Dixon Engineering, Inc.

Maintenance Inspection

353,500 Gallon Reservoir

Ashtabula County Environmental Service
Ashtabula, Ohio

Inspection Performed: October 26, 2022
Reviewed by: Joseph T. Hoban, P.E.: December 14, 2022

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CONCLUSIONS:

1. The exterior coating is a urethane system. The coating is in poor condition overall. Coating deterioration includes spot failures to the substrate with rust undercutting. There are coating failures throughout.

2. The wet interior coating is presumed to be an epoxy system. The coating is in poor condition overall. Below the high-water level coating deterioration includes spot failures to the substrate with rust undercutting on the floor and sidewall. Above the high-water level coating is deteriorating at the welded lap seams, at the gap between the roof stiffeners and roof plates, and on the roof stiffeners.

RECOMMENDATIONS (GENERAL):

Annually inspect the roof vent, hatches, and any other health or security items on the structure. The work could be performed by in-house personnel or contracted as part of a regular maintenance program.

Schedule regular cleanings and inspections of the tank by an independent third party once every five years as recommended by AWWA.

RECOMMENDATIONS (WITH THE NEXT PAINT PROJECT):

Complete the recommended work in one to two years. The repairs and upgrades should be completed during the next major tank rehabilitation project when coating repairs are made.

1. Abrasive blast clean the exterior inside a dust tight containment system and repaint with a urethane system. The estimated cost is $180,000 plus $100,000 for containment.

2. Abrasive blast clean the entire wet interior and repaint with an epoxy system. The estimated cost is $220,000.

3. Install clips and a pressure fitting for future installation of a submerged cathodic protection system. The estimated cost is $3,000.

4. Coat the foundation to help prevent deterioration. The cost would be incidental to exterior painting.

5. Repair areas of missing or damaged grout between the steel baseplate and the concrete foundation. The estimated cost is $1,000.

6. Install handrail sections at the edge of the roof on both sides of the sidewall ladder. The estimated cost is $5,000.

7. Install rigging couplings on the roof for temporary fall prevention of workers in the wet interior. The cost would be incidental to the next painting project.

8. Repair the damaged section of the overflow pipe. The estimated cost is $2,000.

9. Install a 30 inch diameter sidewall manway. The estimated cost is $10,000.

10. Replace the flow through roof vent with a pressure vacuum. The estimated cost is $6,000.

11. Install a vandal guard on the exterior ladder. The estimated cost is $2,000.

12. As a contingency, budget to replace the corroded roof stiffeners. The estimated cost is $30,000.

13. As a contingency, budget to eeld the roof stiffener connections at the sidewall. The estimated cost is $8,000.

COST SUMMARY:

Exterior repaint with containment	$280,000
Wet interior repaint	220,000
Cathodic clips and pressure fitting	3,000
Grout repair	1,000
Roof handrail sections	5,000
Overflow pipe repair	2,000
30 inch sidewall manway	10,000
Pressure vacuum roof vent	6,000
Vandal guard	2,000
Roof stiffener replacement contingency	30,000
Roof stiffener welds	8,000
Sub Total	$567,000
Engineering and Contingencies	$87,000
Total	$654,000

Note: Exterior coating is primarily for aesthetics and can be delayed since the next paint job cannot be an overcoat. While the appearance will deteriorate the structural integrity should not be impacted.

INSPECTION:

On October 26, 2022, Dixon Engineering Inc. performed a maintenance inspection on the 353,500 gallon water storage reservoir owned by the Ashtabula County Environmental Service located in Ashtabula, Ohio. 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 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 Jesse Darnell, Engineering Technician. The inspector was assisted by Austin Willette, Staff Technician. Photos are included with this report.

GENERAL INFORMATION:

The tank was built in 1994 by Caldwell with a height to high-water level of 22 feet and a diameter of 52 feet.

CONDITIONS AND RECOMMENDATIONS:

EXTERIOR COATING CONDITIONS:

It is not known when the exterior was last painted. A coating sample was taken and sent to Tnemec Paint Company for lab analysis. Lab results indicate that the exterior coating is a urethane.

