

Dixon Engineering, Inc.

Preliminary Maintenance Inspection

Wastewater Treatment Plant
Digester B

Leesburg, Virginia

Inspection Performed: June 23, 2016
Report Prepared: July 7, 2016
Reviewed by Ira M. Gabin, P.E.: July 13, 2016

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CONCLUSIONS:

1. The exterior roof cap coating is an enamel system that is in poor condition overall. The coating is extensively faded and the primary modes of deterioration is spot coating failures to the substrate.
2. The concrete on the exterior is in good condition overall with several cracks on the sidewall. The cracking consists of mostly horizontal hairline cracks with efflorescence and rust staining present. There were no spalls noted on the exterior. The concrete on the tank exterior has no coating.
3. The interior roof cap coating is a coal tar epoxy system that is in fair condition with numerous failures. Primary method of deterioration are spot coating failures and delamination.
4. The concrete on the interior is in good condition overall with a few spalls on the lower sidewall.
5. The interior coating on the concrete is a polyurea system that is in fair condition. The primary reason for coating failures is delamination to concrete.
6. One exterior sample was taken and analyzed for heavy metal content. Test results indicated the exterior is a lead and chrome bearing coating.

RECOMMENDATIONS:

1. Complete the recommended work in 1-2 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 process when coating repairs are made.
2. A crane is recommended for removal of the roof cap during the blasting and painting, the sides of the exterior roof cap are not accessible. The crane would be used to install the roof cap after work has been completed. The estimated cost is \$20,000.
3. Clean out cracks on the exterior by routing to a u-shape and fill with a mortar repair system. The estimated cost is \$3,000.
4. Remove the spalling concrete on the interior by cutting around the failures and repair with a mortar repair system. The estimated cost is \$2,000.

5. Water dampen abrasive blast clean the exterior steel roof cap to a commercial (SSPC-SP6) condition and apply a urethane system. The estimated cost is \$20,000.
6. Abrasive blast clean the wet interior steel roof cap to a near white metal (SSPC-SP10) condition and apply an epoxy system. The estimated cost is \$35,000.
7. Abrasive blast clean the wet interior concrete floor and sidewall to create a profile and apply a plural component polyurethane system. The estimated cost is \$45,000.
8. Abrasive blast clean the wet interior piping, support rods, and center cylinder to a near white (SSPC-SP10) condition, and recoat with an epoxy system. The estimated cost is \$12,000.

COST SUMMARY:

Crane Rental	\$20,000
Repair Exterior Cracks	3,000
Repair Interior Spalling	2,000
Paint Exterior Roof Cap	20,000
Paint Interior Roof Cap	35,000
Paint Interior Piping, Cylinder, Rods	12,000
Paint Interior Concrete	45,000
Subtotal	<u>\$137,000</u>
Engineering and Contingencies:	<u>30,000</u>
Total:	<u>\$167,000</u>

Note: Cost estimates have been increased 10% above our data base averages from municipally bid projects (primarily in the Midwest).

INSPECTION:

On June 22, 2016, Dixon Engineering, Inc. (DIXON) performed a preliminary maintenance inspection on the Wastewater Digester B 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 concrete and metal surfaces and appurtenances; review safety and health aspects; and make budgetary recommendations for continued maintenance of the clarifier. 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 Staff Technicians. Scheduling and arrangements for the inspection were completed through Russell Chambers.

DIGESTER INFORMATION:

The Digester B tank consists of a 30 feet. diameter concrete tank covered by floating steel roof cap. The walls of the concrete tank are approximately 19 feet. high with a slope to the center. The roof is welded steel construction with the sidewall height of 6 feet. Records indicate the structure was last coated in 1968 during original construction.

CONDITIONS AND RECOMMENDATIONS:

EXTERIOR STEEL COATING CONDITIONS:

The exterior roof cap coating system is a multiple coat enamel coating system. The coating is in poor 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 numerous coating failures found. Primary method of deterioration is spot coating failures to the substrate.

