

# **Dixon Engineering, Inc.**

Preliminary Maintenance Inspection  
1,500,000 Gallon Hydropillar  
(Boyd Orchard)

Martinsburg, West Virginia

Inspection Performed: September 19, 2019  
Reviewed by Joseph T. Hoban, P.E.: February 24, 2020

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## **CONCLUSIONS:**

1. The exterior coating is a urethane system that is in fair condition overall. Coating deterioration includes spot failures to the substrate with rust undercutting and erosion. There are numerous small coating failures throughout.
2. The dry interior coating is presumed to be an epoxy system. The coating is in fair condition overall. Coating deterioration includes numerous spot failures to the substrate with rust undercutting and rust bleedthrough. Most of the failures are on the baseplate, topside of the platform, on the bowl, and in the access tube.
3. The wet interior coating is presumed to be an epoxy system. The coating is in fair condition overall. Below the high-water level coating deterioration includes spot failures to the substrate on the access tube and sidewall. Above the high-water level coating is deteriorating at the roof panels, the manway and coupling penetrations, and throughout the roof stiffeners.

## **RECOMMENDATIONS:**

Complete the recommended work in one to two 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 repairs are made.

1. High pressure water clean and overcoat the exterior with a urethane system. The estimated cost is \$200,000.
2. Spot abrasive blast clean the baseplate, the topside of the platform, the entire access tube, the entire bowl, and other spot coating failures in the dry interior. Spot repaint all prepared surfaces with an epoxy coating system. The estimated cost is \$30,000.
3. Abrasive blast clean the entire wet interior and repaint with an epoxy system. The estimated cost is \$330,000.
4. Install clips and a pressure fitting for future installation of a submerged cathodic protection system. The estimated cost is \$2,000.
5. Coat the foundation to help prevent deterioration. The cost would be incidental to exterior painting.
6. Install a handrail and a painter's railing on the roof. The estimated cost is \$25,000.

7. Install additional rigging couplings on the roof for temporary fall prevention of workers in the wet interior. The cost would be incidental to the coating project.
8. Replace the light bulbs in the dry interior and aviation light. The work should be part of a regular maintenance and security program.
9. Seal the electrical conduit pipe penetration and adjacent empty pipe in the base of the column with silicone caulk. The cost would be incidental to exterior painting.
10. Remove the existing tripods and relocate all roof antennas and equipment to the new roof handrail. The cost would be incidental to roof handrail installation.
11. Modify the overflow to discharge with an air gap and install flap gate with a concrete catch basin. The estimated cost is \$8,000.
12. Install a handhold at the wet interior roof hatch, at the access tube roof hatch, and above the painter's (bird) hatch to assist entering and exiting the openings. The cost would be incidental to the next painting project.
13. Annually inspect the roof vent. The work should be performed by in-house personnel as part of a regular maintenance program.
14. Install a cable fall prevention device on the column ladders. The estimated cost is \$2,000.
15. Install a mud valve in the bowl with an access ladder. The estimated cost is \$6,000.
16. Install a check valve on the condensate drain line and route the discharge into the overflow pipe. The estimated cost is \$2,000.

## **A DISCUSSION ON RESCUE AND RETRIEVAL OPERATIONS FROM ELEVATED PEDESTAL STORAGE TANKS**

A series of accidents involving falls from or in water tanks has highlighted inadequacies in water tower design and a potentially greater problem. The rescue may be more dangerous, with potential for more loss of life or injury, than the original accident. Contractors and engineers are responsible for their own employees, but even with safety training and proper equipment, accidents can occur. Most rescue squads are local or neighboring fire departments, with some departments having more experience than others. Water storage tanks are designed to store water and are not suited for rescue or retrieval convenience. This discussion is offered as a starting point. We recommend that you meet with your rescue personnel and draft a rescue plan. A copy of the plan should be kept at the tank and with the rescue crew.

OSHA may soon require 30 inch manways and hatches with fall prevention on all ladders. DIXON has always objected to replacement of ladders especially on retrofit of existing tanks as new regulations are passed on a relatively frequent basis. We recommend the changes for the convenience and safety of your employees, rescue personnel, and others working on the structure. As far as we know, none of these conversion items recommended are required or mandated by any government agency for retrofits.

DIXON recommends these changes be made during the next major tank coating project.

### RETRIEVAL FROM WET INTERIOR:

#### Current Access:

The roof is accessed from dry interior ladders located in the column and access tube. There is a ladder in the wet interior from the roof hatch to the bowl. The base column ladder is not equipped with a fall prevention device. There is a 24 inch manway in the bowl for access into the bottom of the wet interior. There is a 30 inch roof hatch to the dry interior and a 30 inch roof hatch to the wet interior. There is no handrail on the exterior roof.

There is a full platform under the bowl which also acts as a condensate ceiling that is approximately 20 feet above the ground in the dry interior. Ladder opening in the platform is 30 inch diameter.

### Rescue Procedure:

1. It is not practical to install a 30 inch manway in the bottom of the tank or in the access tube. Retrieval must be through the roof hatch or roof vent opening by use of a winch and tripod. Rescue personnel would gain access to the roof using the existing ladders equipped with fall prevention devices. Rescue personnel would enter the tank through the 30 inch roof hatch or the existing bottom manway.
2. Inside the new roof handrail, the rescue crew raises the rescue basket to the roof using a tripod and a winch. Place the rescue basket on the roof while the tripod is moved over the access tube hatch.
3. Lower the rescue basket down the access tube to the top platform. From the top platform, lower the rescue basket to ground level through the 30 inch platform hatch with a pulley or winch connected to an attachment lug on the tank's bowl.

From the roof it is possible to lower the rescue basket over the side to ground level, but that would require a very large winch and increased loading on the attachment point. On a rainy, windy, or snowy day, the objective would be to get rescue personnel off the roof as soon as possible, so lowering through the dry interior is preferred. If it is not possible to lower the rescue basket down the dry interior, a helicopter rescue will be required.

