DIXON

ENGINEERING & INSPECTION SERVICES
FOR THE COATING INDUSTRY

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June 12, 2024

Mr. Barry Sorenson, Superintendent
Waterloo Utilities
575 Commercial Avenue
Waterloo, WI 53594

Subject: Condition Assessment Inspection Services for the 100,000 Gallon Cone Roof

Dear Mr. Sorenson:

Dixon Engineering performed an inspection on April 4, 2024 on the 100,000 gallon cone roof water tower located in the City of Waterloo, Wisconsin. The purpose of the inspection was to perform a condition assessment of the entire structure to determine the feasibility of maintaining the structure as a landmark/antenna support structure. The inspection was performed by James Rowley, Structural Engineer, and Joseph T. Hoban, PE.

Summary:

This structure was built in 1910 by Chicago Bridge & Iron Works. The tank is generally of riveted construction with some welding on appurtenances. The tank is located on an unfenced site that is located near a church parking lot. This tank has been removed from service for a length of time and it is understood that there are no plans to place the tank back into service. For this reason, the inspection and recommendations have been limited to general structural integrity and safety items.

Site Inspection:

Overall Site:

The tank is located in an unfenced area near a church parking lot. There is an electrical line that routes from an adjacent pole to one of the legs. There is a concrete retaining wall around the perimeter of the tank base. The concrete retaining wall is in fair condition overall with numerous spalls. The retaining wall appears plumb and generally structurally sound. The site is generally well-kept with no vegetation encroachment on the tank.

Foundation and Anchor Bolt Conditions:

The exposed concrete foundations are in poor to fair condition overall. It appears that some concrete was added to the original concrete foundations. There are numerous spalls throughout the concrete foundations. There is a survey benchmark located on the leg foundation with the ladder.

There are no anchor bolts at the wet riser. There is one 2 inch diameter anchor bolt at each of the four legs. The anchor bolts are in good condition overall with no significant deterioration.

Coating Conditions:

The exterior of the structure consists of the riser, legs, struts, sway rods, bowl, sidewall, balcony, and roof. The exterior coating is in fair to good condition overall. The lower portion of the tower is coated with an aluminum coating and the sidewall and roof are coated with an unknown coating system. Adhesion testing was performed on the legs and the sidewall. The leg coating showed poor adhesion and the sidewall coating showed good adhesion.

The wet interior coating is in fair condition overall. Coating deterioration consists of spot failures with rust undercutting and rust bleedthrough throughout.

Coating samples were taken from a leg and the exterior sidewall and tested for the presence of heavy metals. The exterior coating tested at 1.3 to 3.6 percent (13,000 to 36,000 ppm) lead by weight and 0.26 to 0.40 percent (2,600 to 4,000 ppm) chromium by weight. Special consideration will be needed during maintenance to avoid contamination of workers and prevent generation of hazardous waste.

Structural Steel Conditions:

The exterior structure is in good condition overall. There is no significant deterioration of the structure, no missing rivets, cracked welds, or pitting of the steel were observed. Typical areas of concern on similar structures are the condition of the anchor bolts, the sway rod and strut connections, and the leg connections to the sidewall. All of these areas that were able to be accessed are in good condition with no areas of concern.

There are several holes in the roof plates throughout. The holes can let water into the interior of the structure and accelerate corrosion.

Access and Safety Conditions:

The exterior leg ladder starts 4 feet above the leg foundation and extends up to the balcony. The leg ladder is equipped with a cage and a vandal guard that are in good condition. The ladder is not equipped with a fall prevention device. The ladder is in good condition overall but does not meet OSHA size requirements. The toe clearance and length of rungs are undersized. The leg ladder cage has an opening at the balcony for access and continues to the roof. There are rungs welded to the roof to access the finial ball at the peak.

The exterior balcony is in good condition overall. The balcony and railing do not conform the current OSHA requirements. The railing height is undersized and there is no midrail. The tank does not have a roof handrail.

There is one antenna mounted to the balcony railing. The mounts appear to be in good condition. The cable routing does not interfere with access.