The coating is in poor condition overall. The coating 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.

The sidewall coating is in poor condition with failures. Primary method of deterioration is spot failures to the substrate with rust undercutting. The sidewall is covered with heavy mildew growth.

The roof coating is in poor condition with failures. Primary method of deterioration is spot failures to the substrate.

EXTERIOR COATING RECOMMENDATIONS:

Budget for total exterior coating removal and repainting in approximately one to two years or when aesthetics dictate. 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 urethane system. All blast work would be performed inside a dust tight containment system using negative air pressure.

Total removal is recommended because the coating failures are extensive and it is not practical to attempt to spot repair all failed areas.

The coating system would consist of a full prime coat on the bare metal, a full coat of epoxy, and followed by two full coats of urethane. The urethane system offers excellent abrasion resistance with high gloss and sheen retention. The expected life of this system is fifteen years. The system can be overcoated in fifteen years, and a second time approximately fifteen years after the first overcoat, extending the total life of the coating to approximately forty-five years before total removal would be necessary. The tank would be removed from service during the coating project. This is necessary to reduce condensation on the tank's surface. Urethane 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 is $180,000 plus $100,000 for containment.

WET INTERIOR COATING CONDITIONS:

It is not known when the wet interior was last painted. The coating is presumed to be an epoxy system based on the color and condition. Determining exact coating type is not essential because spot repair is not typically recommended and overcoating in the wet interior is never recommended.

The roof coating is in poor condition with numerous failures. Primary methods of deterioration are spot failures to the substrate with rust undercutting and delaminated topcoat. There are minor coating failures on the roof panels but most of deterioration is along the welded lap seams, at the gap between the roof stiffeners and roof plate, and on the stiffeners. The roof contains welded lap seams that have started to rust and streak. Rusting is typical for a roof where the lap seams are open and not seal welded. The presence of rust in the lap seams is not a concern but should be monitored during future inspections for additional corrosion growth. Corrosion on the roof stiffeners is typical but should be corrected before structural loss of steel occurs.

The sidewall and floor coating are in poor condition with numerous failures. Primary method of deterioration is spot failures to the substrate with rust undercutting. There is no significant coating damage at the high-water level which would be the area most affected by ice movement.

The surfaces below the normal operating water level are covered with mineral staining which does not affect the integrity of the coating system.

WET INTERIOR COATING RECOMMENDATIONS:

Budget to repaint the wet interior in one to two years. Abrasive blast clean the entire wet interior to a near-white metal (SSPC-SP10) condition. Wet interior coating systems must be approved for potable water storage tanks contingent upon meeting requirements of NSF/ANSI 61.

Apply a three-coat epoxy system to the prepared surfaces. Epoxy coating systems are recommended in most applications because they have good adhesion and abrasion resistant qualities. The estimated cost is $220,000.

CATHODIC PROTECTION CONDITIONS:

There is no cathodic protection system in the wet interior.

CATHODIC PROTECTION RECOMMENDATIONS:

Install cathodic clips and a pressure fitting for future installation of floating type cathodic protection system. The estimated cost is $3,000.

PIT PIPING CONDITIONS:

There is a pit adjacent to the tank that contains piping and valves. The pit has a metal hatch that is in good condition. The piping is in good condition. The coating on the piping is in good condition with no significant coating deterioration.

FOUNDATION CONDITIONS:

The exposed concrete foundation is in good condition with no significant deterioration. The foundation is not coated.

FOUNDATION RECOMMENDATIONS:

Coat the exposed concrete with an epoxy coating system to help prevent deterioration. The cost would be incidental to exterior painting.

GROUT CONDITIONS:

The grout between the steel baseplate and the concrete foundation is in fair condition with approximately 20 total lineal feet missing.

GROUT RECOMMENDATIONS:

The purpose of the grout is to evenly distribute the load onto the foundation and to prevent water from getting between the foundation and the tank. Repair areas of missing or damaged grout between the steel baseplate and the concrete foundation. The estimated cost is $1,000.

ROOF HANDRAIL AND ROOF RIGGING CONDITIONS:

The tank does not have a roof handrail sections at the edge of the roof by the top of the sidewall ladder.