### Modifications Necessary:

1. Install fall prevention devices on the column ladder.
2. Install a 42 inch handrail on the roof.

### Equipment:

Winch or pulley system and tripod  
Tag line  
Rescue basket

**COST SUMMARY:**

Exterior overcoat	\$200,000
Partial dry interior repaint	30,000
Wet interior repaint	330,000
Cathodic clips and pressure fitting	2,000
Roof handrail and painters rail	25,000
Modify overflow discharge	8,000
Column ladder fall prevention devices	2,000
Mud valve and access ladder	6,000
Condensate drain line	<u>2,000</u>
Sub Total	\$605,000
Engineering and Contingencies	<u>\$91,000</u>
Total	\$696,000

Notes: Safety improvements other than fall prevention devices are optional and can be delayed. Best price for safety improvements would be obtained by including them with exterior painting.

Cables and antennas on the roof ideally would be temporarily removed from the tank during a future painting project. Abrasive blast cleaning in the dry interior access tube would be difficult with cables remaining in place. To properly relocate the roof antennas to the new OSHA compliant handrail could require additional cable lengths. Coordination with antenna companies during a future painting project is critical.

## **INSPECTION:**

On September 19, 2019 Dixon Engineering Inc. performed a preliminary maintenance inspection on the 1,500,000 gallon fluted column (Boyd Orchard) elevated water storage tank owned by the City of Martinsburg, West 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 Josh Grover, Engineering Technician. The inspector was assisted by Paul Moore, ROV Operator, and Trevor Jessup, Staff Technician. Scheduling and arrangements for the inspection were completed through Narayan Venkatesan.

The wet interior inspection was completed with a remotely operated vehicle (ROV). Video of the inspection and still photos are included with this report. No cleaning was performed in the wet interior during the ROV inspection.

## **GENERAL INFORMATION:**

The original construction date is unknown, but an owner representative suggests it was between 2001 and 2002.

## **CONDITIONS AND RECOMMENDATIONS:**

### **EXTERIOR COATING CONDITIONS:**

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 fair 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 column, bowl, sidewall, and roof coatings are in fair condition with numerous failures throughout. Primary methods of deterioration are spot failures to the substrate with rust undercutting, and erosion. The bowl and sidewall are covered with light mildew growth. There is lettering that states "CITY OF MARTINSBURG, WV" on the sidewall in one location.

Fair adhesion was noted on the ASTM X-cut test areas with up to  $\frac{1}{16}$  inch loss of topcoat to intermediate coat. If overcoating is not performed within the next two years, additional adhesion testing should be performed.

#### **EXTERIOR COATING RECOMMENDATIONS:**

Budget for overcoating in one to two years. The typical overcoat frequency for modern urethane systems is 15 years. There is always a risk in overcoating the exterior, but we have had several successful projects when performed in the timeframe noted. The risk of poor adhesion of the overcoat system gets higher as the existing system gets older. Current adhesion showed the existing coating would support an additional coating system.

The recommended procedure is to high pressure water clean (5,000-10,000 psi) the exterior to remove any poorly adhered coating and any contaminants. Coating failures to the substrate would be spot power tool cleaned to bare metal (SSPC-SP11) condition. All sharp edges would be feathered into the surrounding coating.

The coating system would consist of a spot prime coat on the bare metal, a full coat of epoxy, 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 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 \$200,000.

#### **DRY INTERIOR COATING CONDITIONS:**

The dry interior on this structure is defined as the non-water contact surfaces, consisting of the column, platform, bowl, and access tube.

The coating is presumed to be an epoxy system based on the appearance. Determining exact coating type is not essential because we do not recommend overcoating in the dry interior. The coating is in fair condition overall.

The column coating is in good condition with only a few failures noted. Primary method of deterioration is spot failures to the substrate. Most of the failures are on the baseplate.



The coating on the topside of the condensate platform, the bowl, and the access tube is in poor condition with numerous failures throughout. Primary methods of deterioration are spot failures to the substrate with rust undercutting and rust bleedthrough.

**DRY INTERIOR COATING RECOMMENDATIONS:**

Spot abrasive blast clean the dry interior to a commercial (SSPC-SP6) condition including the topside of the platform, the entire access tube, the entire bowl, the entire baseplate, and other areas of failed coating. The prepared surfaces would be coated with an epoxy system. The estimated cost is \$30,000.

**WET INTERIOR COATING CONDITIONS:**

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 is the wet interior is never recommended.

The roof coating is in fair condition with numerous failures. Primary methods of deterioration are spot failures to the substrate with rust undercutting and rust bleed through. The failures on the panels are minor, most of the deterioration is on the roof stiffeners and at the roof coupling and manway penetrations. Some corrosion on the roof stiffeners is typical but should be corrected before structural loss of steel occurs.

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

The bowl and access tube coatings are in good condition with only a few failures. Primary method of deterioration is spot failures to the substrate. There is no significant damage at the high-water level.

The bowl was covered with less than two inches of sediment that limited the amount of surfaces visible with the ROV. The sediment was light in color and the owner's representative suggested it was likely due to the high calcium content in the water.

**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 \$330,000.

**CATHODIC PROTECTION CONDITIONS:**

There is no cathodic protection system in the wet interior. The tank does not have attachment clips or a pressure fitting installed for a future cathodic protection installation.

**CATHODIC PROTECTION RECOMMENDATIONS:**

Install cathodic clips and a pressure fitting for future installation of floating type cathodic protection system. The estimated cost is \$2,000.

**PIT PIPING CONDITIONS:**

There are valves and piping above the floor in the column. The piping is in good condition, but the coating is fair to poor with general surface corrosion throughout.

**PIT PIPING RECOMMENDATIONS:**

Abrasive blast clean the piping to a commercial (SSPC-SP6) condition and repaint with an epoxy system. The cost would be incidental to the dry interior partial repaint.

**SITE CONDITIONS:**

The tank is located on a large fenced site adjacent to a school.

**FOUNDATION AND ANCHOR BOLT CONDITIONS:**

The top 6 to 16 inches of the foundation is exposed. The exposed concrete foundation is in good condition.

There are twenty-five anchor bolts evenly spaced on the baseplate around the column in the dry interior. The anchor bolts are in good condition but the coating is fair with minor corrosion on the nuts and bolts.

**FOUNDATION AND ANCHOR BOLT 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 baseplate and the foundation is in good condition with none damaged or missing.

**ROOF HANDRAIL, PAINTER'S RAILING, AND ROOF RIGGING CONDITIONS:**

The tank does not have a roof handrail or a painter's railing.

There are not enough roof rigging couplings for safety and staging lines during wet interior coating work.