There is a wet interior roof hatch at the top of the sidewall ladder. The roof hatch has a curb and overlapping cover that are in good condition. There is a finial ball at the center of the roof that could not be safely accessed and inspected. The overflow pipe stubs out the of the upper sidewall, routes down the sidewall and leg of the tank, and discharges to a splash pad.

Recommendations:

This structure is in good condition overall with no major structural deficiencies. Several items are outlined below to increase the longevity and aesthetics of the structure as well as increase the safety for future inspections and maintenance activities. The existing concrete should be repaired, entry points for water in the

roof should be sealed to protect the wet interior, the structure should be coated for aesthetics and long-term protection, and safety upgrades should be performed to allow for safe maintenance in the future.

Disclaimer:

Unless DIXON feels the ladders and railings are unsafe, it is our opinion that if they were built to code at the time of construction, they do not require replacement. Codes can change regularly making compliance expensive and impractical. However, it is our responsibility to inform you of this possible deficiency.

1. Repair spalls on the concrete foundations and retaining walls. The estimated cost is $20,000.
2. Weld plates over the holes in the roof. The estimated cost is $5,000.
3. 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.
4. Install a fall prevention device on the leg/sidewall ladder. The estimated cost is $6,000.
5. Long term budget recoating the exterior every 15 years (after the initial abrasive blast cleaning and repaint).

The total estimated construction cost for the rehabilitation project is $311,000.

Engineering, project specifications, construction inspection are estimated to be $60,000. This total is not included in the total construction cost for rehabilitation project estimate.

Inspecting the structure every 5 years is recommended. The estimated cost is $6,000 plus 4% annual inflation cost.

If you have any questions, please feel free to contact the project manager, Kayla Mulcahy at (414) 429-3430 or kayla.mulcahy@dixonengineering.net.

FOR DIXON ENGINEERING, INC.,

James Rowley
Senior Structural Engineer

Reviewed by:
Joseph T. Hoban, PE
Vice President

Attachments: Field Inspection Report
Heavy Metal Lab Results
Inspection Photographs

ANALYTICAL LABORATORY REPORT

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

DATE RECEIVED: Monday, April 8, 2024
PO/PROJECT #:
SUBMITTAL #: 2024-04-08-003

LAB NUMBER: AD31409

Sampled By: James Rowley
Date Sampled: 4/4/2024
Job Location: Waterloo Utilitites, WI 100M Cone Roof
Sample Description: Paint Chips
Sample Identification: 1 : Waterloo Utilities 100M Cone Roof EXT Leg

Preparation Method: EPA 3050B-P-M (Acid Digestion for Paints)
Analysis Method: EPA 6010D-M (ICP-AES Method for Determination of Metals)
Date Analyzed: Wednesday, April 10, 2024

ELEMENT	RESULT (by dry	REPORTING LIMIT (RL)
Chromium	**0.40 %**	0.00065 %
Lead	**3.6 %**	0.0013 %

LAB NUMBER: AD31410

Sampled By: James Rowley
Date Sampled: 4/4/2024
Job Location: Waterloo Utilitites, WI 100M Cone Roof
Sample Description: Paint Chips
Sample Identification: 2 : Waterloo Utilities 100M Cone Roof EXT Side wall

Preparation Method: EPA 3050B-P-M (Acid Digestion for Paints)
Analysis Method: EPA 6010D-M (ICP-AES Method for Determination of Metals)
Date Analyzed: Wednesday, April 10, 2024

ELEMENT	RESULT (by dry	REPORTING LIMIT (RL)
Chromium	**0.26 %**	0.0013 %
Lead	**1.3 %**	0.0013 %

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

DATE: **April 4, 2024**

OWNER: **Waterloo Utilities**
CLIENT CODE: **49-28-19-01**
LOCATION: Address: **260 Squire Street**
City: **Waterloo**
State: **Wisconsin**
TANK SIZE: Capacity: **100,000 gallons**
Bottom (LWL): **62 feet (measured)**
Sidewall height from the balcony to top of wall: **28 feet**
CONSTRUCTION: **Riveted**
Type: **Cone roof**
YEAR CONSTRUCTED: **1910**
MANUFACTURER: **CB&I**
USE: **Out of service/landmark**
Coating information below is from: **Exterior coating samples**