There are no roof rigging couplings for safety and staging lines during wet interior coating work.

ROOF HANDRAIL AND ROOF RIGGING RECOMMENDATIONS:

Install handrail sections at the edge of the roof on both sides of the sidewall ladder. The railing will allow someone working near the edge of the roof to be tied off and secure. The estimated cost is $5,000.

Install rigging couplings on the roof for fall prevention of workers in the wet interior. The cost would be incidental to the next painting project.

OVERFLOW PIPE CONDITIONS:

The overflow pipe exits the upper sidewall, extends down along the exterior, and routes below grade. There is a repair clamp the pipe.

OVERFLOW PIPE RECOMMENDATIONS:

Repair the damaged section of the overflow pipe. The estimated cost is $2,000.

HATCH AND MANWAY CONDITIONS:

The roof hatch to the wet interior is in good condition. The hinged cover is in good condition. The hatch was secured with a padlock.

There are two 24 inch diameter manways in the sidewall that are in good condition. There are two 12 x 16 inch manways in the sidewall that are in fair condition. The manway gaskets showed no signs of leakage and the bolts are in good condition.

HATCH AND MANWAY RECOMMENDATIONS:

Install a 30 inch manway in the sidewall. Average rescue baskets will not pass through the existing manway. The estimated cost is $10,000.

VENT CONDITIONS:

The roof vent is a flow-through design that is in fair condition. The screens are in good condition. The vent is hinged and it can be used to access the wet interior.

VENT RECOMMENDATIONS:

Replace the roof vent with a screened pressure vacuum vent. The new vent would have a movable plate that would allow air to flow in and out of the tank even if the screens become plugged or frosted over. The vent would have a rain shield to prevent rainwater from entering the storage tank during high winds. The estimated cost is $6,000.

LADDER CONDITIONS:

There is no ladder in the wet interior.

LADDER RECOMMENDATIONS:

Install a step-off platform at the top of the sidewall. The platform would have a handrail that would extend around the roof hatch. The step-off platform and railing will provide a safer working area at the roof hatch. The estimated cost is $10,000.

Install a vandal guard on the ladder. The estimated cost is $2,000.

FILL AND DRAW PIPE CONDITIONS:

The fill pipe routes along the sidewall and discharges approximately 8 feet above the floor. The draw pipe was not visible for inspection.

WET INTERIOR METAL CONDITIONS:

The steel structure is in fair condition overall. The interior roof is supported by radial stiffeners that are in fair condition with moderate corrosion in the crevices and at the edges. The connections at the sidewall are welded and are in fair condition. The connections at the center support are welded and are in fair condition.

There is a single column in the center of the tank that supports the inner roof stiffeners.

WET INTERIOR METAL RECOMMENDATIONS:

As a contingency, budget to replace the corroded roof stiffeners. Extent of the stiffener deterioration cannot be determined until they are abrasive blast cleaned. The estimated cost is $30,000.

As a contingency, budget to weld the roof stiffener connections at the sidewall. The estimated cost is $8,000.

DIXON ENGINEERING, INC.

STEEL TANK FIELD INSPECTION REPORT

RESERVOIR TANK

DATE: **October 26, 2022**

OWNER: **Ashtabula County Environmental Service**
CLIENT CODE: **25-04-10-30**
LOCATION: Cross Streets: **2501 State Road**
City: **Ashtabula**
State: **Ohio**
TANK SIZE: Capacity: **353,500 gallons**
Diameter: **52 feet (nameplate)**
Overflow (HWL): **22 feet (nameplate)**
CONSTRUCTION: **Welded**
Type: **Reservoir**
Type of roof: **Flat**
YEAR CONSTRUCTED: **1994**
MANUFACTURER: **Caldwell**
CONTRACT NUMBER: **E3647**
USE: **Non-potable water and fire protection**
Exterior coating sample taken for type: **Yes**
Coating information below is from: **Exterior coating sample taken for type**