**ROOF HANDRAIL, PAINTER'S RAILING, AND ROOF RIGGING RECOMMENDATIONS:**

Install an OSHA compliant railing on the roof. The railing would allow tie off locations during routine vent screen inspections, aviation light inspections, and would provide a safe work area for retrieval personnel performing a roof extraction. Install a painter's railing outside the railing. Remove the antenna mounting tripods and relocate the antennas and equipment to the new roof handrail. The estimated cost is \$25,000.

Install additional rigging couplings on the roof including under the new painter's railing for fall prevention of workers in the wet interior. The couplings would allow a contractor working in the wet interior to be tied off to a fall prevention device at all times. The cost would be incidental to the installation of the roof handrail.

### **ELECTRICAL/LIGHTING CONDITIONS:**

The tank has a double aviation light on the roof that is in good condition. There is a photocell that will switch the lights on when it's dark outside. It could not be determined if the lights are operational. The aviation light bulbs were changed by Dixon Engineering inspectors during the inspection.

There are light fixtures located in the dry interior. One of the lights was found to be burned out during the inspection.

There is electrical conduit that routes into the column base. The pipe with the conduit and the adjacent pipe are not sealed.

### **ELECTRICAL/LIGHTING RECOMMENDATIONS:**

Verify operation of the aviation lights. If operational, the lights should be on after it's dark outside in the evening. The work can be performed by in-house personnel from the ground.

Replace the light bulbs in the dry interior. Work can be performed by in-house personnel or cost would be incidental to the next painting project.

Seal the electrical conduit pipe penetration and adjacent empty pipe in the base of the column with silicone caulk. The cost would be incidental to exterior painting.

### **ANTENNA CONDITIONS:**

There are ten roof antennas and miscellaneous antenna equipment attached to tripod frames. The mounting tripod base plates are bolted in place on stud welds. The antenna cable routing is in good condition and does not interfere with climbing or tank operations. The cable penetrations through the roof are sealed with rubber boots.

### **ANTENNA RECOMMENDATIONS:**

A complete redesign of the roof mounting is recommended to eliminate the existing tripod frames. The antennas should be installed on the new roof handrail to provide a safe working environment when utility personnel, antenna workers, and coating contractors are accessing the roof.

### **OVERFLOW PIPE CONDITIONS:**

The tank has a 16 inch diameter overflow pipe that extends along the access tube in the wet interior, down through the dry interior, and exits the tank near the base of the column. The pipe routes underground without a proper airgap.

### **OVERFLOW PIPE RECOMMENDATIONS:**

Modify the overflow pipe to create an air gap in the overflow pipe by removing the underground section at the bolted flange. Install a screened flap gate on the new discharge end and a concrete catch basin to route water away from the foundation. The estimated cost is \$8,000.

### **HATCH AND MANWAY CONDITIONS:**

There is a 30 inch diameter roof hatch to the wet interior that is in good condition. The coating is in fair condition. The hinged cover coating is in poor condition. There is no handhold next to the hatch to aid in entering and exiting the opening. The hatch was secured with a padlock.

There are two additional 24 inch diameter roof hatches to the wet interior that are in good condition. The coating is in fair condition. The interior coating of the hinged cover could not be inspected because the manways were not safely accessible. There are no handholds next to the hatches to aid in entering and exiting the openings. The hatches were secured with padlocks.

There is a 30 inch diameter roof hatch into the dry interior that is in good condition. The coating is in fair condition. The hinged cover coating is in fair condition. There is no handhold next to the hatch to aid in entering and exiting the opening.

There is a 24 inch diameter manway in the wet interior bowl that is in good condition. The coating is in poor condition. The manway gasket showed no signs of leakage and the bolts are in good condition.

There is a 36 x 80 inch door in the column that is in good condition. The coating is in fair condition. The door operated properly during the inspection.

There is an 11 x 12 foot overhead door in the column that is in good condition. The door operated properly during the inspection.

There is a 30 inch diameter painter's hatch (bird hatch) at the top of the column that is in good condition. There is no safety handhold above the hatch. The hatch was secured with a nut and bolt.

The ladder opening in the dry interior platform is 30 inch tombstone shaped. The opening is equipped with a hinged cover.

**HATCH AND MANWAY RECOMMENDATIONS:**

Install a handhold at the wet interior roof hatches, access tube roof hatch, and the painter's (bird) hatch to assist entering and exiting the openings. The cost would be incidental to the next painting project.

**VENT CONDITIONS:**

The roof vent is a 20 inch frost-free pressure vacuum design that is in good condition. The pressure vacuum plate was found to be properly aligned. The outer vertical screen is intact. The internal screen was not accessible.

There is a 4 inch vent on the access tube roof hatch that is in good condition.

**VENT RECOMMENDATIONS:**

Annually inspect the roof vent and to ensure the pressure plate is free to move and the screens are intact.

**LADDER CONDITIONS:**

The dry interior ladders are located in the column and access tube. The ladders are in good condition. The access tube and wet interior ladders are equipped with cable-type fall prevention devices that are in good condition. The column ladder is not equipped with a fall prevention device.

**LADDER RECOMMENDATIONS:**

Install a cable-type fall prevention device on the column ladders. The estimated cost is \$2,000.

**FILL/DRAW PIPE CONDITIONS:**

The tank fills and draws from a single pipe. The pipe routes through the dry interior into the bottom of the bowl and extends approximately 18 inches into the wet interior.

There are two deflector bars over top of the pipe in the wet interior. There is a removable silt ring on the top of the fill/draw pipe in the wet interior.

**EXPANSION JOINT CONDITIONS:**

The fill/draw pipe is equipped with a bellows expansion joint that is located above the condensate platform near the middle of the fill pipe.

**MUD VALVE CONDITIONS:**

The tank does not have a mud valve.

**MUD VALVE RECOMMENDATIONS:**

Install a mud valve with access ladder to aid with removal of sediment during regular maintenance inspections. Without a mud valve the sediment has to be removed by sending it down the fill/draw pipe and flushing it out of a hydrant, which may not be possible on your tank. The estimated cost is \$6,000.

**CONDENSATE DRAIN CONDITIONS:**

The condensate drain line routes from the condensate platform, down the inside of the column, and penetrates out near the bottom. The line is in good condition. The drain opening appeared to be operational.

