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COMPOSITE SITE INSPECTION REPORT

Created for:

City of Winnipeg Water and Waste Department

Hwy 207, Access Road 57802

Springfield, MB

204-806-4919

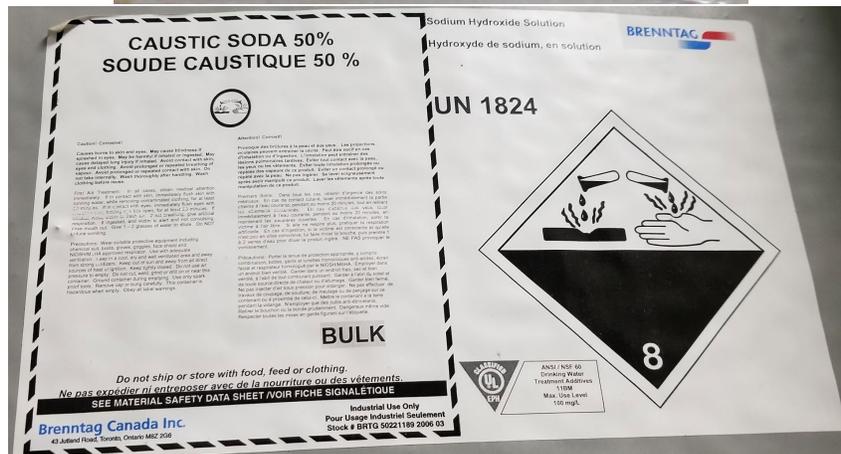
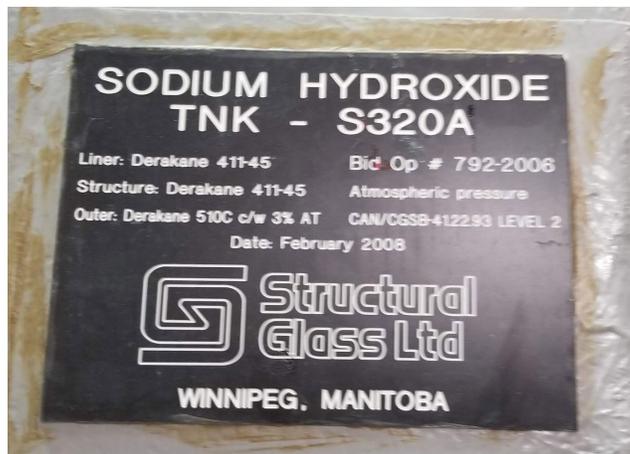


Inspection of: Sodium Hydroxide Tank Equipment No. TNK-S320A
 Serial No. N/A
 Built in 2008

