</u>

PERSONNEL: Inspector Lee Jamison, Top person Frankie Spratto,

TYPE OF INSPECTION: Preliminary Maintenance

METHOD OF INSPECTION: Dry

DATE LAST INSPECTED: Unknown

SITE CONDITIONS

Fenced: Yes

Site large enough for contractor's equipment: Yes

Control building: Yes

Antenna control site: No

Site conditions: Well maintained

Neighborhood:

North: Industry

East: Industry

South: Industry

West: Industry

Power lines within 50 feet: No

Are power lines attached to the structure: No

Would power lines interfere with containment: No

Site drainage: Away from tank

Indications of underground leakage: No

Shrub, tree, etc. encroachment: No

Rubbing on the Tank: No

Interference with future containment: No

EXPOSED PIPING:

N/A

FOUNDATION

Foundation exposed: Yes

Exposed height: 28-46 inches (12-31 inches) to bottom of 16 inch curb

Exposed foundation condition: Good

Damage or deterioration: Yes

Type of damage: Cracks

Severity: Minor

Crack location: Random

Total length cracking: approximately 65 feet(0 ft. need repair)

Foundation coated: No

Type of base-plate gap filler: None

FOUNDATION

Undermining of foundation: No

EXTERIOR COATING

Sidewall:

Lettering: Yes

Number: 1

Lettering Content: TecTank

Logo: No

Topcoat condition: Fair

Previous coat condition: Good

Describe coating: Rust staining from bolted panel connections

Dry film thickness: 2.6-3.5 mils

Coating adhesion: Not taken

Panel connections: Bolted and caulked

Gasket Condition: Fair

Metal condition: Good

Bottom shell steel thickness: 0.249-0.256 inches

Roof:

Topcoat condition: Fair

Previous coat condition: Fair

Describe coating: Fading, spot coating failures to substrate, and rust bleedthrough

Dry film thickness: 2.8-3.5 mils

Coating adhesion: Not taken

Metal condition: Good

Roof comments: 3 panels have nonskid coating that appears to be corroded but measured 5-9 mils dry film thickness

EXTERIOR APPURTENANCES

Pilaster Access door/hatch:

N/A

Sidewall manway:

Number: 1

Size: 24 inches

Coating condition: Good

Metal condition: Good

EXTERIOR APPURTENANCES

Anchor bolts:

N/A

Mud valve:

N/A

Sidewall ladder:

Height to start of ladder: At curb
Toe clearance: 7 inches or greater
Width of rungs: 18 inches
Thickness of rungs: 7/8 inch
Shape of rungs: Round
Coating condition: Aluminum
Metal condition: Good
Fall prevention device: No
Cage: Yes
 Diameter: 31 inches
Vandal Guard: Yes
 Condition: Good

Step-off platform:

Dimensions: 30 x 30 inches
Railing height: 42 inches
Midrail height: 21 inches
Toe plate height: 4 inches
Metal condition: Good
Step-off platform comments: Ladder transfer 1/2 way up on sidewall

Balcony:

N/A

Roof handrail:

N/A

Painter's rail:

N/A

Roof rigging points:

N/A

EXTERIOR APPURTENANCES

Removable cathodic caps:

N/A

Roof hatches:

Wet interior:

Neck size: 24 inches

Distance from center of the tank (to outer edge): 20 feet 6 inches

Shape: Square

Handhold at opening: Yes

Hatch security: None

Outside coating condition: Fair

Inside coating condition: Poor

Metal condition: Good

Bolted ventilation hatch:

N/A

Roof vent:

Number: 1

Type: Flow-through

Neck diameter: 20 inches

Flange opening diameter: 20 inches

Coating condition: Fair

Metal condition: Good

Screen condition: Good

Percent of screen open: 100

Aviation lights:

N/A

Antennas:

N/A

Aluminum Geodesic Dome:

N/A

WET INTERIOR COATING

Roof:

Topcoat condition: Good
Primer coating condition: Good
Describe coating: No significant coating deterioration
Metal condition: Good
Lap seams: Open
Condition of laps: Good

Sidewall:

Topcoat condition: Fair
Primer coating condition: Fair
Describe coating: Delaminating, previous coating repairs, spot coating failures to substrate, rust undercutting
Mineral deposits: Heavy
Metal condition: Good
Active pitting: No
Previous pitting: No

Tank bottom:

Topcoat condition: Fair
Primer coating condition: Fair
Describe coating: Delaminating
Mineral deposits: Light
Concrete condition: Good
Sump/Drain line: Yes