**CONDENSATE DRAIN RECOMMENDATIONS:**

Replace the condensate drain line with a new line. The drain pipe would be routed to the overflow pipe and would be equipped with a check valve to prevent backflow during overflow conditions. Remove the old drain pipe and weld a patch plate over the opening in the column. The estimated cost is \$2,000.

**WET INTERIOR METAL CONDITIONS:**

The steel structure is in good condition above and below the high-water level.

The interior roof is supported by thirty-four radial stiffeners that are in good condition but with moderate corrosion at the edges. The coating on the stiffeners is poor.

There is a stiffener located at the upper bowl. The stiffener is in good condition but the coating is fair.

There are two painter's railings attached to the roof stiffeners. The painter's railings are in fair condition.

**WET INTERIOR METAL RECOMMENDATIONS:**

Monitor the corrosion on the edge of the roof stiffeners. Repaint the roof before metal loss becomes significant.



**DIXON ENGINEERING, INC.**  
**STEEL TANK FIELD INSPECTION REPORT**  
**PEDESTAL TANK**

DATE: September 19, 2019

OWNER: City of Martinsburg  
 CLIENT CODE: 48-02-02-02  
 TANK NAME: Boyd Orchard  
 LOCATION: Address: 1415 Delmar Orchard Rd.  
                   City: Martinsburg  
                   State: West Virginia

TANK SIZE: Capacity: 1,500,000 gallons  
                   Tank diameter: 50 feet (estimated)  
                   Bottom (LWL): 30 feet (estimated)  
                   Overflow (HWL): 90 feet (estimated)  
                   Head range: 60 feet (estimated)

CONSTRUCTION:  
                   Type: Fluted column  
                   Type of roof: Hemisphere  
                   Type of bowl: Hemisphere

YEAR CONSTRUCTED: 2001 or 2002 (per owner)

COATING HISTORY	EXTERIOR	WET INTERIOR	DRY INTERIOR
YEAR LAST COATED	<u>Unknown</u>	<u>Unknown</u>	<u>Unknown</u>
CONTRACTOR	<u>Unknown</u>	<u>Unknown</u>	<u>Unknown</u>
COATING SYSTEM	<u>Urethane</u>	<u>Presumed Epoxy</u>	<u>Presumed Epoxy</u>
HEAVY METAL COATING SAMPLES	<u>No</u>	<u>No</u>	<u>No</u>
HEAVY METAL BEARING	<u>No</u>	<u>No</u>	<u>No</u>

PERSONNEL: Inspector Josh Grover, Top person Trevor Jessup,  
                   ROV operator Paul Moore

TYPE OF INSPECTION: Preliminary Maintenance

METHOD OF INSPECTION: ROV

YEAR LAST INSPECTED: Unknown

## **SITE CONDITIONS**

Fenced: **Yes**

Site large enough for contractor's equipment: **Yes**

Control building: **No**

Antenna control site: **Yes**

Number: **1**

Location: **In dry interior**

Would antenna sites interfere with containment: **No**

Neighborhood: **Open/woods/school**

Power lines within 50 feet: **No**

Site drainage: **Away from tank**

Indications of underground leakage: **No**

Shrub, tree, etc. encroachment: **No**

## **EXPOSED PIPING**

Location: **Tank base (above floor)**

Altitude valve: **No**

Pipe coating condition: **Fair to poor**

Describe coating: **Spot coating failures to substrate, rust bleedthrough**

Condition of metal: **Good**

Piping comments: **There is general rust bleedthrough throughout piping**

## **FOUNDATION**

Foundation exposed: **Yes**

Exposed height: **6-16 inches**

Exposed foundation condition: **Good**

Damage or deterioration: **No**

Foundation coated: **No**

Grout Condition: **Good**

Undermining of foundation: **No**

## **EXTERIOR COATING**

### **Column:**

Topcoat condition: **Fair**

Previous coat/system condition: **Fair**

Describe coating: **Fading, spot coating failures to substrate, rust undercutting**

Dry film thickness: **15-17 mils**

Adhesion: **3A**

Mildew growth: **Yes**

Metal condition: **Good**

## **EXTERIOR COATING**

Column comments: **100+ spot coating failures to substrate, most are quarter size**

### **Bowl:**

Topcoat condition: **Poor**

Previous coat condition: **Poor**

Describe coating: **Fading, spot coating failures to substrate, rust undercutting**

Mildew growth: **Yes**

Metal condition: **Good**

Bowl comments: **200+ spot coating failures to the substrate, mainly along the weld seams**

### **Sidewall:**

Lettering: **Yes**

Number: **1**

Lettering content: **CITY OF MARTINSBURG WV**

Logo: **No**

Topcoat condition: **Fair**

Previous coat condition: **Fair**

Describe coating: **Spot coating failures to substrate, rust undercutting**

Mildew growth: **Yes**

Metal condition: **Good**

Sidewall comments: **75+ spot failures to the substrate, most are quarter size**

### **Roof:**

Topcoat condition: **Fair**

Previous coat condition: **Fair**

Describe coating: **Fading, delaminating, spot coating failures to substrate, erosion**

Dry film thickness: **13-17 mils**

Adhesion: **5A**

Metal condition: **Good**

Roof comments: **One small quarter size area of delamination. Ten spot coating failures to the substrate.**

## **EXTERIOR APPURTENANCES**

### **Column door:**

Size: **36 x 80 inches**

Coating condition: **Fair**

## **EXTERIOR APPURTENANCES**

Metal condition: **Good**

### **Overhead door:**

Size: **11 x 12 feet**

Coating condition: **Fair**

Metal condition: **Good**

### **Anchor bolts:**

Number: **25**

Diameter: **1½ inches**

Location: **Dry interior**

Coating condition: **Fair**

Metal condition: **Good**

### **Overflow pipe:**

Diameter: **16 inches**

Coating condition: **Fair**

Metal condition: **Good**

Flap gate: **No**

Air gap: **No**

Overflow comments: **Pipe routes directly underground without an airgap**

### **Roof handrail:**

**N/A [Proposed diameter 30 feet]**

### **Painter's rail:**

**N/A**

### **Roof rigging points:**

Number: **4**

Couplings covered: **Yes**

Covered with: **Steel plugs**

Coating condition: **Fair**

Metal condition: **Good**

Rigging comments: **Corrosion on the plugs**

### **Wet interior roof hatch:**

Neck size: **30 inches**

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

Shape: **Round**

Handhold at opening: **No**

## **EXTERIOR APPURTENANCES**

Curb height: **7 inches**

Cover overlap: **2 inches**

Hatch security: **Lock**

Outside coating condition: **Fair**

Inside coating condition: **Poor**

Metal condition: **Good**

Hatch comments: **There is corrosion on the chain between the manway lid and curb**