Location: Deacon WTP
 Hwy 207, Access Road 57802
 Springfield, MB

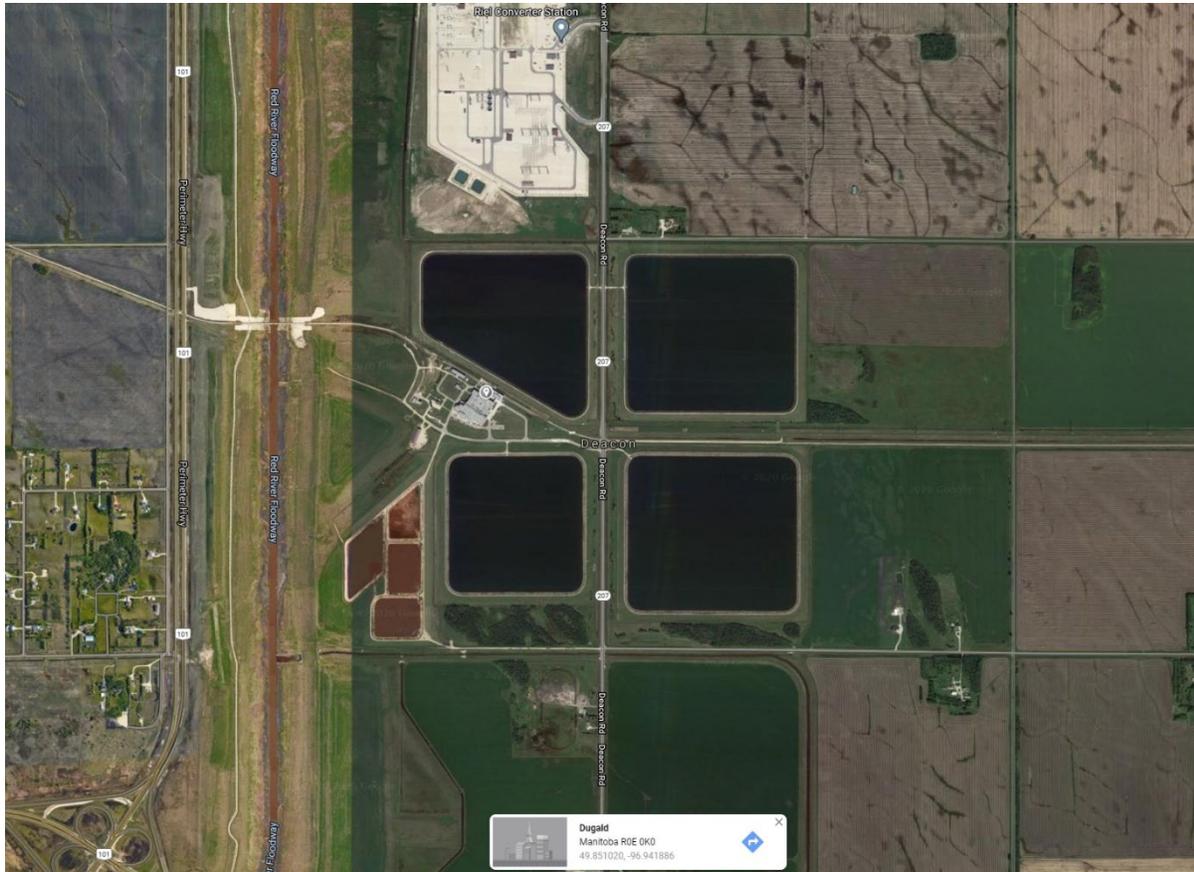
Date of Inspection: January 8th, 2021 at approximately 10:00AM

Inspected By: Gene Walterson, CCT-C



BACKGROUND:

Carlson Engineered Composites Inc. performed an inspection of Sodium Hydroxide Tank Equipment No. TNK-S302A, manufactured by Structural Glass Ltd. in 2008. This inspection was performed on site by Gene Walterson, CCT-C at the City of Winnipeg Deacon WTP located at Hwy 207, Access Road 57802 Springfield, MB.



MANUFACTURING METHODS:

Tank Equipment No. TNK-S302A is used to store Sodium Hydroxide solution with a design temperature of (NOT INDICATED) at Atmospheric Pressure.

This tank was manufactured and designed for a Maximum 50% Caustic Soda concentration as indicated on a SDS Label on the physical tank but not indicated on the Tank Data Plate.

Tank is 4000mm internal diameter by approximately 8500mm tall

The tank was manufactured using Derakane 411-350M Vinyl Ester Resin for the Corrosion Barrier consisting of 2 plies of Synthetic NEXUS Veil + 2 plies of 1.5oz CHOPPED STRAND Mat (CSM) with a nominal thickness of 0.11”.



The Structural Layers were fabricated by HLU consisting of 1.5oz CSM and 24oz Woven Roving (WR) using Derakane 411-350M Vinyl Ester Resin.

Final Layer of 1ply CSM/WR/CSM and resin rich finishing layer using Derakane 510-C-350 Vinyl Ester Resin with 3-5% Antimony Trioxide and pigmented grey in color to create a Class 1 Fire Retardant Laminate.

INSPECTION PRECEDURE AND REPORT:

This tank was inspected using a non-destructive visual inspection only.

Preliminary Safety Checks prior to entering Confined Space.

- A. Tank was NOT in-service at the time of inspection
- B. Tank was cleaned prior to inspection with some residue on the tank walls although these were deemed to be neutralized. No litmus test data provided prior to the inspection. Tank was considered safe for entry utilizing appropriate PPE and based on data collected from ENTRY PERMIT FOR CONFINED SPACES and JOB SAFETY PLANNING FORM.
- C. Air monitor test prior to inspection showed the following:
 - a. % LEL @ 0
 - b. % O2 @ 20.09
 - c. CO2 @ 0.01
 - d. CO @ 0
 - e. H2S @ 0
- D. Access to the tank is down a set of stairs and through side entry access port.
- E. Tank is located in a concrete containment berm, within a separated room of 4 tanks.

