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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

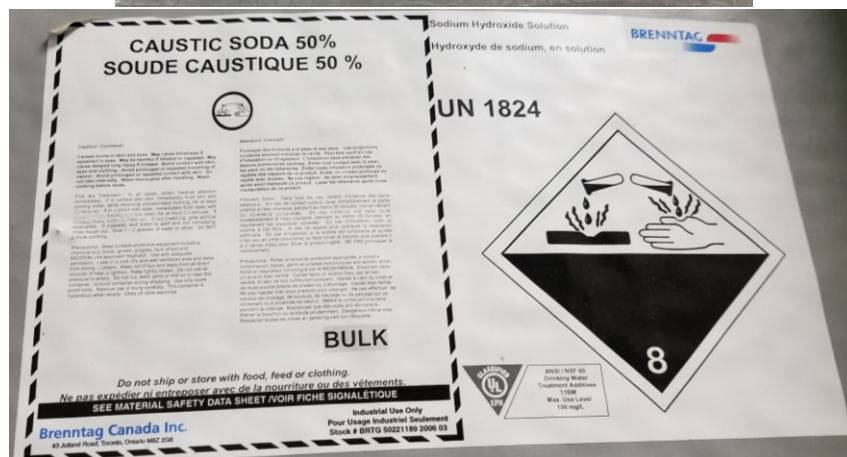
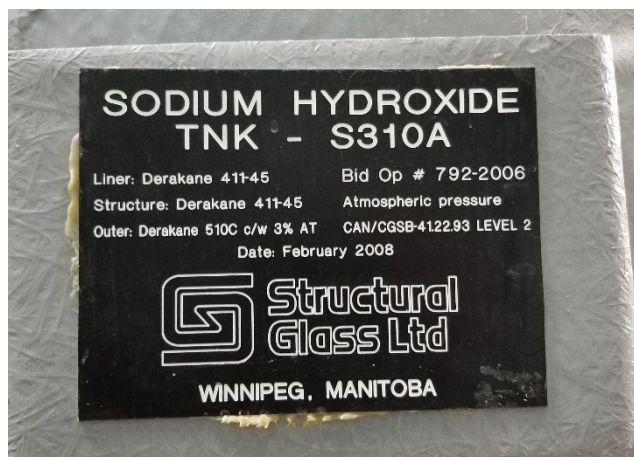


Inspection of: Sodium Hydroxide Tank Equipment No. TNK-S310A
Serial No. N/A
Built in 2008

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

Date of Inspection: January 28th, 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-S310A, 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-S310A 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 411-45 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 411-45 Vinyl Ester Resin.



Final Layer of 1ply CSM/WR/CSM and resin rich finishing layer using Derakane 510-C 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 @ 0.00
 - 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 (N7) and Lid interior appears to be in poor condition with minor 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 poor condition where chemical attack was present. Remainder of the flange area and lid was protected from chemical attack by the gasket seal.

Top Head Manway (N5) appears to be in good condition.

IMAGE: N7-a, N7-b, N7-c, N7-d, N7-e, N7-f (MW-2a, MW-2b, MW-2c, MW-2d, MW-2e, MW-2f)

Floor/Bottom Head:

Prior to entering the tank, the floor had noticeable scum/residue remaining in the tank covering approximately 30% 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 extremely poor condition with minor scum/residue remaining on walls covering approximately 10% of the visible area.

In locations that were visible, the extent of the dry glass NEXUS VEIL appearance was very evident throughout the entire 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 tank walls show extreme deterioration evident in **photos TW-X1a, TW-X1b**, which shows pitting and pinholes in the corrosion barrier. These are described as: Small, regular, or irregular crater on laminate surface, usually with nearly equal width and depth. Possible causes for this are: Air bubbles that rise to surface and curing occurs before rolling out bubbles.