### **Secondary wet interior roof hatches:**

Number: **2**

Neck size: **24 inches**

Shape: **Round**

Handhold at opening: **No**

Curb height: **7 inches**

Cover overlap: **2 inches**

Hatch security: **Lock**

Outside coating condition: **Fair**

Inside coating condition: **Not inspected**

Metal condition: **Good**

Hatch comments: **It is not safely accessible. Hatch used to access interior painter's rails**

### **Dry interior roof hatch:**

Neck size: **30 inches**

Shape: **Round**

Handhold at opening: **No**

Hatch security: **Bolt**

Outside coating condition: **Fair**

Inside coating condition: **Fair**

Metal condition: **Good**

Hatch comments: **4 inch vent on cover with 4 mesh screen**

### **Bolted ventilation hatch:**

**N/A**

### **Roof vent:**

Number: **1**

Distance from center of the tank (to outer edge): **7 feet**

Type: **Frost-free pressure-vacuum**

Neck diameter: **20 inches**

## **EXTERIOR APPURTENANCES**

Flange opening diameter: **24 inches**

Coating condition: **Fair**

Metal condition: **Good**

Screen condition: **Outer screen – good, inner screen – not accessible**

Pressure plate free to move: **Yes**

### **Aviation lights:**

Design: **Double red**

Location: **Free-standing mount**

Functioning: **Unknown**

Globe condition: **Good**

Photoelectric cell: **Yes**

Aviation light comments: **Dixon changed the light bulbs during the inspection**

### **Antennas:**

Roof Number: **10**

Attached to: **Tripods**

Roof cable penetrations sealed: **Yes**

Sealed with: **Rubber boots**

Antenna or cables interference: **No**

### **Electrical:**

Electrical conduit condition: **Good**

Exposed wiring: **No**

## **DRY INTERIOR COATING**

### **Below the bottom platform:**

Coating condition: **Good**

Describe coating: **Spot coating failures to substrate**

Dry film thickness: **8-13 mils**

Metal condition: **Good**

Floor: **Stone**

Comments: **Coating failures along the baseplate**

### **Condensate platform:**

Platform design: **Full**

Coating condition: **Fair**

Describe coating: **Spot coating failures to substrate, rust undercutting, rust bleedthrough**

Metal condition: **Good**

## **DRY INTERIOR COATING**

Ladder opening size: **30 inches**

Shape: **Tombstone**

Opening covered: **Yes**

Handhold at opening: **Yes**

Drain: **Yes**

Size: **2 inches**

Type: **Out column at base**

Check valve: **No**

Platform comments: **Several large coating failures, 4 x 4 foot covered opening in the platform**

### **Column above the condensate platform:**

Diameter: **60 feet**

Coating condition: **Good**

Describe coating: **Spot coating failures to substrate**

Dry film thickness: **8-13 mils**

Metal condition: **Good**

### **Bowl:**

Coating condition: **Poor**

Describe coating: **Spot coating failures to substrate, rust bleedthrough**

Metal condition: **Good**

Rigging lug above opening: **Yes**

Bowl comments: **Extensive rust bleedthrough**

### **Access tube:**

Diameter: **60 inches**

Topcoat condition: **Poor**

Prime coat condition: **Poor**

Describe coating: **Spot coating failures to substrate, rust undercutting, rust bleedthrough**

Dry film thickness: **7-16 mils**

Metal condition: **Good**

Access tube comments: **Extensive coating failures, most are at or near the weld seams**

## **DRY INTERIOR APPURTENANCES**

### **Electrical:**

Lights functioning: **Yes**

Number of bulbs burned out: **1**

Additional lights needed: **No**

**DRY INTERIOR APPURTENANCES**

Electrical outlet and conduit condition: **Good**

Outlets used during inspection: **No**

**Sample tap:**

**N/A**

**Expansion joint:**

Location: **Middle of fill pipe above the platform**

Accessible for inspection: **Yes**

Type: **Bellows**

Coating condition: **Not coated, minor corrosion on flanges and bolts**

Metal condition: **Good**

**Fill pipe insulation:**

**N/A**

**Column ladder:**

Toe clearance: **7 inches or greater**

Width of rungs: **16 inches**

Thickness of rungs: **3/4 inch**

Shape of rungs: **Rebar**

Coating condition: **Good**

Metal condition: **Good**

Fall prevention device: **No**

Cage: **No**

Comments: **Ladder to bird hatch does not have a fall prevention device**

**Painter's (bird) hatch:**

Size: **30 inches**

Handhold above hatch: **No**

Coating condition: **Good**

Metal condition: **Good**

Hatch security: **Bolt**

**Manway to wet interior:**

Size: **24 inches**

Location: **In bowl**

Coating condition: **Poor**

Metal condition: **Good**



## **DRY INTERIOR APPURTENANCES**

Manway comments: **The ladder to manway is 16 inch wide, ¾ inch diameter rebar in good condition. The ladder has a cable type fall prevention device is in good condition. There are spot coating failures to the substrate and rust bleedthrough on the hatch cover**

### **Mud valve:**

**N/A**

### **Access tube ladder:**

Toe clearance: **7 inches or greater**

Width of rungs: **16 inches**

Thickness of rungs: **¾ inch**

Shape of rungs: **Rebar**

Coating condition: **Poor**

Metal condition: **Good**

Fall prevention device: **Yes**

Type: **Cable**

Function properly: **Yes**

Ladder comments: **There are spot coating failures to the substrate with rust undercutting on the ladder rails and rungs**

## **WET INTERIOR COATING**

### **Roof:**

Topcoat condition: **Fair**

Primer coating condition: **Fair**

Describe coating: **Spot coating failures to substrate, rust undercutting, rust bleedthrough**