Inspection as follows:

Tools used for inspection:

- F. PPE (Including eye protection, gloves, hard hat, etc.)
- G. Flashlight
- H. Hook Knife
- I. Paint Scraper / Putty Knife
- J. Digital Caliper with depth gauge (Accuracy to 0.001")
- K. Camera
- L. OEM Drawings, Pen and Notebook



Manway:

Side Manway and Lid appears to be in poor condition with some scum/residue remaining on each component. Appearance of a dry glass NEXUS VEIL was evident and exposed to the environment.

Bolting flange of manway and lid appear to be in good condition and was protected from chemical attack by the gasket seal.

IMAGE: M-1a, M-1b, M-1c

Floor/Bottom Head:

Prior to entering the tank, the floor had noticeable scum/residue remaining in the tank covering approximately 50% of the surface area.

Upon entering the tank, we found that the bottom head/floor appears to be in poor condition. In locations that were visible, appearance of a dry glass NEXUS VEIL was evident and exposed to the environment.

Small baffle type plates bonded to the floor (possible heater droop supports) were found to be in poor condition. In locations that were visible, appearance of a dry glass NEXUS VEIL was evident and exposed to the environment.

IMAGE: BH-1a, BH-1b

Tank Walls:

Tank wall appears to be in poor condition with some scum/residue remaining on walls covering approximately 25% of the visible area.

In locations that were visible, the extent of the dry glass NEXUS VEIL appearance was evident throughout a majority of the tank wall. Due to the resin rich interior coating being deteriorated this has exposed the surfacing veil and deteriorated corrosion barrier to the environment.

The top 250mm (10") of the tank wall appear to be in acceptable condition but due to the distance/height for inspection we cannot 100% guarantee this does not require reconditioning.

IMAGE: TW-1a, TW-1b, TW-1c, TW-1d, TW-1e, TW-1f

Tank Lid/Top Head:

Tank lid/Top Head appears to be in acceptable condition with large deposits of scum/residue remaining on the top head covering approximately 15% of the visible area which looks to be from splashing during fill.

IMAGE: TW-1e, TW-1f, TH-1a, N1, N2, N3, N4, N5

Fittings and Accessories:

Nozzle 1 (VENT), 2 (FILL), 3 (FILL), 4 (LEVEL ELEMENT), 5 (TOP HEAD MANWAY) – From visual inspection of the top head manway access port these fittings appear to be in good condition.

Nozzle 2 and 3 have downcomers running the height of the tank to 450mm from the bottom head. These downcomers appear to be in poor condition externally with some scum/residue



remaining on exterior of piping. Appearance of what appears to be only a single ply of dry glass C-VEIL on exterior of pipe was evident and exposed to the environment

Nozzle 6 (SUCTION LINE) – Appears to be in good condition with only a slight buildup of scum/residue remaining on the interior and exterior of the penetrating stub

Nozzle 7 (Top MANWAY) – Appears to be in good condition with no action required

Nozzle 8 (OVERFLOW W/INTERNAL ELBOW) – Cannot determine condition due to the entire fitting being covered in scum/residue.

Nozzle 9, 10, & 11 (HEATER) - The extent of the dry glass NEXUS VEIL appearance was evident.

Nozzle 12 (DRAIN) – There is an excessive amount of scum/residue remaining on the interior and exterior of the penetrating stub and the extent of the dry glass NEXUS VEIL appearance was evident.

Nozzle 13 (LEVEL GUAGE) - There is an excessive amount of scum/residue remaining on the interior and exterior of the penetrating stub. Condition can not be determined.

Nozzle 14 (TEMPERATURE TRANSMITTER) - This is bonded as a penetrating nozzle and was found to have **NOT** been bonded correctly to create an end seal which is to prevent chemical attack to the structure of the flange.

Tank Exterior:

The tank itself appears to be in good condition with no indication of cracks or leaks.

There does not appear to be any cracks or leaks from the nozzles/flanges. Due to improper installation based on RTP-1 specifications and the fabricator neglecting to install a weeping hole, any leaking from the tank wall through the stub penetration into the conical gusset cannot be determined.

All fittings appear to have external conical gussets adding 360° loading strength to the fittings. Conical gussets should **ALWAYS** have a minimum 0.25" weeping hole drilled in the lowest area of the gusset to allow external inspection of fitting for secondary bonding failure and leakage through the weeping hole.