COATING HISTORY	EXTERIOR	WET INTERIOR
YEAR COATED	**Unknown**	**Unknown**
CONTRACTOR	**Unknown**	**Unknown**
SYSTEM	**Unknown**	**Unknown**
HEAVY METAL COATING SAMPLES	**Yes**	**No**
HEAVY METAL BEARING	**Yes** **1.3-3.6% lead** **0.26-0.40% chromium**	**Unknown**

PERSONNEL: Lead inspector **James Rowley**, Crew member **Joe Hoban**
METHOD OF INSPECTION: **Dry**

SITE CONDITIONS

Fenced: **No**
Site large enough for contractor's equipment: **Yes**
Control building: **No**
Antenna control site: **No**
Power lines within 50 feet: **Yes**

Are power lines attached to the structure: **Yes**
Would power lines interfere with containment: **Yes**
Site drainage: **Away from the tank**
Indications of underground leakage: **No**
Vegetation, tree, etc. encroachment: **No**
Site comments: **There is a concrete retaining wall around the base of the tank that is in fair condition**

EXPOSED PIPING

Location: **Tank base (in the pit)**
Condition of structure: **Unknown, could not access**
Cover condition: **Good**
Cover material: **Steel plate**
Locked: **No (bolted)**

FOUNDATION

Riser:

Foundation exposed: **Yes**
Exposed height: **2-6 inches**
Exposed foundation condition: **Fair**
Damage or deterioration: **Yes**
Type of damage: **Spalls/chips and exposed aggregate**
Severity: **Moderate**
Total spall area: **3 square feet**
Foundation coated: **Yes**
Coating condition: **Fair**
Describe coating: **Delamination and erosion**
Undermining of foundation: **No**

Legs:

Foundations exposed: **Yes**
Exposed height: **10-16 inches**
Exposed foundation condition: **Poor**
Damage or deterioration: **Yes**
Type of damage: **Spalls/chips and exposed aggregate**
Severity: **Moderate**
Total spall area: **20 square feet**
Foundation coated: **Yes**
Coating condition: **Fair**
Type of baseplate gap filler: **None**
Undermining of foundation: **No**

FOUNDATION

Leg foundation comments: **Additional concrete was added around the original foundations. Spalls are approximately 3 inches deep at maximum**

EXTERIOR COATING

Adhesion Testing:

Location	Result (0A-5A)	Heat Used
Leg	**0**	**No**
Sidewall	**5**	**No**

Legs:

Number: **4**
Type: **Lattice**
Dimensions: **12 x 14 inches**
Topcoat condition: **Fair**
Previous coat/system condition: **Fair**
Describe coating: **Spot coating failures to substrate, rust undercutting**
Dry film thickness: **5-25 mils**
Metal condition: **Good**

Riser:

Type: **Wet**
Diameter: **12 inches**
Topcoat condition: **Poor**
Previous coat/system condition: **Fair**
Describe coating: **Spot coating failures to substrate, rust undercutting, rust bleedthrough**
Mildew growth: **No**
Metal condition: **Good**

Bowl:

Topcoat condition: **Fair**
Previous coat/system condition: **Good**
Describe coating: **Spot coating failures to substrate, rust undercutting**
Mildew growth: **No**
Metal condition: **Good**

EXTERIOR COATING

Sidewall:

Lettering: **Yes**
Number: **4**
Lettering content: **There are four sponsors listed on the tank**
Logo: **Yes**
Number: **1**
Describe logo: **Carousel horses around the entire tank**
Topcoat condition: **Good**
Previous coat/system condition: **Good**
Describe coating: **Spot coating failures to substrate, rust undercutting**
Dry film thickness: **3-11 mils**
Metal condition: **Good**

Roof:

Topcoat condition: **Good**
Previous coat/system condition: **Good**
Describe coating: **Spot coating failures to substrate, rust undercutting**
Metal condition: **Good**
Roof comments: **Several holes in the roof**

EXTERIOR APPURTENANCES

Anchor Bolts:

Number of bolts per leg: **1**
Diameter: **2 inches**
Metal condition: **Good**
Number of riser bolts: **0**

Grounding:

N/A

Overflow Pipe:

Diameter: **6 inches**
Metal condition: **Good**
Discharge orientation: **Angle**
Screen condition: **Good**
Percent of screen open: **100**
Mesh size: **4**
Flap gate/duck bill check valve: **No**
Air gap: **Yes**
Lowest part of discharge to the ground distance: **31 inches**

EXTERIOR APPURTENANCES

Overflow discharges to: **Concrete pad**

Condition: **Good**

Leg Ladder:

Height to start of ladder: **4 feet**
Toe clearance: **Less than 7 inches**
Width of rungs: **Less than 16 inches**
Thickness of rungs: **¾ inch**
Shape of rungs: **Round**
Metal condition: **Good**
Fall prevention device: **No**
Cage: **Yes**

Diameter: **24 inches**

Vandal guard: **Yes**

Condition: **Good**

Step off platform: **No**

Struts and Rods:

Number of bays: **3**
Sway rod metal condition: **Good**

Loose rods: **No**

Strut metal condition: **Good**
Riser tie rod metal condition: **Good**

Connection to riser: **Welded lugs**

Bowl Rigging Couplings:

N/A

Balcony:

Balcony width: **24 inches**
Railing height: **36 inches**
Midrail style: **Cross bucks**
Kickplate height: **6 inches x 2 inches channel**
Vertical post type: **Angle**

Size: **2 x 1½ inches**

Top rail type: **Angle**

Size: **2 x 1½ inches**

Diagonal type: **Plate**

Size: **1½ x ¼ inches**

Opening for ladder access: **No**

EXTERIOR APPURTENANCES

Coating condition: **Fair**
Describe coating: **Spot coating failures to substrate, rust undercutting**
Metal condition: **Good**
Evidence of water ponding: **No**
Balcony comments: **There are four sidewall lights off the balcony**

Sidewall Manway:

Size: **11 x 15 inches**
Cover attachment: **Crab**
Metal condition: **Good**

Antennas:

Balcony number: **1**
Attached to: **Railing**
Cable runs: **Along the balcony railing**
Antenna or cable interference: **No**

Sidewall Ladder:

Sidewall ladder comments: **Continuation of the leg ladder**

Step-off Platform:

N/A

Roof Ladder:

Design: **Fixed**
Roof ladder comments: **Welded rungs on the roof**

Roof Handrail:

N/A

Painter's Railing:

N/A

Roof Rigging Points:

N/A

Wet Interior Roof Hatch:

Neck size: **24 inches**
Distance from center of the tank (to outer edge): **At the outer edge**
Shape: **Round**

EXTERIOR APPURTENANCES

Handhold at opening: **Yes**
Curb height: **4½ inches**
Cover overlap: **1 inch**
Gasket on cover/neck curb: **No**
Hatch security: **Lock**
Metal condition: **Good**

Bolted Ventilation Hatch:

N/A

Roof Vent:

Number: **1**
Distance from center of the tank (to outer edge): **0 feet**
Type: **Finial ball**
Metal condition: **Good**

Aviation Lights:

N/A

Electric Conduit:

Electrical conduit condition: **Good**
Exposed wiring: **No**

WET INTERIOR COATING

Roof:

Topcoat condition: **Fair**
Primer coating condition: **Good**
Describe coating: **Spot coating failures to substrate, rust undercutting**
Metal condition: **Fair**
Lap seams: **Open**
Condition of lap seams: **Fair**
Roof comments: **Several holes in the roof**

Sidewall:

Topcoat condition: **Fair**
Primer coating condition: **Good**
Describe coating: **Spot coating failures to substrate, rust bleedthrough**
Mineral deposits: **Light**
Metal condition: **Good**
Active pitting: **No**