The top 1500mm (60") 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

Tank Lid/Top Head:

Tank lid/Top Head appears to be in acceptable condition with minor deposits of scum/residue remaining on the top head covering approximately 10% of the visible area which looks to be from splashing during fill or the overflow "burping" which is the release of air in the pipe and elbow while liquid has completely covered the fitting and liquid is trying to enter against the air pressure.

IMAGE: TH-1a, TH-1b, N1, N2, N3, N4, N5 (M1)

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.

IMAGE: TH-1b, N1-a, N1, M1, N2, N3, N4, N5 (MW-1a, MW-1b, MW-1c, MW-1d)



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 minor scum/residue remaining on exterior of piping. Pipe supports and secondary bonding have deteriorated and appear to be in extremely poor condition where chemical attack was present.

IMAGE: N2-a, N3-a, N2-b, N3-b, N2-c, N3-c

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. 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.

IMAGE: N-6a, N-6b

Nozzle 5 (Top MANWAY) – Appears to be in good condition with no action required.

IMAGE: N-5a, N-5b

Nozzle 8 (OVERFLOW W/INTERNAL ELBOW) – Cannot determine condition due to the fitting being coated in scum/residue and the location is not accessible by standard inspection means.

IMAGE: N-8a

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

IMAGE: N-9, N-10, N-11

Nozzle 12 (DRAIN) – There are small amounts 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. 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.

IMAGE: N-12a, N-12b

Nozzle 13 (LEVEL GUAGE) - There are small amounts 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. 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.

IMAGE: N-13a, N-13b

Nozzle 14 (TEMPERATURE TRANSMITTER) - There are small amounts 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. 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. A hot coat appears to be applied to the end of the stub and now veil is present on this area. This nozzle may require replacement due to the dry glass and delamination starting at the stub end internal corrosion barrier.

IMAGE: N-14a, N-14b, N-14c



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.

IMAGE: ALL-1, ALL-2

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.

Top 1500mm (60") appears to be in good condition so no action is required

Fittings and Accessories:

All fittings excluding fitting on the top head require an external reline 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 appears to require an external reline 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.



Client/End User to Provide:

- Electrical power access
- Maintain the current cleanliness of the tank interior.

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
- 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)
- COR Certification in good standing
- Safety officer recognized and holding The National Construction Safety Officer (NCSO™) designation.

PHOTO'S ON FOLLOWING PAGES

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

Thank you,



Gene Walterson, CCT-C

Director of Composite Sales

Carlson Engineered Composites

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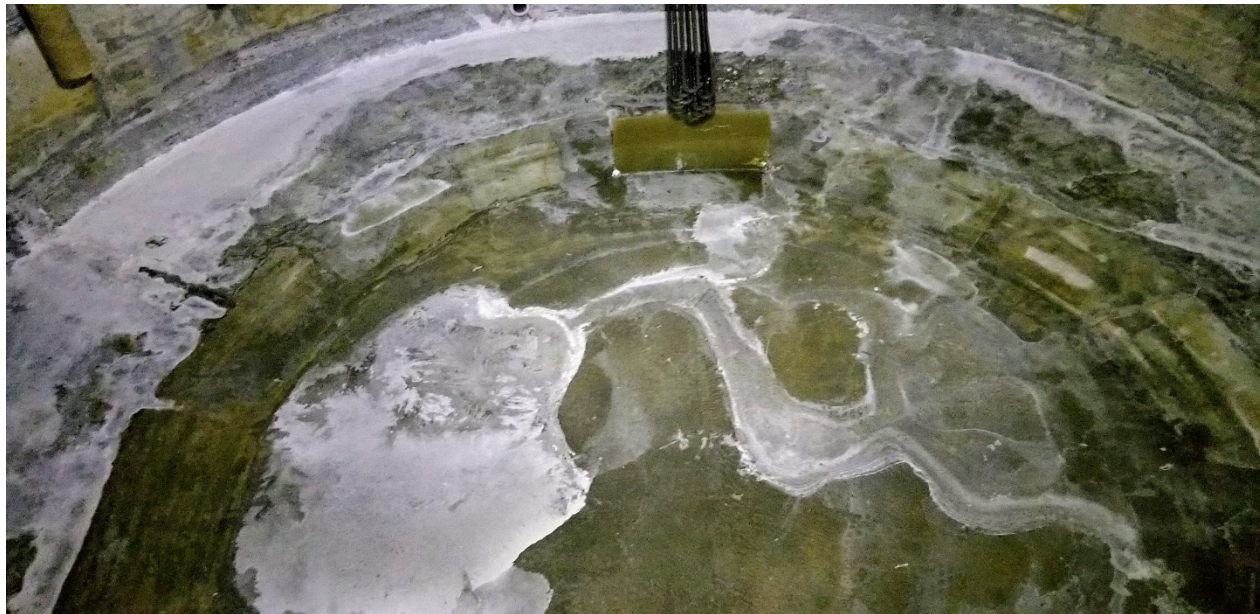
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www.carlsonindustrial.ca