WET INTERIOR APPURTENANCES

Tank ladder:

N/A

Cathodic protection:

N/A

Clips and pressure fitting present: No

Fill pipe:

Diameter: 6 inches
Height above floor: 42 inches
Configuration: Stubs at floor
One way valves present: No

WET INTERIOR APPURTENANCES

Deflector on end: No
Mixing system: No
Coating condition: Good
Metal condition: Good
Fill pipe comments: Ductile iron

Separate draw pipe:

N/A

Overflow pipe:

Type: Stub
Coating condition: Good
Metal condition: Good
Overflow comments: 2 pipes- 1 approximately 20 feet, 2nd approximately 30 feet; ductile iron

Roof stiffeners:

Orientation: Radial with support rings and 2 transverse beams
Stiffener Shape: Channel
Number of stiffener support rings: 2
Beam Dimensions: 2 x 6 inches
Number of inner ring stiffeners: 28
Dimensions: 2 x 6 inches x 8 ft. long (estimated)
Stiffener Condition: Fair
Connection at center support: Bolted
Connection Condition: Fair
Number of middle ring stiffeners: 8
Dimensions: 2 x 6 inches x 6 ft. long (estimated)
Stiffener Condition: Fair
Connection at support ring: Bolted
Connection Condition: Fair
Number of outer ring stiffeners: 28
Dimensions: 2 x 6 inches x 6 ft. long (estimated)
Stiffener Condition: Fair
Connection at support ring: Bolted
Connection Condition: Fair
Coating condition: Fair to poor
Metal condition: Fair

WET INTERIOR APPURTENANCES

Roof stiffener comments: **Metal loss occurring along edges of stiffeners, center ring, and angles**

Columns:

N/A

Sidewall stiffener:

Number: **4**

Coating condition: **Fair**

Metal condition: **Good**

Sidewall beam comments: **Vertical- length of top panel; support 2 transverse I-beams**

Baffle wall:

N/A

Interior platform:

N/A

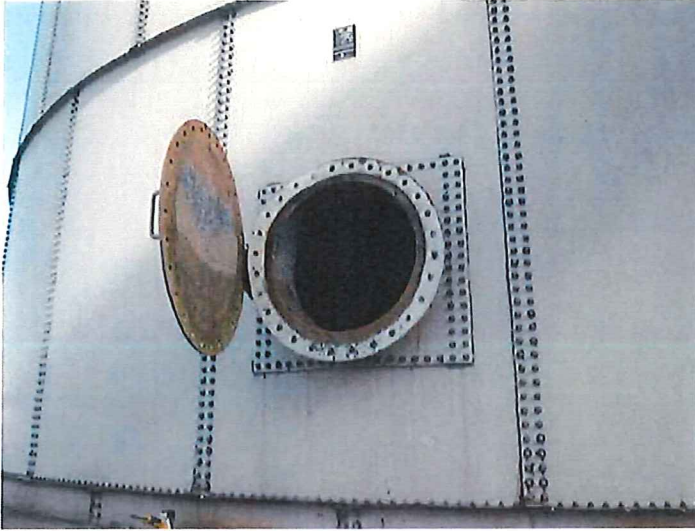
Spider Rods:

N/A

Field Inspection Report is prepared from the contractor's viewpoint. It contains information the contractor needs to prepare his bid for any repair or recoating. The engineer uses it to prepare the engineering report. Cost estimates are more accurate if the contractor's problems can be anticipated. While prepared from the contractor's viewpoint, the only intended beneficiary is the owner. These reports are completed with diligence, but the accuracy is not guaranteed. The contractor is still advised to visit the site.



315,000 gallon bolted steel reservoir owned by the City of Leesburg, Virginia.



1) Sidewall manway is in good condition.

2) Foundation is in good condition with a few cracks.