The coating was tested at 0.97 percent (9700 ppm) lead by weight, 0.071 percent (710 ppm) chromium by weight, special considerations will be needed during maintenance to avoid contamination of workers, and prevent generation of a hazardous waste.

EXTERIOR STEEL 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.

Lift the digester cover and move to a location on site where blast media can be contained and the plant can operate without interference. Remove the existing coating by water dampened abrasive blast cleaning to a commercial condition (SSPC-SP6), and apply a urethane system.

A crane is required to remove the floating roof cap from the sludge tank. Once the blasting and painting have been completed on the ground, the roof cap would be lifted back into place. The estimated cost for crane rental is \$20,000.

Since the existing coating is a heavy metal based coating, during abrasive blast cleaning procedures the waste generated may be considered hazardous waste and groundwater leachable. In addition, the airborne particulate of spent abrasive and heavy metal bearing coating may be considered a threat to public health, not only to workers, but also to pedestrians, residences, and business owners in the immediate vicinity. Special provisions in project specifications will be necessary to address hazardous waste, worker safety, and environmental concerns.

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 estimated cost to repaint is \$20,000.

WET INTERIOR STEEL COATING CONDITIONS:

The wet interior roof cap coating is a coal tar epoxy system. The coating is in fair condition with deterioration in the form of spot coating failures and delaminated topcoat. Many coating failures were found on the cap stiffeners.

WET INTERIOR STEEL 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 \$35,000.

EXTERIOR CONCRETE COATING CONDITIONS:

The exterior of the digester has no coating on the concrete.

WET INTERIOR CONCRETE COATING CONDITIONS:

The interior sidewall concrete is coated with a polyurea system. The coating is in fair condition with delamination. The coating is in fair condition on the floor with delamination.

WET INTERIOR CONCRETE COATING RECOMMENDATIONS:

Remove the mineral encrustation and sediment on the surfaces by high-pressure water cleaning. Remove the loose and deteriorated concrete on surfaces back to solid concrete by abrasive blast cleaning. Apply a plural component polyurethane coating system or polyurea system.

A plural component system has good adhesion and an exceptionally quick cure time. It is applied in one coat. Within several days of completing the cleaning and blasting, the tank can be returned to service. The estimated cost to apply the plural component urethane system is \$45,000.

EXTERIOR CONCRETE STRUCTURE CONDITIONS:

Approximately 14 feet of the exterior walls are exposed and are poured in-place. The sidewalls are in fair condition. There are several tight cracks with edges in place. The cracks are horizontal with efflorescence and rust staining present.

EXTERIOR CONCRETE STRUCTURE RECOMMENDATIONS:

Clean out cracks by routing the crack to a u-shape and fill with a mortar repair system. The estimated cost is \$3,000.

INTERIOR CONCRETE STRUCTURE:

The concrete sidewall is in good with slight spalling at the sidewall to floor connection. The floor structure is in good condition, no concrete deterioration present.

INTERIOR STRUCTURE RECOMMENDATIONS:

Remove damaged concrete by cutting around the spalled areas to sound concrete, chipping out the loose concrete and repair the spalled sidewall areas with a mortar repair system. The estimated cost is \$2,000.

PIPING AND MISCELLANEOUS METAL CONDITION:

There is piping on the interior of the tank that are connected to the sidewall and roof cap. The piping is in good condition but the coating is in fair condition with delamination.

A central cylinder is attached to the center of the interior roof cap and extends to the floor. There are support rods that are attached to the bottom of the cylinder and run to the outer edge of the roof cap. The coating is in fair condition with delamination.

PIPING AND MISCELLANEOUS METAL RECOMMENDATIONS:

Abrasive blast cleaning the interior piping, cylinder, and support rods to a near white metal (SSPC-SP10) condition and apply a cold tar epoxy coating system. The estimated cost to apply the three-coat epoxy system is \$12,000.