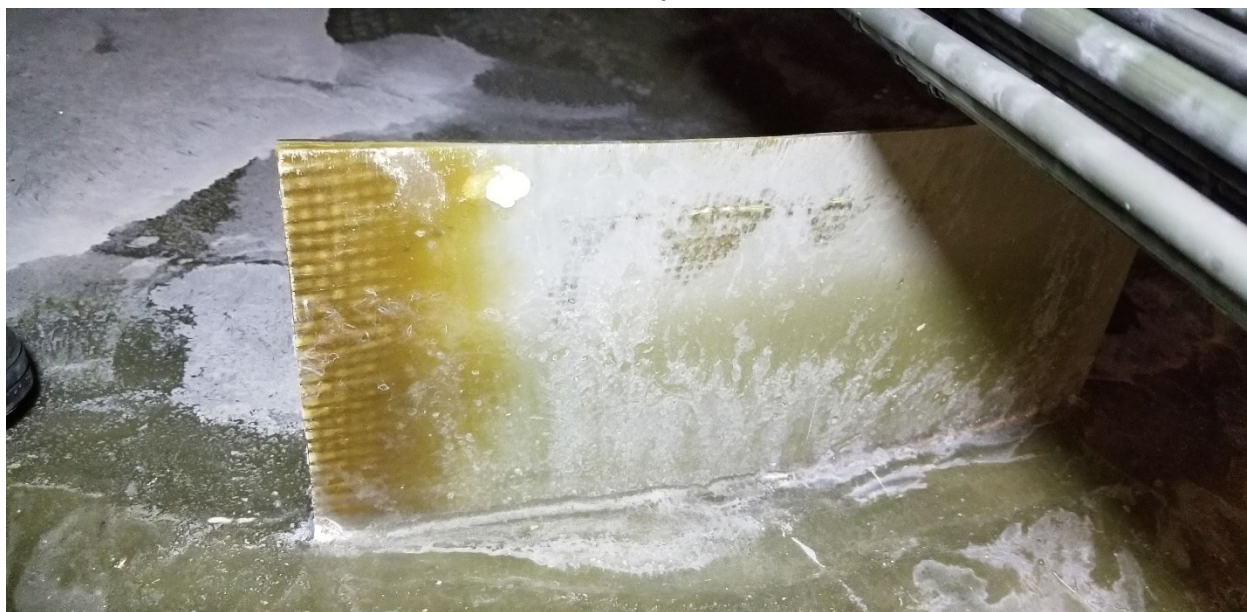
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BH-1a