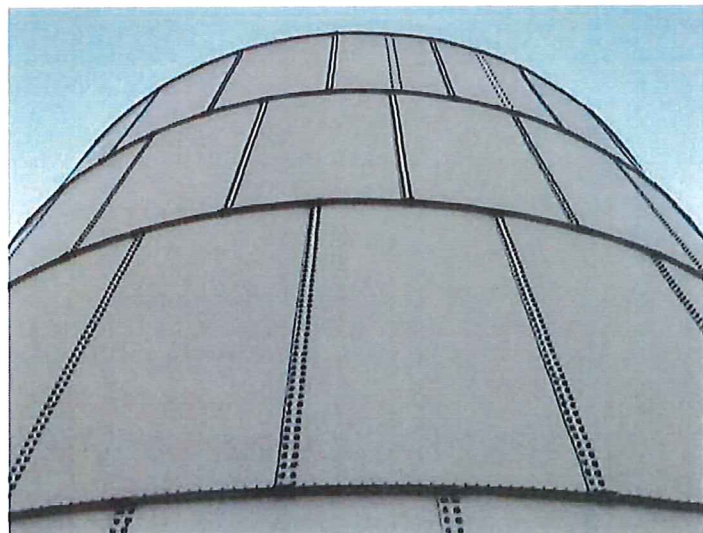


3) Vertical cracking is tight.

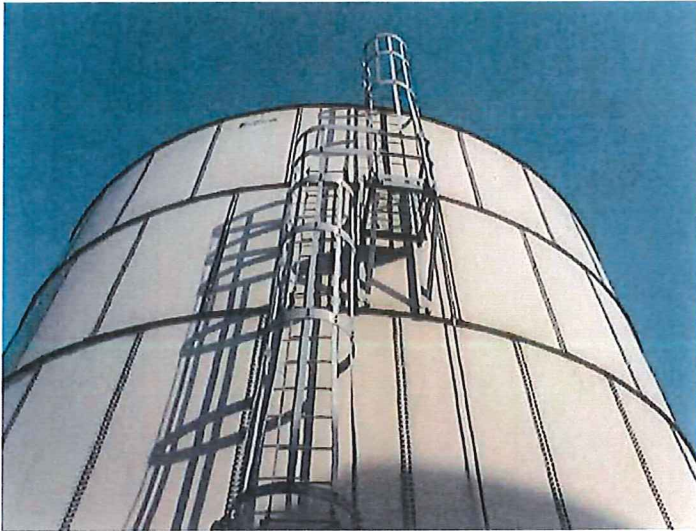


4) Cracking on underside of foundation.

5) Another area of vertical cracking.

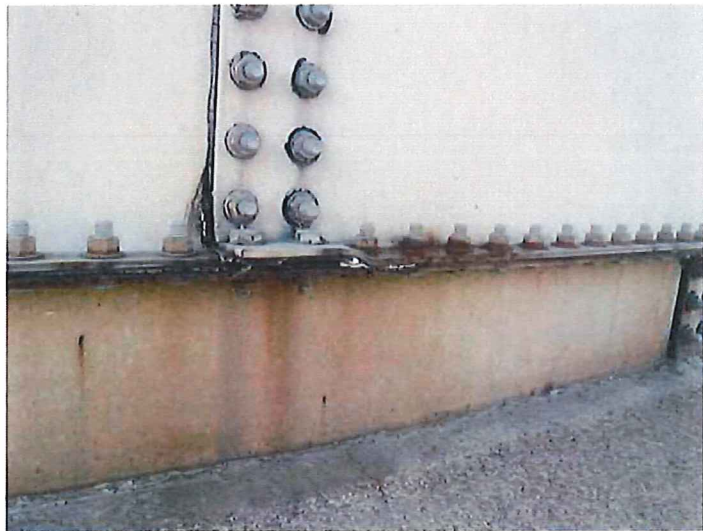


6) Exterior coating is faded with spot failures.



7) Caged sidewall ladder equipped with a cable fall prevention device.

8) Coating failures on the bottom section of the sidewall.



9) Sidewall coating failures above foundation.



10) Rusting on lip of bolted side-wall stiffener.

11) Top of sidewall at lip with coating failures and rusting.

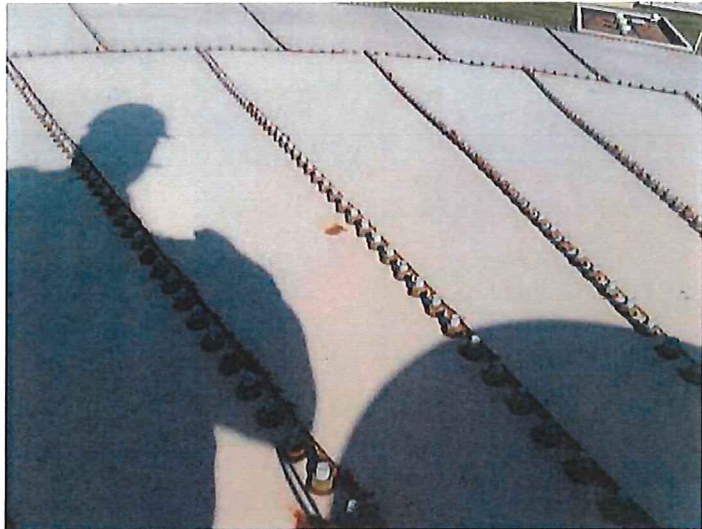


12) Roof panels with surface rusting.