Metal condition: **Good**

Lap seams: **Welded**

Condition of laps: **Good**

Roof comments: **Failures at beam junctions**

### **Sidewall:**

Topcoat condition: **Fair**

Primer coating condition: **Fair**

Describe coating: **Spot coating failures to substrate, rust undercutting, rust bleedthrough**

Mineral deposits: **Light**

Metal condition: **Good**

## WET INTERIOR COATING

Sidewall comments: Extensive spot coating failures to the substrate throughout both the seams and the panels. Rust staining from the corrosion on the stiffeners

### Access tube:

Topcoat condition: Good

Primer coating condition: Good

Describe coating: Spot coating failures to substrate

Mineral deposits: Light

Metal condition: Good

Access tube comments: 50-100 spot coating failures total

### Tank bottom:

Covered in sediment could not completely inspect with the ROV

Type: Bowl

Sediment depth: >2 inches (estimated)

Bottom comments: Sediment was very light colored. Director stated high calcium could be the reason

## WET INTERIOR APPURTENANCES

### Tank ladder:

Toe clearance: 7 inches or greater

Width of rungs: 16 inches

Thickness of rungs: 3/4 inch

Shape of rungs: Rebar

Shape of side rails: Flat

Coating condition: Poor

Metal condition: Good

Fall prevention device: Yes

Type: Cable

Function properly: Unknown, not used during inspection

### Cathodic protection:

N/A

Clips: No

Pressure fitting: No

### Roof stiffeners:

Radial:

Number: 34

Dimensions: 1/2 x 6 inches

## WET INTERIOR APPURTENANCES

Shape: Plate

Connections: Welded

Ring:

Number: 2

Dimensions: 6 x 8 inches (estimated angle)/3 x 3 inches (estimated I-beam)

Shape: Angle and I-beam

Connections: Welded

Coating condition: Poor

Metal condition: Good

Roof stiffener comments: Rust bleedthrough, spot coating failures, and rust undercutting throughout the stiffeners. There is edge corrosion on the rings. The rings appear to be in place for painting purposes only

### Sidewall stiffeners:

Number: 1

Location: Bowl

Coating condition: Fair

Metal condition: Good

Sidewall stiffener comments: Bottom of stiffener has rust bleedthrough present and the top had light sediment covering it so it could not be completely inspected

### Overflow pipe inlet:

Type: Weir box

Coating condition: Poor

Metal condition: Good

Overflow comments: There are spot failures to the substrate throughout

### Fill pipe:

Diameter: 12 inches (estimated)

Height above bowl: 18 inches with ring (estimated)

Deflector over end: Yes – two bars

Coating condition: Good

Metal condition: Good

### Separate draw pipe:

N/A

## **WET INTERIOR APPURTENANCES**

**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.



1,500,000 gallon fluted column (Boyd Orchard) owned by the City of Martinsburg, West Virginia.



1) The foundation is in good condition.

2) Same.



3) The electrical conduit penetrations in the column are not fully sealed.



4) The overflow pipe elbows downward and routes directly underground.

5) The condensate drain line discharges outside of the column.

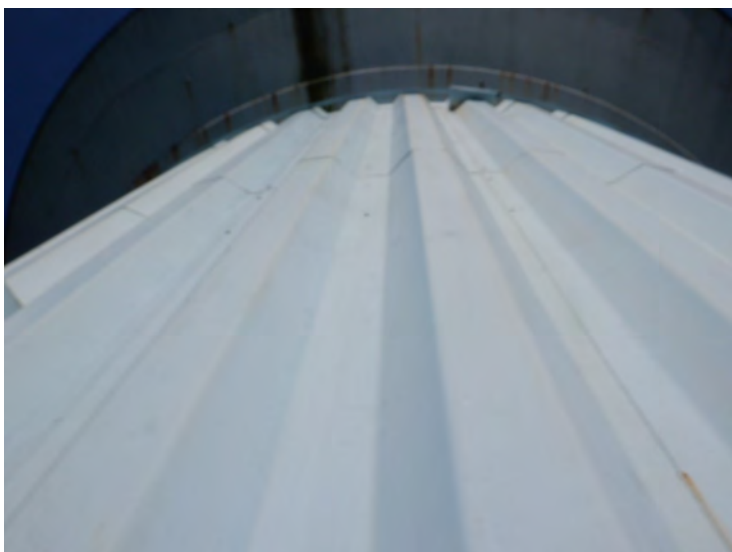


6) The overhead door is in good condition.



7) The service door was properly locked upon arrival.

8) The column coating is in fair condition.



9) The coating on the column has faded significantly.





10) There are numerous coating failures to the substrate on the bowl.

11) Spot coating failures with rust undercutting on the bowl.



12) Coating failures are on both the weld seams and randomly throughout the flat panels.



13) There is mildew growth on the sidewall and bowl.

14) The sidewall coating is in fair condition.



15) Same.



16) The roof coating is in fair condition.

17) Same.



18) Same.



19) Roof antennas are mounted to tripods bolted to the roof.

20) Two additional roof manways were not safely accessible.

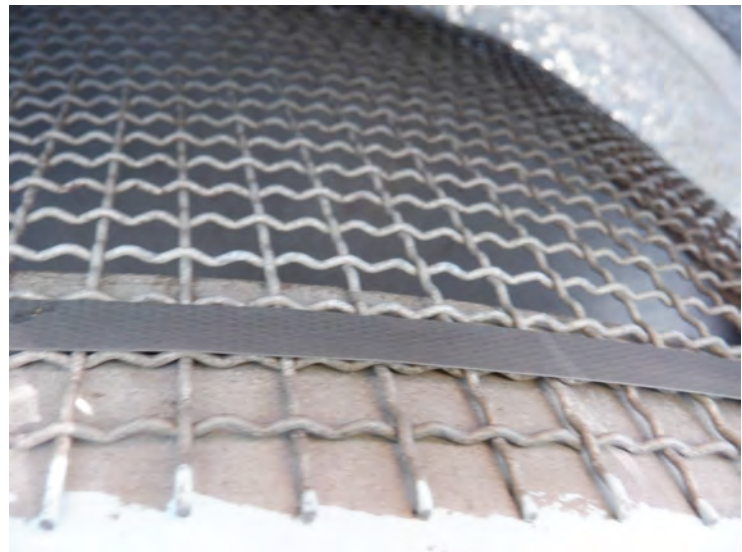


21) The double red aviation light is attached to a free standing pole.