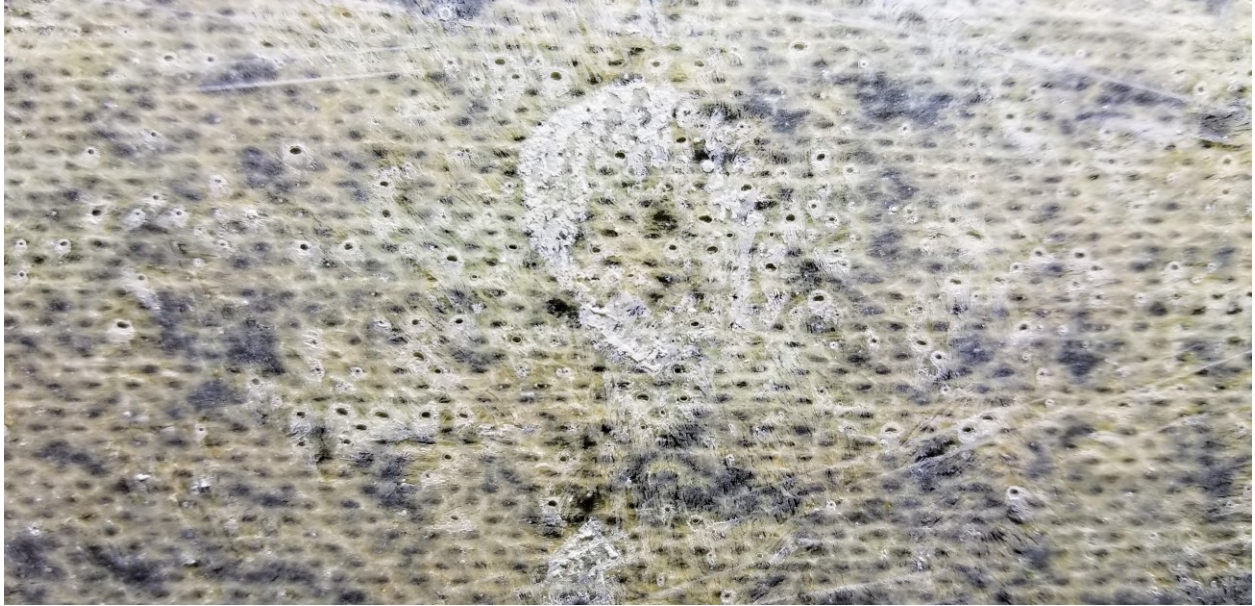


BH-1b





Close up of walls
TW-X1a



TW-X1b



TW-1a



TW-1b





TW-1c



TW-1d





TW-1e



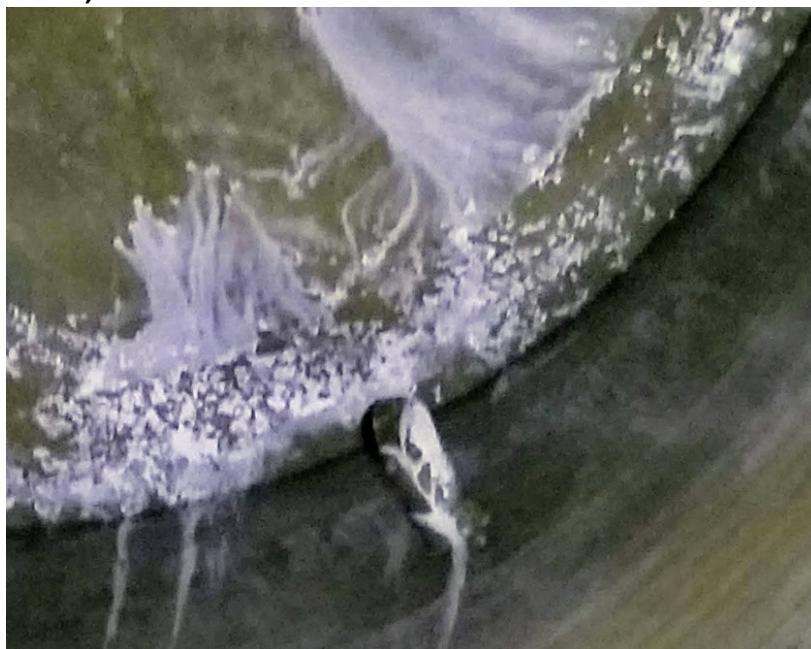
TH-1a



TH-1b, N1, N2, N3, N4, N5-a (MW-1a)