COATING HISTORY	EXTERIOR	WET INTERIOR
YEAR COATED	**Unknown**	**Unknown**
CONTRACTOR	**Unknown**	**Unknown**
SYSTEM	**Urethane**	**Presumed epoxy**
SURFACE PREPARATION	**Unknown**	**Unknown**
HEAVY METAL COATING SAMPLES	**No**	**No**
HEAVY METAL BEARING	**No**	**No**

PERSONNEL: Lead inspector **Jesse Darnell**, Crew member **Austin Willette**
METHOD OF INSPECTION: **Dry**

SITE CONDITIONS

Fenced: **Yes**
Site large enough for contractor's equipment: **Yes**
Control building: **Yes**
Antenna control site: **No**
Power lines within 50 feet: **No**
Site drainage: **Away from the tank**
Indications of underground leakage: **No**
Shrub, tree, etc. encroachment: **No**

EXPOSED PIPING:

Location: **Adjacent to the tank (in a pit)**
Condition of structure: **Good**
Structure is: **Dry**
Pump present: **No**
Drain line present: **Yes**
Hatch condition: **Good**
Locked: **Yes**
Pipe coating condition: **Good**
Describe coating: **No significant coating deterioration**
Condition of metal: **Good**
Piping comments: **Not for the tank. Potable water in the building. Pit piping is for non-potable water**

FOUNDATION

Foundation exposed: **Yes**
Exposed height: **0-5 inches**
Exposed foundation condition: **Good**
Damage or deterioration: **No**
Foundation coated: **No**
Type of baseplate gap filler: **Grout**
Condition: **Fair**
Amount missing: **20 feet**
Undermining of foundation: **Yes**

EXTERIOR COATING

Sidewall:

Lettering: **No**
Logo: **No**
Topcoat condition: **Poor**
Previous coat/system condition: **Fair**

EXTERIOR COATING

Describe coating: **Spot coating failures to substrate, rust undercutting**
Dry film thickness: **12-15 mils**
Adhesion: **2A**
Reason not taken: **Wet**
Metal condition: **Good**
Sidewall comments: **X-cut for the adhesion test was wet, but still removed coating. Approximately fifty spot coating failures with rust undercutting**

Roof:

Topcoat condition: **Poor**
Previous coat/system condition: **Fair**
Describe coating: **Fading, spot coating failures to substrate**
Dry film thickness: **13-15 mils**
Adhesion: **Not taken**
Reason not taken: **Wet**
Metal condition: **Good**
Roof comments: **Heavy mildew. Approximately fifty spot coating failures. There is traction paint between the hatch and the roof vent**

EXTERIOR APPURTENANCES

Sidewall Manway (x2):

Size: **24 inches**
Cover attachment: **Davit arm and bolts**
Metal condition: **Good**

Sidewall Manway (x2):

Size: **16 x 12 inches**
Cover attachment: **Bolts**
Metal condition: **Fair**

Anchor Bolts:

N/A

Overflow Pipe:

Diameter: **4.5 inches**
Metal condition: **Good**
Discharge orientation: **Vertical**
Air gap: **No**
Height to sidewall: **22 feet**

EXTERIOR APPURTENANCES

Overflow discharges to: **Routes underground**

Condition: **Good**

Overflow comments: **There is a repair clamp 5 feet above the ground**

Sidewall Ladder:

Height to start of ladder: **8 feet**
Toe clearance: **Less than 7 inches**
Width of rungs: **16+ inches**
Thickness of rungs: **¾ inch**
Shape of rungs: **Round**
Metal condition: **Good**
Fall prevention device: **Yes**

Type: **Cable**

Function properly: **Yes**

Cage: **Yes**

Dimensions: **28 x 30 inches**

Vandal guard: **No**

Step-off Platform:

N/A

Roof Handrail:

N/A

Painter's Rail:

N/A

Roof Rigging Points:

N/A

Wet Interior Roof Hatch:

Neck size: **24 inches**
Distance from center of the tank (to outer edge): **25 feet**
Shape: **Round**
Handhold at opening: **No**
Curb height: **4 inches**
Cover overlap: **2 inches**
Gasket on cover/neck curb: **No (Dixon tried to install a gasket but the cover would not close with a gasket on)**
Hatch security: **Lock**
Metal condition: **Good**