SITE CONDITIONS:

The digester is located at the wastewater treatment plant. The size of the site is average and is fenced with a locking gate. There is industrial development surrounding the wastewater treatment plant.

RAILING CONDITIONS:

A railing runs along the perimeter of the top of the sidewall. The railing is not coated and in good condition.

HATCH CONDITIONS:

The roof has two 24 inch diameter bolted hatch covers to the wet interior. The hatches are in good condition.

ROLLER CONDITIONS:

There are rollers assemblies attached to the upper interior sidewall. The roof cap uses these rollers to move up and down as need. The rollers are in good condition.

ANALYTICAL LABORATORY REPORT

Thursday, June 30, 2016

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CUSTOMER: Dixon Engineering
1104 3rd Ave.
Lake Odessa, MI 48849

DATE RECEIVED: Monday, June 27, 2016
PO/PROJECT #:
SUBMITTAL #: 2016-06-27-003

LAB NUMBER: AC14985

Sampled By: Lee Jamison
Job Location: Leesburg, VA Digester B
Sample Identification: 1: Leesburg, VA Digester B

Date Sampled: Wednesday, June 22, 2016
Sample Description: Paint Chips

Preparation Method: EPA 3050B-P-M (Acid Digestion for Paints)

Analysis Method: EPA 6010C-M (ICP-AES Method for Determination of Metals)

Date Analyzed: Tuesday, June 28, 2016

<u>ELEMENT</u>	<u>RESULT (by dry weight)</u>	<u>REPORTING LIMIT (RL)</u>
Arsenic	< RL	0.0050 %
Barium	0.076 %	0.013 %
Cadmium	< RL	0.00075 %
Chromium	0.071 %	0.0013 %
Lead	0.97 %	0.0025 %
Selenium	< RL	0.0050 %
Silver	< RL	0.0013 %

Method: EPA 7471B (Mercury in Solid or Semisolid Waste -- Manual Cold-Vapor Technique)

Date Analyzed: Wednesday, June 29, 2016

<u>ELEMENT</u>	<u>RESULT (by dry weight)</u>	<u>REPORTING LIMIT (RL)</u>
Mercury	0.0000033 %	0.0000025 %

Flagged Data: Sample integrity suspect upon receipt. (Not Received on Ice).
Sample results for Mercury are not recognized under the AIHA laboratory accreditation program.

CCC&L has obtained accreditation under the programs detailed on the final page of the laboratory report. The accreditations pertain only to the testing performed for the elements, and in accordance with the test methods, listed in the scope of accreditation table. Testing which is performed by CCC&L according to other test methods, or for elements which are not included in the table fall outside of the current scope of laboratory accreditation.

This report shall not be reproduced except in full, without written approval of CCC&L.

**FIELD INSPECTION REPORT
DIGESTER**

DATE: June 22, 2016

I. TANK DATA

OWNER: Leesburg, Virginia

CLIENT CODE: 45-55-01-30

STRUCTURE NAME: Digester B

LOCATION: Street: 1391 E. Market St.

City: Leesburg

State: Virginia

CLARIFIER SIZE:

Diameter: 30 feet steel/ 32 feet including concrete wall

Sidewall height: Approximately 14 feet

CONSTRUCTION:

Type of structure: Wastewater digester

Layout: Above ground attached to building

DATE CONSTRUCTED: 1968 per owner

MANUFACTURER: Door-Oliver

CONTRACT NUMBER: Unknown

COATING HISTORY	<u>INTERIOR ROOF</u>	<u>EXTERIOR ROOF</u>	<u>INTERIOR CONCRETE</u>
DATE LAST COATED	<u>Unknown</u>	<u>Unknown</u>	<u>Unknown</u>
CONTRACTOR	<u>Door-Oliver</u>	<u>Door-Oliver</u>	<u>Door-Oliver</u>
COATING SYSTEM	<u>Epoxy Poxitar</u>	<u>Enamel</u>	<u>Polyurea</u>
SURFACE PREPARATION	<u>SSPC-SP10</u>	<u>SSPC-SP6</u>	<u>Brush Blast</u>
COATING MANUFACTURER	<u>Inertol</u>	<u>Inertol</u>	<u>Inertol</u>
COATING SAMPLES	<u>No</u>	<u>Yes</u>	<u>No</u>
HEAVY METAL	<u>No</u>	<u>Yes 0.97%</u>	<u>N/A</u>