TH-1b, N1-a





N1, N5-b (MW-1b)



N2, N3



N4,



N5-c (MW-1c)





N5-d (MW-1d)



N2-a, N3-a DOWNCOMERS





N2-b, N3-b DOWNCOMERS



N2-c





N3-c



N-6a

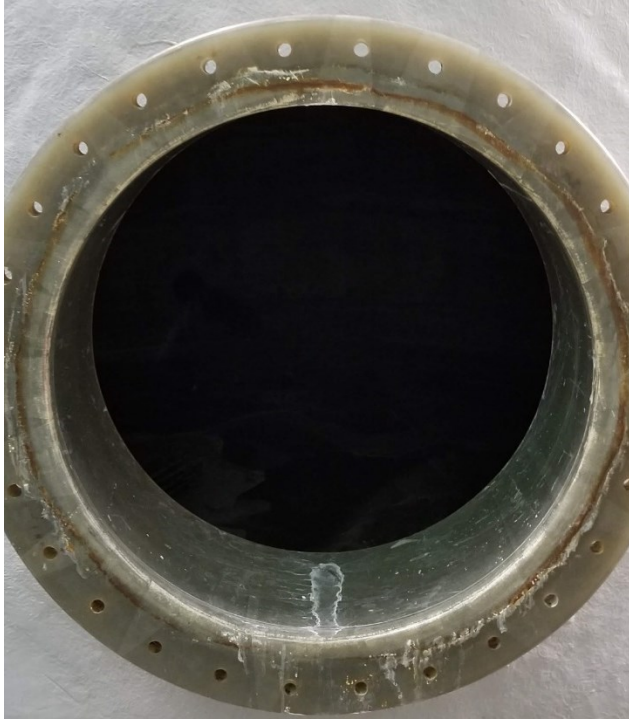


N-6b





N7-a (MW-2a)



N7-b (MW-2b)



N7-c (MW-2c)



N7-d (MW-2d)



N7-e (MW-2e)



N7-f (MW-2f)