EXTERIOR APPURTENANCES

Hatch comments: **Installed a lock after the inspection**

Bolted Ventilation Hatch:

N/A

Roof Vent:

Number: **1**
Distance from center of the tank (to outer edge): **0 feet**
Type: **Flow-through**
Neck diameter: **24 inches**
Flange opening diameter: **24 inches**
Interior screen condition: **Good**
Mesh size: **2 and 16**
Rain shield: **Yes**
Height of the lowest opening above the roof: **11 inches**
Metal condition: **Good**
Roof comments: **The vent is hinged and it can be used to access the wet interior**

Antennas:

N/A

Electrical Conduit:

N/A

WET INTERIOR COATING

Roof:

Topcoat condition: **Poor**
Primer coating condition: **Fair**
Describe coating: **Delaminating, spot coating failures to substrate, rust undercutting**
Metal condition: **Good**
Lap seams: **Welded**
Condition of lap seams: **Poor**
Roof comments: **Coating failures all have rust undercutting**

Sidewall:

Topcoat condition: **Poor**
Primer coating condition: **Fair**
Describe coating: **Spot coating failures to substrate, rust undercutting**

WET INTERIOR COATING

Mineral deposits: **Light**
Metal condition: **Good**
Sidewall comments: **Approximately 100 spot coating failures with rust undercutting**

Floor:

Topcoat condition: **Poor**
Primer coating condition: **Fair**
Describe coating: **Spot coating failures to substrate, rust undercutting**
Mineral deposits: **Moderate**
Metal condition: **Good**
Bottom comments: **Spot coating failures throughout**

WET INTERIOR APPURTENANCES

Ladder:

N/A

Cathodic Protection:

N/A

Roof Stiffeners:

Orientation: **Radial**
Center support design: **Cage**
Stiffener connection at center support: **Welded**
Connection condition: **Fair**
Radial Stiffener shape: **Angle**
Dimensions: **8 x 2 inches (measured)**
Stiffener condition: **Fair**
Connection at support ring: **Welded**
Connection condition: **Fair**
Coating condition: **Fair**
Metal condition: **Fair**

Sidewall Stiffener:

N/A

Columns:

Center column shape: **Round**
Dimensions: **12 inches (estimated)**

WET INTERIOR APPURTENANCES

Overflow Pipe Inlet:

Type: **Weir box**
Metal condition: **Good**

Fill Pipe:

Diameter: **12 inches (estimated)**
Height above floor: **8 feet (estimated)**
Configuration: **Routes up the wall**
Deflector on end: **No**
Metal condition: **Good**

Separate Draw Pipe:

Draw pipe comments: **Not visible**

Drain Pipe:

N/A

Sump:

N/A

Mixer:

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.

1) 353,500 gallon water storage reservoir owned by the Ashtabula County Environmental Service.

2) The concrete foundation is in good condition with no significant deterioration.

3) Same.

4) There is missing grout between the steel baseplate and concrete foundation.

5) The four sidewall manways are in good condition. The coating on the manways is in poor condition.

6) Same.

7) Same.

8) Same.

9) The overflow pipe routes along the exterior sidewall and extends below grade.

10) There is a repair clamp on the overflow pipe.

11) There are coating failures on the overflow pipe support brackets.

12) There are coating failures on the sidewall.

13) Same.

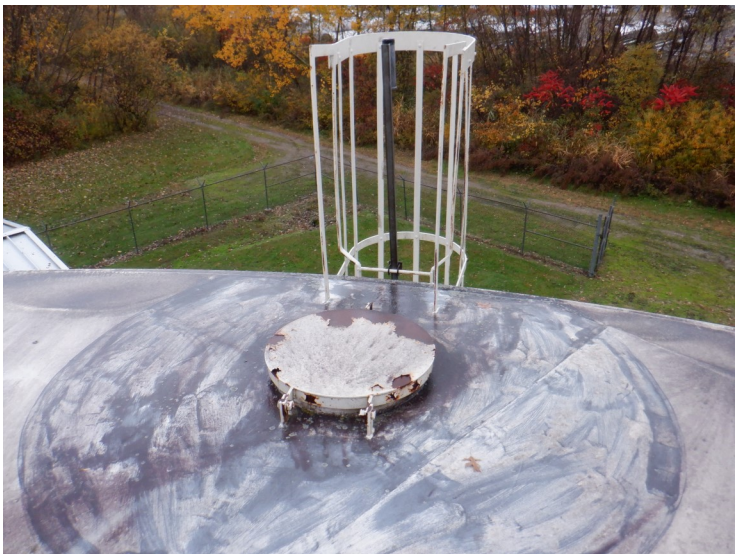
14) Same.