WET INTERIOR COATING

Previous pitting: **No**

Tank Bottom:

Topcoat condition: **Fair**
Primer coating condition: **Good**
Describe coating: **Spot coating failures to substrate, rust bleedthrough**
Mineral deposits: **Light**
Metal condition: **Good**
Active pitting: **No**
Previous pitting: **No**
Sediment depth: **6 inches (estimated)**

WET INTERIOR APPURTENANCES

Ladder:

Ladder comments: **Ladder is laying in the bowl**

Cathodic Protection:

N/A
Clips: **No**
Pressure fitting: **No**

Roof Stiffeners/Painters Railings:

N/A

Sidewall Stiffeners:

N/A

Overflow Pipe Inlet:

Type: **Stub**
Metal condition: **Good**

Spider Rods:

Coating condition: **Poor**
Metal condition: **Fair**

Fill/Draw Pipe:

Diameter: **12 inches**
Height above bowl: **12 inches (estimated)**
Deflector over end: **No**
Metal condition: **Good**

WET INTERIOR APPURTENANCES

Mixer:

N/A

Riser Safety:

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) 100,000 gallon cone roof elevated water tank located in Waterloo, Wisconsin.

2) The tank base is surrounded by a concrete retaining wall.

3) The concrete retaining wall is in fair condition with numerous spalls.

4) Same.

5) The riser foundation is in fair condition overall. There is a pit with a steel plate cover.

6) Typical concrete leg foundation is in poor condition overall.

7) Same.

8) Same.

9) Typical leg anchor bolt is in good condition.

10) Same.

11) Typical leg base is in good condition.

12) Typical sway rod connection is in good condition.

13) Same.

14) The leg ladder is in good condition. The ladder is not equipped with a fall prevention device.

15) Typical strut is in good condition.

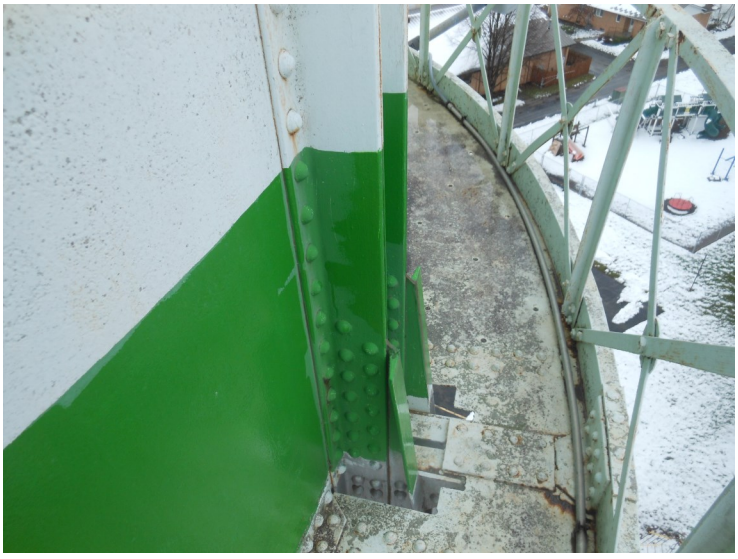
16) Same.

17) The bowl is in good condition overall. The coating is in fair condition.

18) Same.

19) The balcony is in good condition overall.

20) Same.



21) Typical leg connection to the sidewall is in good condition.

22) The sidewall is in good condition. The coating is in good condition.