13) Roof cover with coating failures and surface rusting.

14) Spot coating failures on the roof.

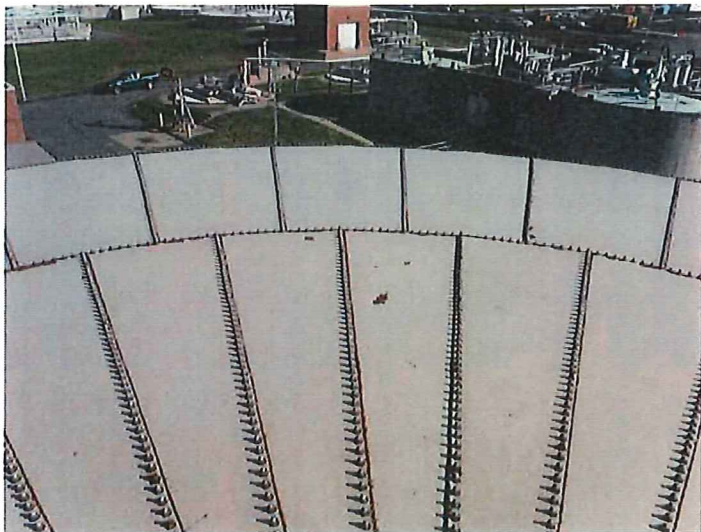
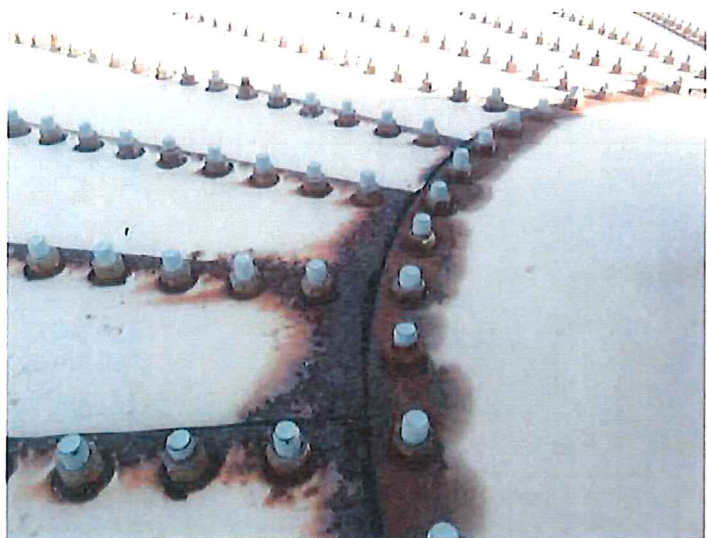


15) Same.



16) Roof vent with rusting bolted connections.

17) Rusting bolted connections at the center of the roof.



18) Roof coating is faded and in fair condition.

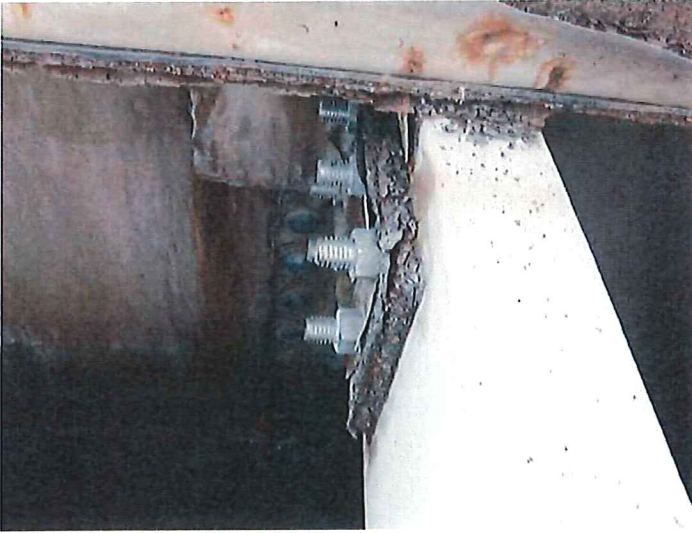


19) Spot coating failures at top of the interior sidewall.