15) There is heavy mildew growth on the sidewall.

16) Same.

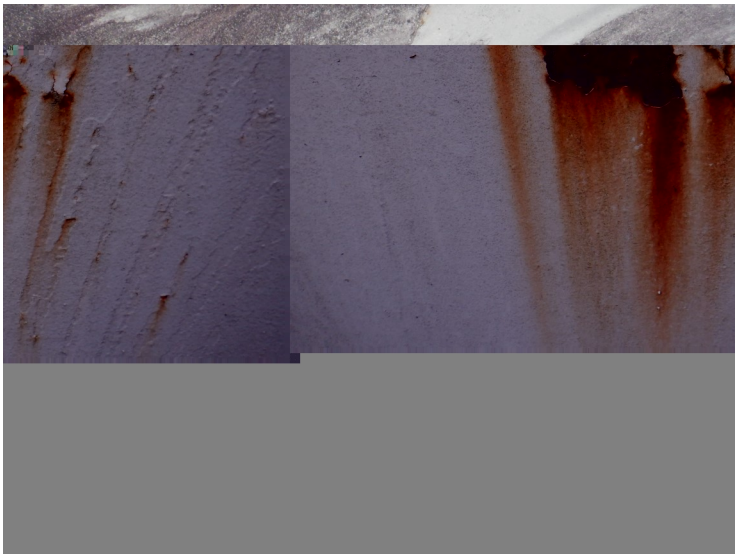
17) There is no vandal guard on the sidewall ladder.

18) The sidewall ladder is in good condition. The ladder is equipped with a cage and a fall prevention device.



19) There are no handrails at the edge of the roof by the sidewall ladder.

20) The roof hatch is in good condition. The hatch coating is in poor condition.



21) The are coating failures on the roof.

28) There are coating failures and corrosion on the wet interior roof.

29) Same.

30) Same.

31) Same.

32) Same.

33) There are coating failures with rust undercutting on the wet interior sidewall.

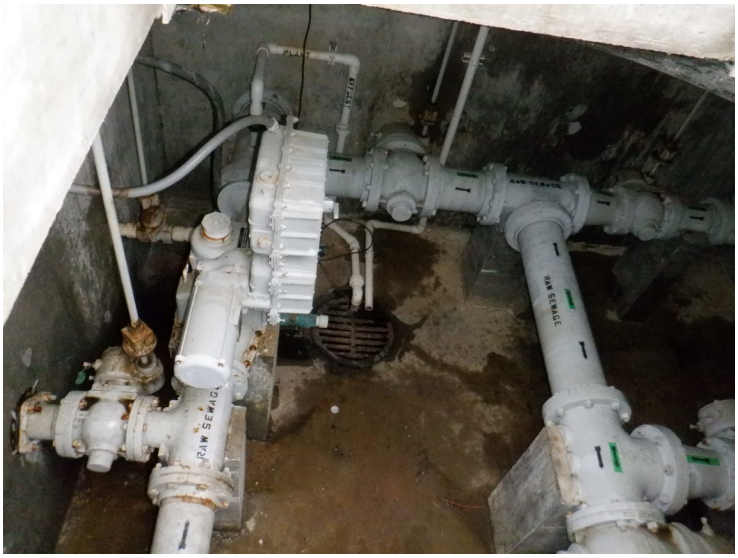
34) There are coating failures on the sidewall and floor.

35) Same.

36) The center column appears to be in good condition.

37) The metal hatch to the pit is in good condition.

38) There is no significant coating deterioration on the pit piping.



39) Same.