PERSONNEL: Inspector Lee Jamison, Ground person Frank Spratto

TYPE OF INSPECTION: Preliminary Maintenance

METHOD OF INSPECTION: Dry
DATE LAST INSPECTED: Unknown

II. INSPECTION DATA
SITE CONDITIONS

Fenced: Yes
Controls Location: Wastewater Treatment Plant
Site conditions: Well maintained
Neighborhood:
North: WWTP
East: WWTP
South: WWTP
West: WWTP
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 clarifier
Indications of underground leakage: No
Shrub, tree, etc. encroachment: No
Access to work area: Through building

Perimeter Railing:

Type: Aluminum
Coating condition: N/A
Metal condition: Good

STEEL STRUCTURE

Metal Roof Cap:

Metal roof cap stationary: No (floats up and down)
Diameter at the base: 30 feet
Height off the floor: 15 ½ feet at lowest position
Access hatch: Yes
Size: 36 inches (1) 24 inches (3)
Interior topcoat condition: Fair
Previous coat condition: Fair
Describe coating: Delaminating and spot coating failures to substrate
Exterior topcoat condition: Poor

STEEL STRUCTURE

Previous coat condition: Poor

Describe coating: Spot coating failures to substrate and rust bleedthrough

Dry film thickness: 8-15 mils

Metal condition: Good

Center Support:

Type: Cylinder

Diameter: 20 inches with 12 inch pipe/column in center

Height off the floor: 19 feet to roof

Topcoat condition below water line: Poor

Previous coat condition: Poor

Describe coating: Spot coating failures to substrate, rust undercutting, and blisters

Drive Shaft:

Type: Cylinder

Diameter: 1 foot

Height off the floor: N/A (floor to roof 19 feet)

Access opening: Yes

Size: 9 x 15 inches

Oil leakage from drive motor evident: Unknown

Topcoat condition below water line: Poor

Previous coat condition: Poor

Describe coating: Spot coating failures to substrate and rust undercutting

Topcoat condition above water line: Not accessible

Influent Pipe:

Penetration: Through wall (x2)

Diameter: 5 3/8 inches

Supported from walkway: Yes

Condition of supports: Good

Topcoat condition: Poor

Previous coat condition: Poor

Describe coating: Spot coating failures to substrate and rust undercutting

Metal condition: Good

STEEL STRUCTURE

Vacuum/Scum Arm:

Topcoat condition: Poor

Previous coat condition: Poor

Describe coating: Spot coating failures to substrate and rust undercutting

Metal condition: Good

Stiffener Rods:

Number: 12

Diameter: 1 ¼ inches

Connection points: Roof skirt to flange on base of column

Any loose: Yes

Number: 3

Coating condition: Poor

Metal condition: Fair

CONCRETE STRUCTURE

Exterior Sidewall:

Concrete condition: Fair

Concrete deterioration: Spalls and cracks

Cracking severity: Moderate

Crack length: 5-60 feet

Number of cracks: Approximately 30

Estimated total crack length: 200 feet (100 feet need repair)

Describe crack pattern: Most are horizontal (largest); rust stain; efflorescence; smaller cracks are vertical

Spall severity: Minor

Spall diameter: ½-1 inches

Spall depth: ¼ inch

Number of spalls: Approximately 6

Describe spall pattern: Along larger cracks (horizontal)

Wires, mesh or rebar visible: No

Coating present: No

Interior Sidewall:

Concrete condition: Good

Concrete deterioration: None visible

Spall severity: Moderate

Spall diameter: 1-15 inches

STEEL STRUCTURE

Spall depth: ½ inch

Number of spalls: 10

Describe spall pattern: All spalling/deterioration is at base of wall

Wires, mesh or rebar visible: No

Coating present: Yes

Topcoat condition: Poor

Previous coat condition: Poor

Describe coating: Brittle black 3/16 inch thick is cracking and delamination from concrete; blisters with liquid

Interior Floor:

Concrete condition: Good

Concrete deterioration: None

Coating present: Yes

Topcoat condition: Poor

Previous coat condition: Poor

Describe coating: Majority of coating is worn away

Interior floor comments: Slopes to center column

Sludge Pit:

N/A

Sludge pit comments: Under water if there is one

Outer Trough:

N/A

ROOF:

Roof material: Steel

Spray insulation: No

Coating: Yes

Topcoat condition: Poor (interior)

Previous coat condition: Poor

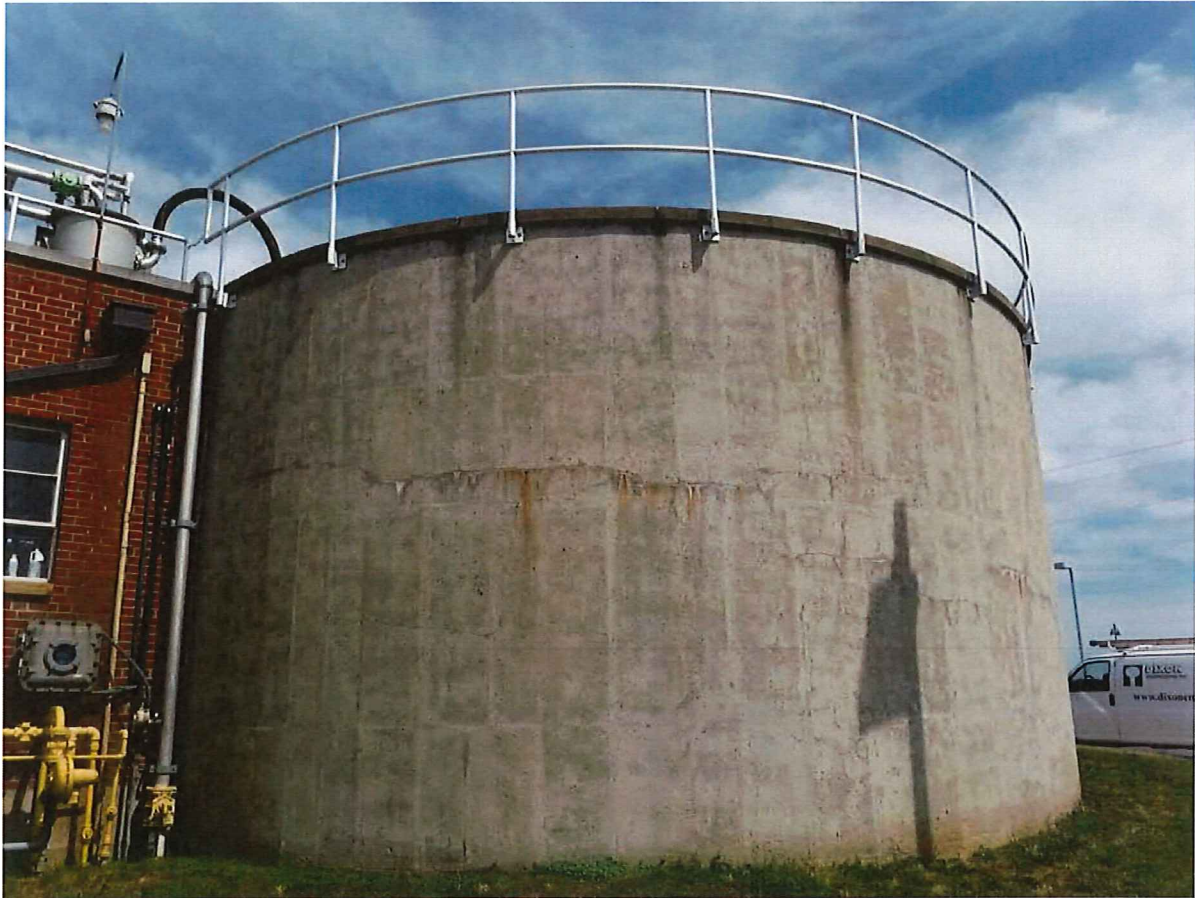
Describe coating: Delaminating and rust undercutting

Ventilation: No

Fan: No

Louvers: No

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.