22) The roof vent coating is in fair condition.

23) The vertical vent screen is in good condition. The horizontal screen was not accessible.



24) The pressure plate on the vent is free to move without interference.



25) The access tube manway is in good condition. There is a four inch vent attached to the manway cover.

26) There is minor corrosion on the roof coupling threads.



27) The wet interior roof hatch coating is in poor condition.



28) The anchor bolts are in good condition.

29) The coating on the column below the condensate platform is in good condition.



30) There is rust bleedthrough on the fill pipe throughout the dry interior.



31) The lights were functioning during the inspection.

32) The coating on the underside of the condensate platform is in good condition.



33) The column ladder is in good condition, but does not have a fall prevention device.





34) The ladder leading to the bird hatch does not have a fall prevention device.

35) The coating on the condensate platform is in poor condition.



36) Same.



37) Spot coating failures to the substrate on the condensate platform.

38) Same.



39) The expansion joint on the fill pipe is in good condition. There are spot coating failures on the flanges and hardware.



40) The bowl manway coating is in poor condition.

41) There is rust bleedthrough throughout the bowl.



42) Same.



43) The access tube ladder is equipped with a cable style fall prevention device.

44) The coating in the access tube is in poor condition overall.



45) There are spot coating failures behind an expansion bracket inside the access tube.

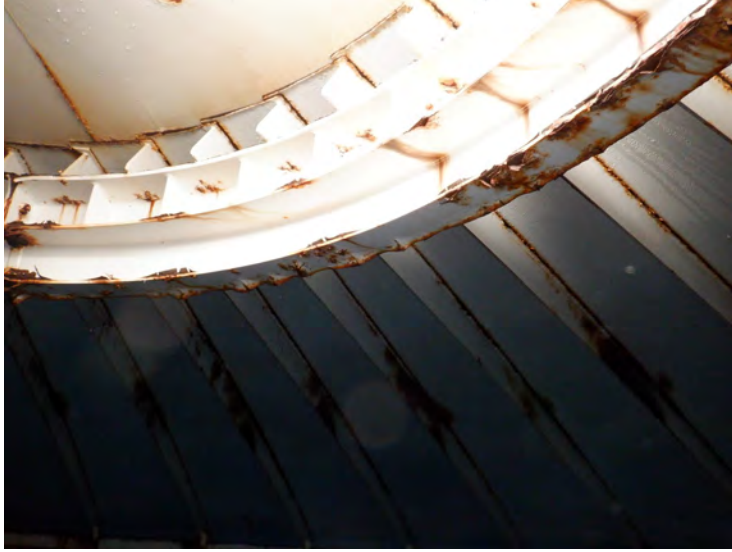


46) Spot coating failures to the substrate on the access tube ladder.

47) There are spot coating failures with rust undercutting on the access tube stiffeners.

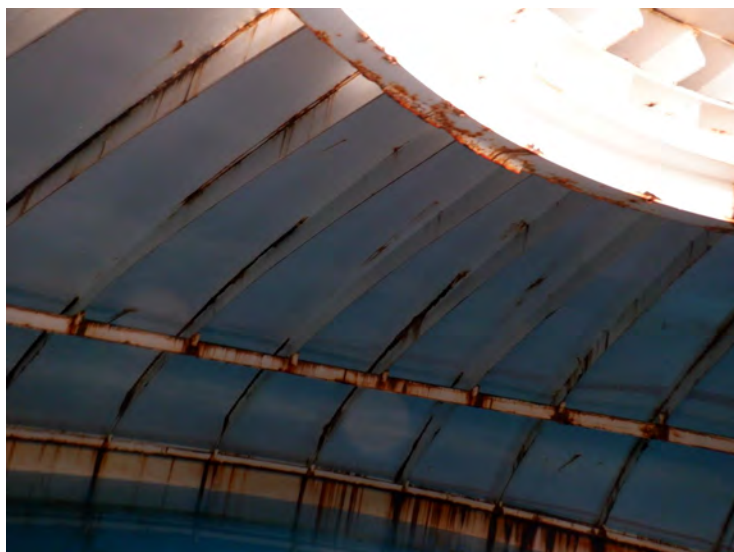
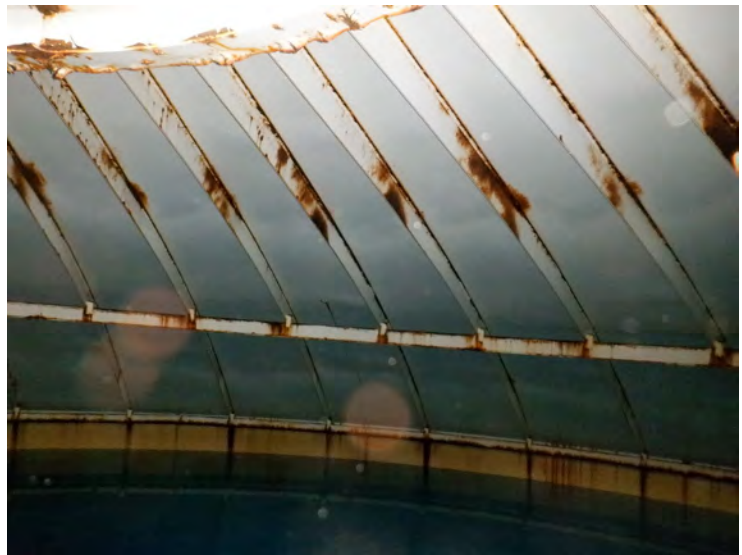


48) There are numerous spot coating failures to the substrate inside the access tube.