20) Same.



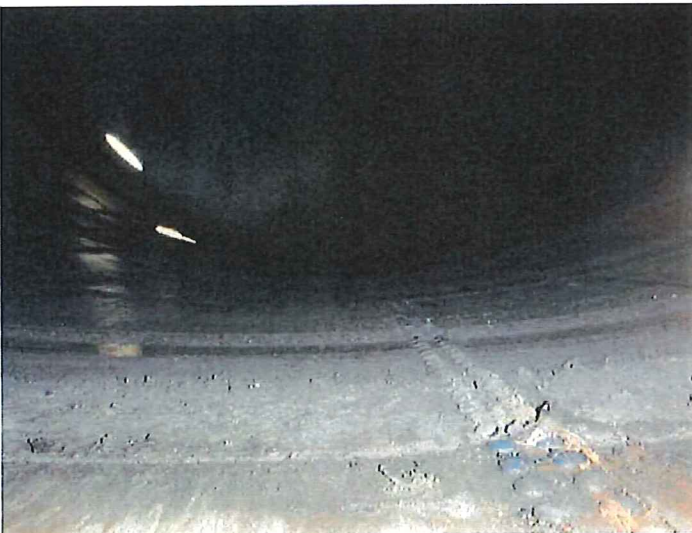
21) Roof stiffeners bolted to sidewall connection plates with coating loss and corrosion forming.



22) Roof stiffener plate with steel loss.



23) Rusting at roof bolted connection.

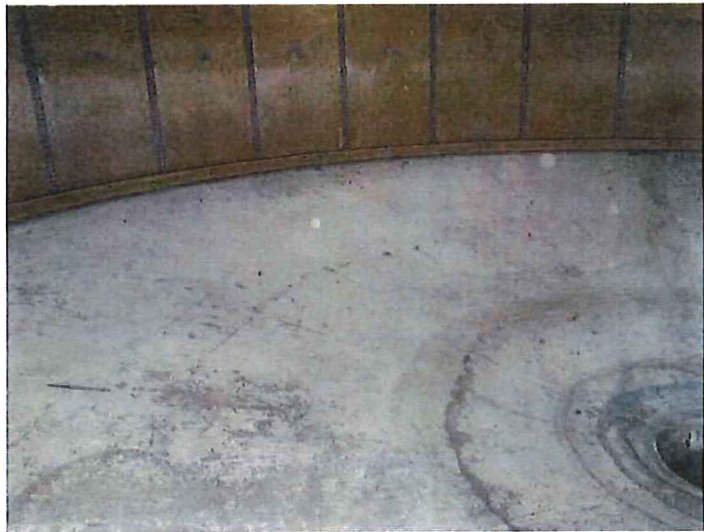


24) Sidewall with rusting at bolted connection.



25) Concrete floor is in good condition.

26) Same.



27) Sidewall manway viewed from interior.

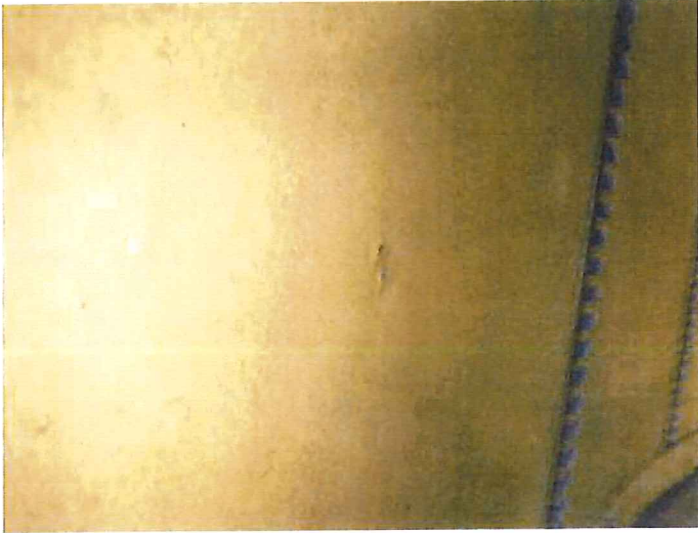


28) Bolted steel roof with radial stiffeners.

29) Interior piping is in fair condition.



30) Sidewall coating is in fair condition.



31) Spot coating failures on the sidewall.

32) Same.



33) Coating repair made on the sidewall.



34) Same.

35) Sidewall coating is in fair condition.



36) Floor to sidewall connection is in good condition.