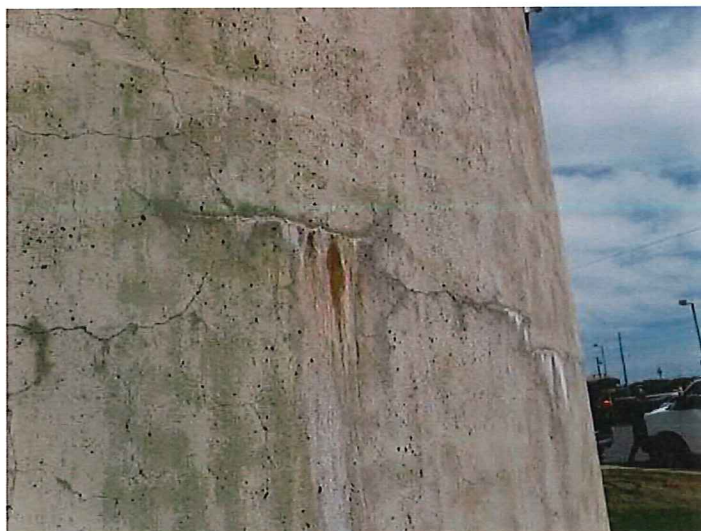


Digester B located at the WWTP and owned by Leesburg, Virginia.



1) Horizontal cracking on the sidewall.

2) Same.



3) Same.



4) Efflorescence and rust staining at cracking.

5) Same.

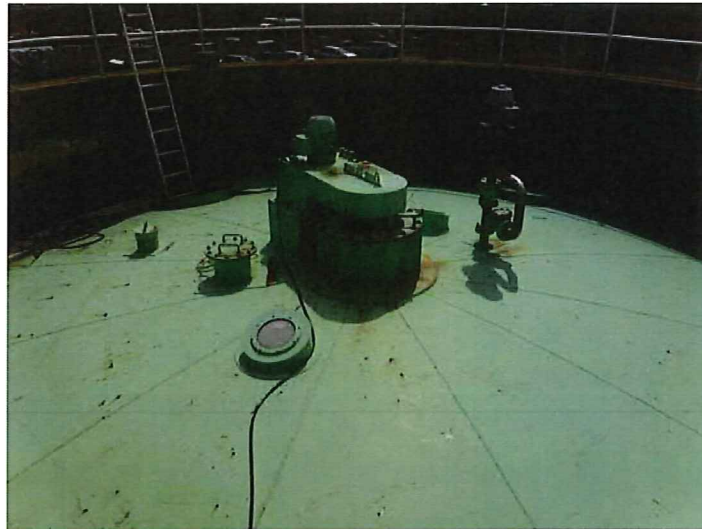


6) Cracking is tight.



7) Outside of floating roof cap.

8) Spot coating failures with rusting.



9) Same.



10) Same.

11) Bolted roof hatch.