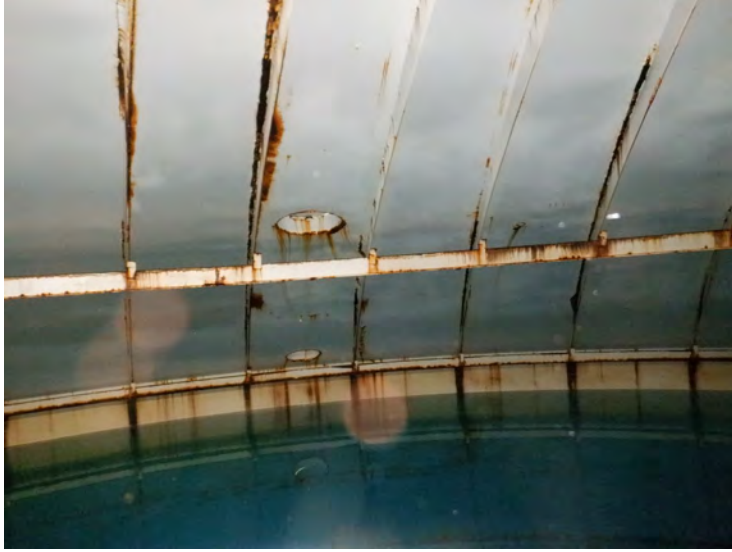


49) Rust bleedthrough and spot coating failures to the substrate on the wet interior stiffeners.

50) Same.



51) Same.



52) There are spot coating failures on the roof hatch penetrations into the wet interior.

53) Weld burns and spot coating failures to the substrate on the wet interior roof panels.



54) Edge corrosion on the roof painter's rings.

9/19/2019 5:05:35 PM

H: 078.1 °  
D: 6.01 ft  
Temp: 65.7 °F

55) Pinhole coating failures on the upper sidewall.

9/19/2019 5:04:54 PM

H: 116.0 °  
D: 5.91 ft  
Temp: 65.5 °F

56) Same.

9/19/2019 5:07:32 PM

H: 187.5 °  
D: 4.37 ft  
Temp: 65.8 °F

57) Spot coating failure to the substrate on the sidewall.



9/19/2019 5:04:28 PM



H: 157.7 °  
D: 5.84 ft  
Temp: 65.2 °F

58) Spot coating failures to the substrate on a wet interior sidewall weld seam.

9/19/2019 5:03:22 PM



H: 012.1 °  
D: 13.38 ft  
Temp: 65.0 °F

59) Same.

9/19/2019 5:01:29 PM



H: 122.8 °  
D: 16.38 ft  
Temp: 65.0 °F

60) Spot coating failures to the substrate on the sidewall.



61) The sidewall coating is in fair condition.



62) Pinhole coating failures on the sidewall.



63) The stiffener at the transition is in good condition.

9/19/2019 4:56:54 PM



H: 058.4 °  
D: 21.61 ft  
Temp: 64.9 °F

64) There are numerous spot coating failures to the substrate on the underside of the stiffener.

65) Same.

9/19/2019 4:56:22 PM



H: 070.8 °  
D: 21.61 ft  
Temp: 64.8 °F

9/19/2019 4:51:53 PM



H: 141.6 °  
D: 22.10 ft  
Temp: 64.7 °F

66) Same.



67) Spot coating failures to the substrate at the top of the access tube above high-water line.

68) Same.

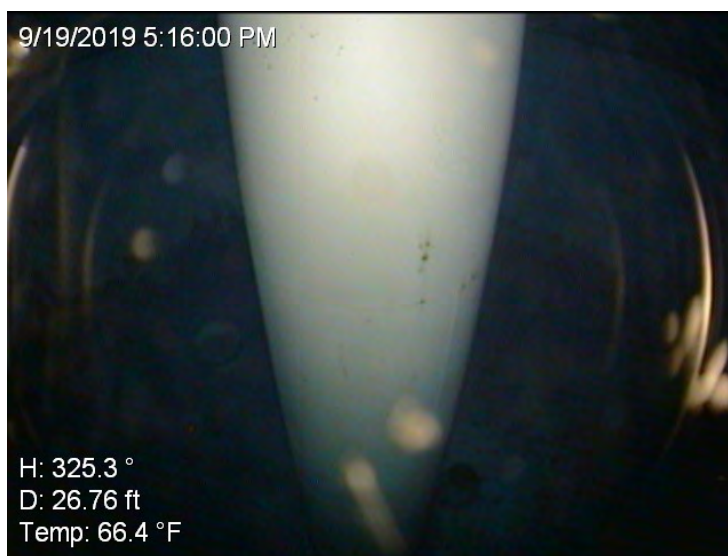


69) There are numerous spot coating failures on the overflow weir box.



70) The wet interior ladder is equipped with a cable-type fall prevention device.

71) There are a few spot coating failures on the access tube below high-water line.



72) Spot coating failures to the substrate on an access tube stiffener.



73) Spot coating failures to the substrate on the access tube.

74) The wet interior ladder is in good condition.



75) There is some corrosion on the bottom fall prevention ladder bracket.

9/19/2019 4:31:56 PM



H: 095.6 °  
D: 44.16 ft  
Temp: 64.2 °F

76) The fill/draw pipe has two deflector bars on the silt ring.

9/19/2019 4:33:24 PM



H: 014.1 °  
D: 46.61 ft  
Temp: 64.2 °F

77) Spot coating failures on the fill pipe.

9/19/2019 4:28:16 PM



H: 206.1 °  
D: 42.76 ft  
Temp: 66.9 °F

78) A thin layer of sediment covers the wet interior bowl.

9/19/2019 4:34:01 PM



79) The coating on the wet interior manway is in poor condition.

H: 050.9 °  
D: 44.65 ft  
Temp: 64.2 °F

9/19/2019 4:34:22 PM



80) Same.

H: 009.5 °  
D: 45.24 ft  
Temp: 64.1 °F

9/19/2019 4:33:49 PM



81) The sediment continues up the contour of the bowl.

H: 149.1 °  
D: 45.79 ft  
Temp: 64.2 °F



9/19/2019 4:40:00 PM



H: 305.0 °  
D: 34.76 ft  
Temp: 64.3 °F

82) There are pinhole coating failures on the bowl weld seams.

9/19/2019 4:40:05 PM



H: 004.4 °  
D: 34.66 ft  
Temp: 64.3 °F

83) Same.

9/19/2019 4:40:32 PM



H: 094.9 °  
D: 32.90 ft  
Temp: 64.4 °F

84) There is rust bleedthrough on the bowl erection lugs.

9/19/2019 4:44:49 PM



H: 318.0 °  
D: 35.58 ft  
Temp: 64.6 °F

85) Spot coating failures an the upper bowl weld seam

86) The coating on the piping above the floor in the column is in fair to poor condition.



87) Same.