This is extremely critical in outdoor applications and part of the RTP-1 standard for all applications where conical gussets are used.

Recommendation for repair:

Side Manway:

Reline manway access port and interior side of lid

Floor/Bottom Head:

Remove existing corrosion barrier to natural glass and resin matrix.

Reline corrosion barrier using 2 plies of 1.5oz mat or chop strand mat + 2 plies of synthetic NEXUS surfacing veil for a nominal thickness of 0.11" ensuring each layer is minimum of 0.5" wider than the previous layer.



Tank Walls:

Remove existing corrosion barrier to natural glass and resin matrix.

Reline corrosion barrier using 2 plies of 1.5oz mat or chop strand mat + 2 plies of synthetic NEXUS surfacing veil for a nominal thickness of 0.11" ensuring each layer is minimum of 0.5" wider than the previous layer.

Fittings and Accessories:

All fittings excluding fitting on the top head require an external relining of the penetrating stub corrosion barrier creating an end seal to protect the structure of the stub.

Nozzle 14 may require replacement due to the corrosion barrier of the penetrating stub delaminating internally and externally from the structure of the stub.

All downcomer piping will require an external relining of the corrosion barrier and to include 2 plies of 1.5oz mat or chop strand mat + 2 plies of synthetic NEXUS surfacing veil for a nominal thickness of 0.11" as well as creating an end seal to protect the downcomer structure of the penetrating stub. We would require the nozzle to be unbolted from the connecting external pipe and a new gasket supplied for us to field fit a new nozzle made from Derakane 411.

Lid/Top Head:

Appears to be in good condition with no action required. Final determination to be completed once all scum/residue is removed from surface area.

Due to the amount of scum/residue remaining in the tank a complete verification of what requires relining cannot be determined.

We do recommend a relining of the bottom head, walls, and penetrating stubs.



Client/End User to Provide:

- Electrical power access
- Extensive cleaning of the tank to remove scum/residue buildup
 - If the tank is determined to be cleaned as good as physically possible by City of Winnipeg, we would require a litmus test done and results submitted prior to performing service to ensure the safety of our technicians.

If any of the above items are not available or Customer is not able to supply, please let us know so we can arrange these items by Carlson

Carlson to Provide:

- Abrasive Blasting and Composite Technicians
- INEOS/Derakane Signia 411 WSR Resin (Pre-Promoted)
- Rescue System (Carlson technicians will have harnesses)
- Initiator
- Solvent
- Abrasive blasting equipment, dust extractor.
- Scaffolding to a maximum of 30ft in height.
- Cutting, Grinding, and sanding tools/equipment.
- Work bench and pipe stands and/or jigs
- Consumables (Serrated rollers, Stiff-bristled brushes, Unwaxed paper, measuring cups, or tubs)
- Mobile Trailer and restroom(s)

PHOTO'S ON FOLLOWING PAGES

If you have any questions or comments, please feel free to contact me.