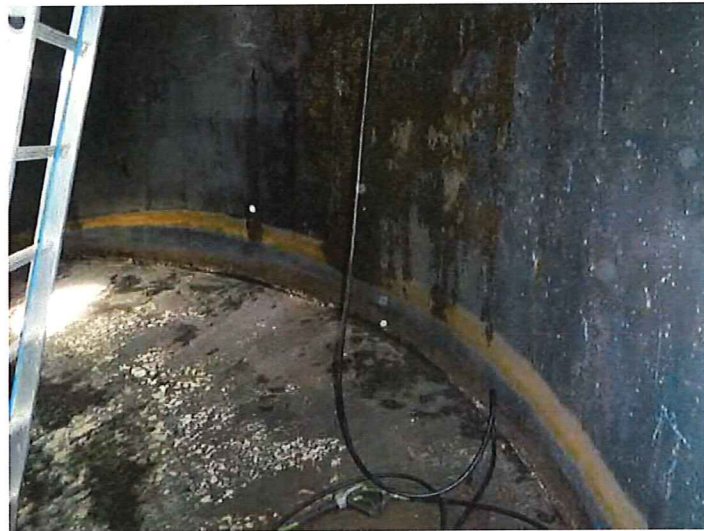


12) Roof cap is on a roller assembly attached to interior of sidewall.



13) Interior cylinder with support rods.

14) Coating is in fair condition on the floor and sidewall.



15) Roof cap with stiffeners.



16) Piping mounted on sidewall.

17) Interior piping coating is in fair condition.



18) Same.



19) Sidewall coating around piping.

20) Sidewall coating with delamination.



21) Same.



22) Same.



23) Same.



24) Same.



25) Coating is brittle.

26) Minor concrete spalling at bottom of sidewall.

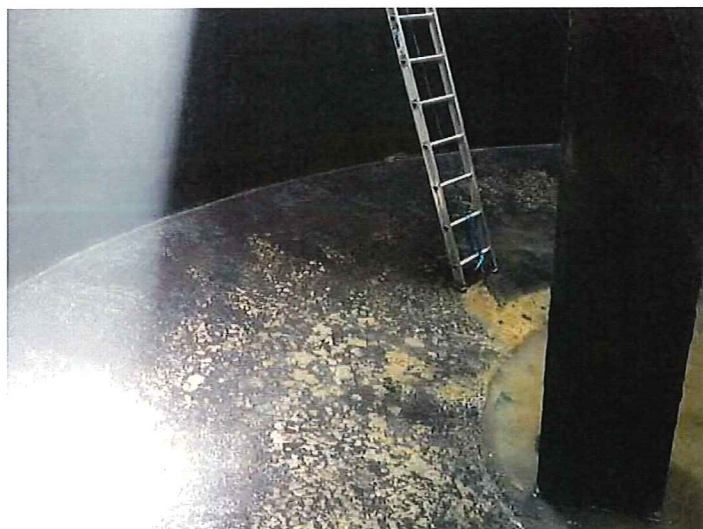


27) Same.



28) Interior cap with support structure.

29) Same.

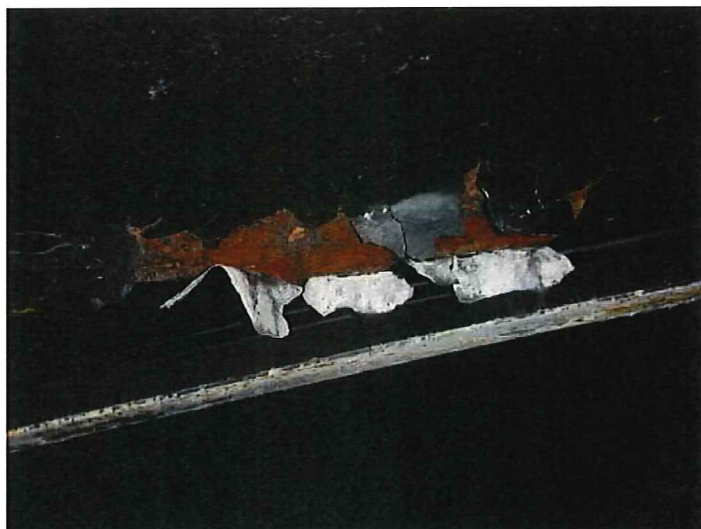


30) Floor coating with delamination.



31) Same.

32) Interior roof cap with coating failures.



33) Same.