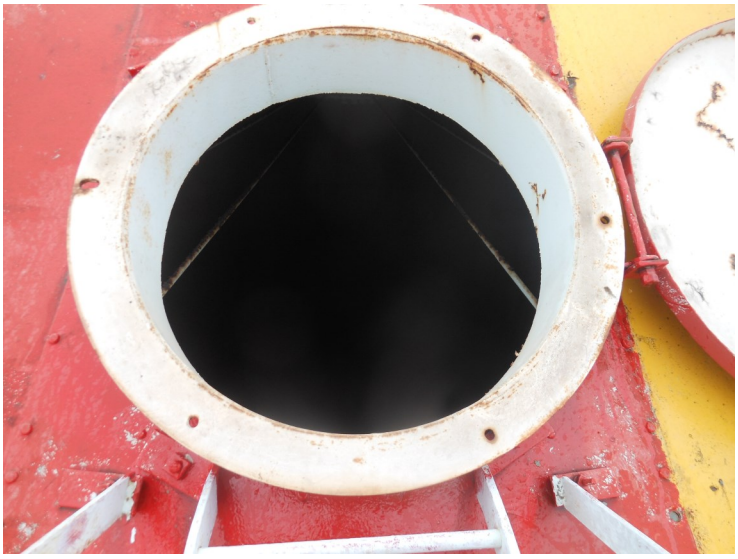
23) Same.

24) The riveted seams on the sidewall are in good condition.

25) The roof is in good condition overall. The coating is in good condition.

26) Same.

27) There are rungs on the roof leading up to the finial ball at the peak.



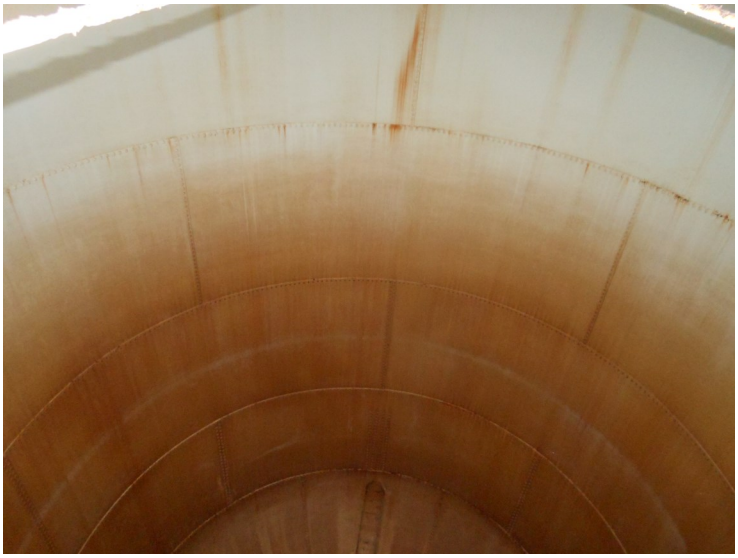
28) The wet interior roof hatch is in good condition.

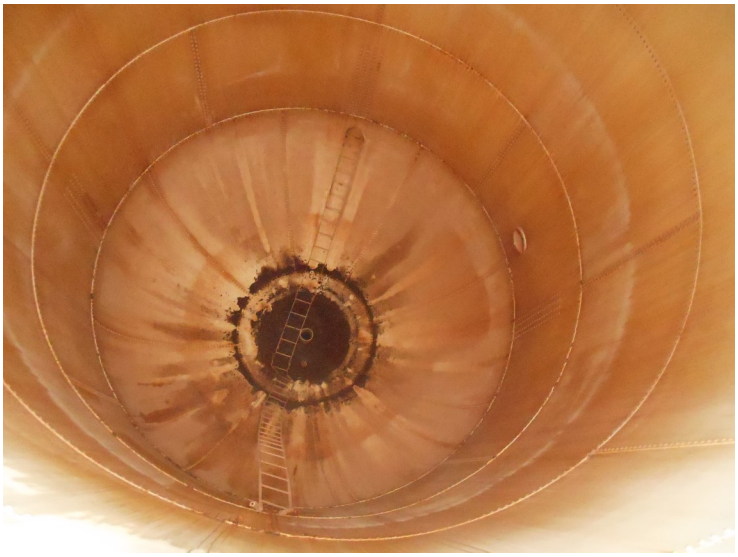
29) The wet interior roof is in good condition overall. There are small holes throughout.

30) Same.

31) The wet interior spider rods are in good condition.

32) The wet interior sidewall is in good condition. The coating is in fair condition.





33) The wet interior bowl is in good condition. The wet interior ladder is laying in the bowl.