Thank you,



Gene Waterson, CCT-C

Director of Composite Sales

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BH-1a



BH-1b





TW-1a



TW-1b



TW-1c





TW-1d



TW-1e



TW-1f + TH-1a





N1, N2, N3, N4, M1



N-2a, N-3a DOWNCOMERS





N-2b, N-3b DOWNCOMERS



N-6a



N-6b





N7 - M-1a



N7 - M-1b



N7 - M-1c



N7 - MW-1d

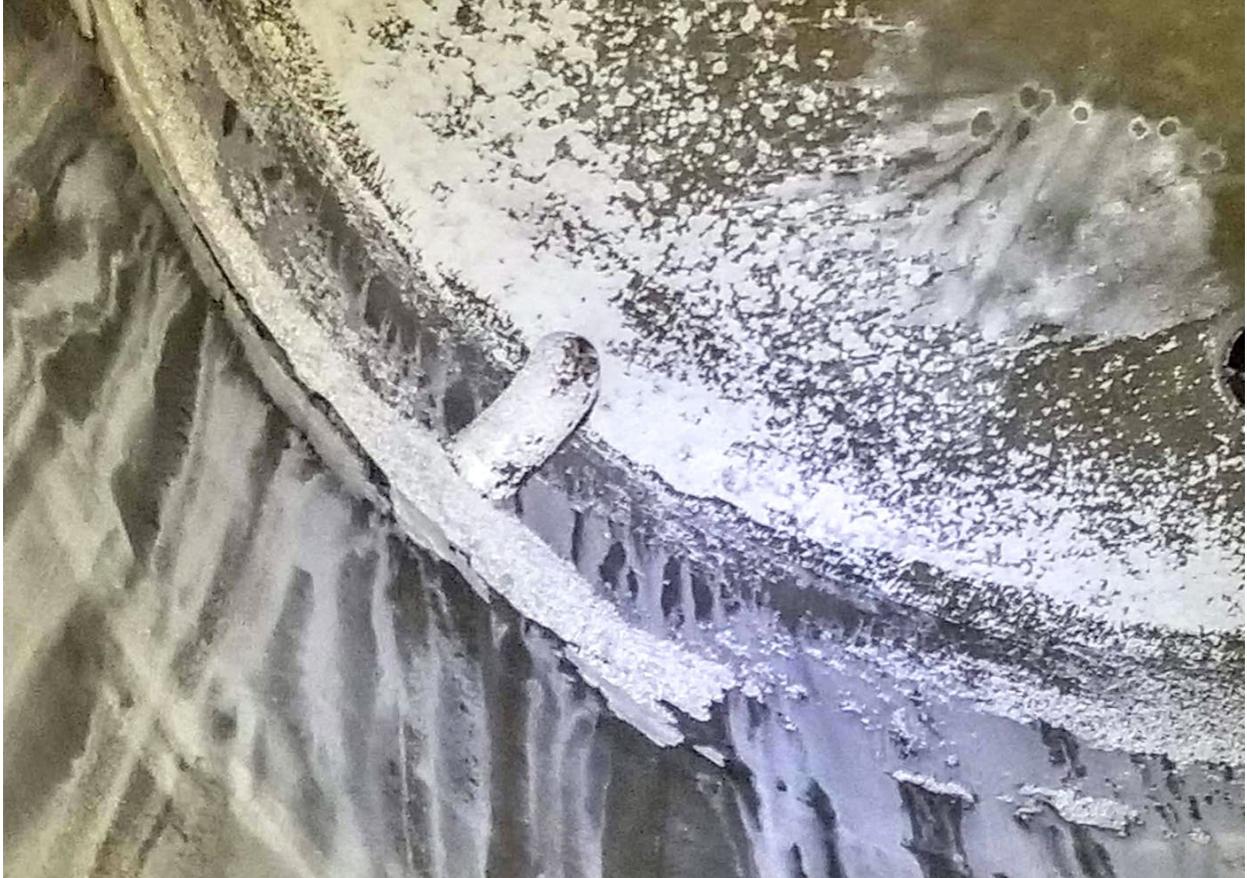


N7 - MW-1e





N-8a



N9



N-10



N-11





N-12



N-13

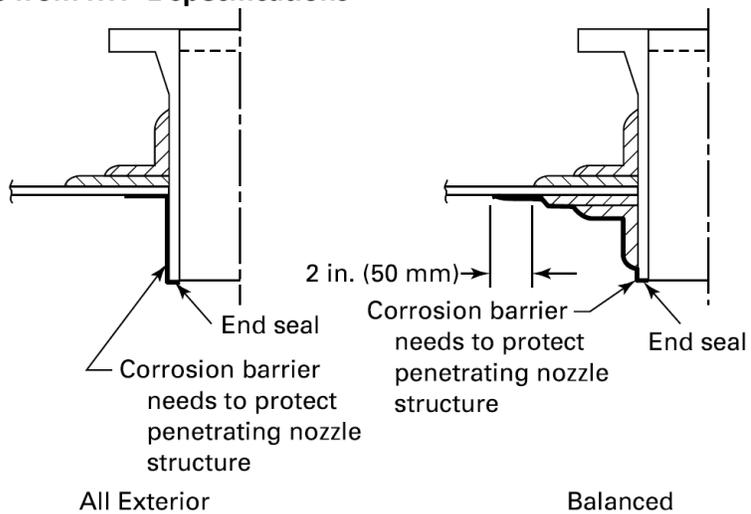


N-14a

Delamination of external secondary bond on penetrating stub and internal stub flange corrosion barrier due to improper secondary bonding.



N-14b from RTP-1 specifications









Bottom of Conical Gusset WITHOUT 0.25" weeping hole.