N-8a



N9



N-10



N-11





N-12a



N-12b



N-13a



N-13b





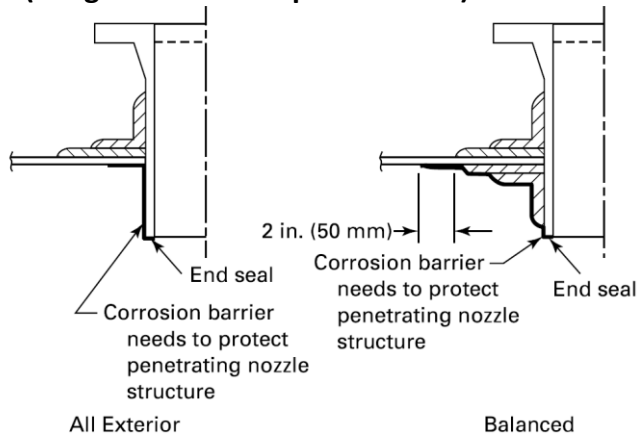
N-14a



N-14b



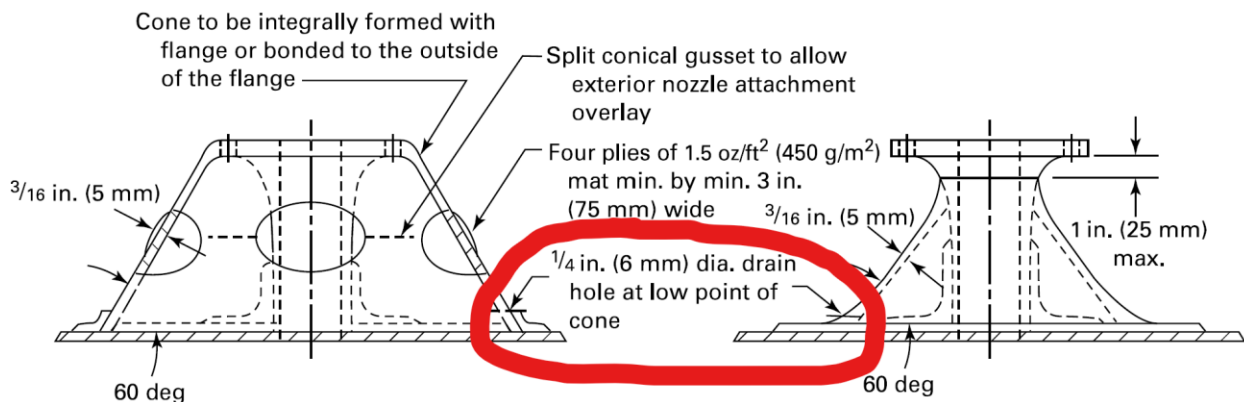
N-14c (Image from RTP-1 specifications)



ALL-1



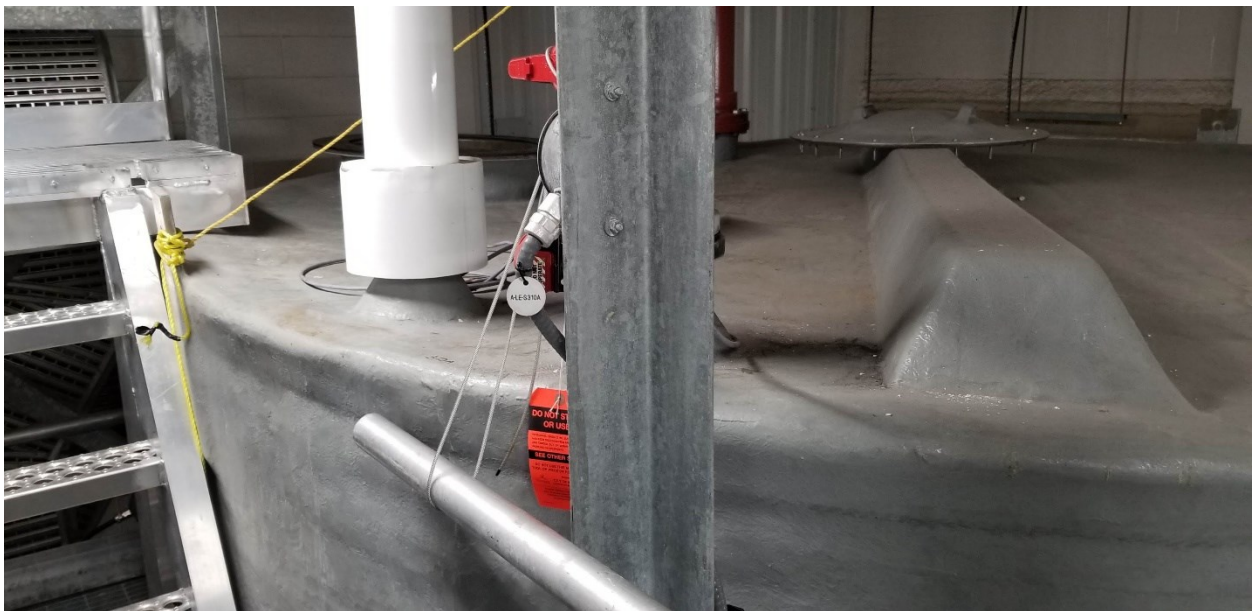
ALL-2 (Image from RTP-1 specifications)



(b) Typical Cone-Type Gussets [Note (2)]







END OF REPORT