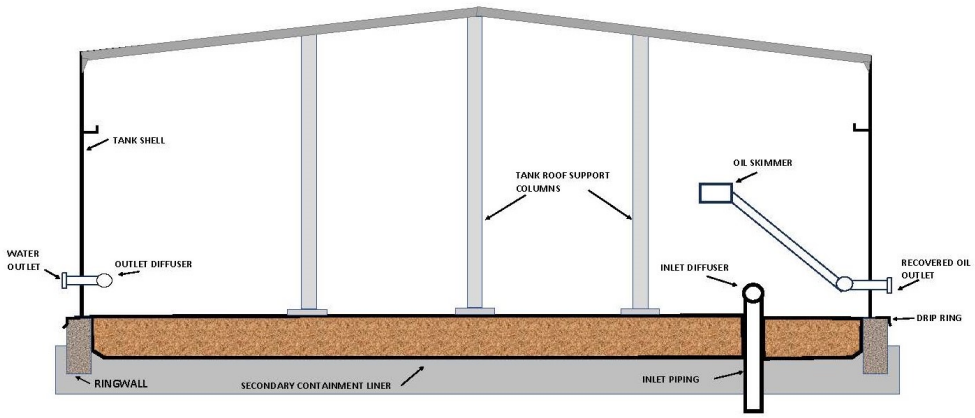
1

Background Tank 93 Information

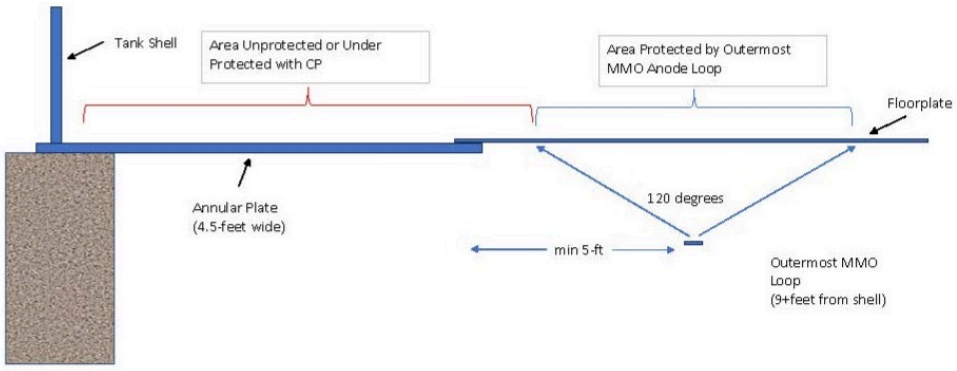
2

Tank 93 - Overview



3

Tank 93 - Cathodic Protection System



4

Tank 93 Floorplate Inspection Findings

- **Mag-Flux Leakage (MFL) inspection**
  - **Identified 870 indications**
- **Ultrasonic Testing (UT) Follow up**
  - **60 areas with less than 179 mils remaining floorplate thickness**
  - **14 of the areas with less than 179 mils remaining were adjacent to the annular plate and replaced when the annular plates were replaced.**
  - **46 floor plate patches were installed.**
  - **Deepest pit was 139 mils remaining.**

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Tank 93 Bottomside Floorplate Corrosion Rates

- **APSC API 653 Out-of-Service Inspection Report**
  - **Bottomside corrosion rate – 3.5 mpy**
  - **Recommended service interval - > 10-years (based on annular plate replacement)**
- **APSC Engineering Summary Report**
  - **Bottomside corrosion rate – 5.3 mpy (long-term corrosion rate)**
  - **Recommended service interval - 10-years (based on annular plate replacement)**
- **Taku Engineering Report**
  - **Bottomside corrosion rate – 6.9 mpy (short term corrosion rate)**
  - **Recommended service interval - 10-years (based on annular plate replacement)**

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Tank 93 CP System Monitoring

- **AMPP (formerly NACE) standards call out two criteria for cathodic protection (CP).**
  - **A polarized potential of -850 mV (accounting for IR drop), or**
  - **100 mV of polarization.**
- **The AMPP standard (NACE SP-0193) requires that in order to use the 100 mV criteria, the operator should measure the formation or decay of polarization.**
  - **APSC's internal written procedures align with the AMPP standard with regard to monitoring the formation or decay of polarization.**

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Tank 93 CP System Monitoring Issues

- **None of the Tank 93 CP data meets the -850 mV criteria for CP.**
- **APSC is relying on 100 mV shift criteria to show that Tank 93 is cathodically protected.**
  - **APSC has been using depolized data as old as 9-years old in lieu of measuring the formation or decay of polarization.**
- **APSC is not collecting CP data in the outermost 10-feet of the tank perimeter.**
  - **This is the area of the most active corrosion.**
- **Replacement of the annular plate, 870 MFL indications and the installation of 46 patches suggests that the CP system is not effectively protecting the tank bottom.**

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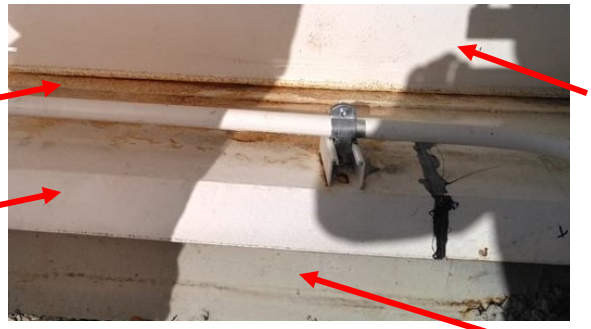
Annular Plate Extension Seal



Annular Plate Drip Ring

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Tank 93 Roof Support Column Inspections & Repairs

- **Inspection of the roof support columns was expanded from spot readings at the bottom to comprehensive inspection of the bottom 20-feet of the columns.**
- **The APSC engineering summary report indicated that lower portion of each roof support column was inspected.**
- **Sleeves were installed on the bottom 15-feet of the outer columns.**
- **Internal anodes were installed in the columns**

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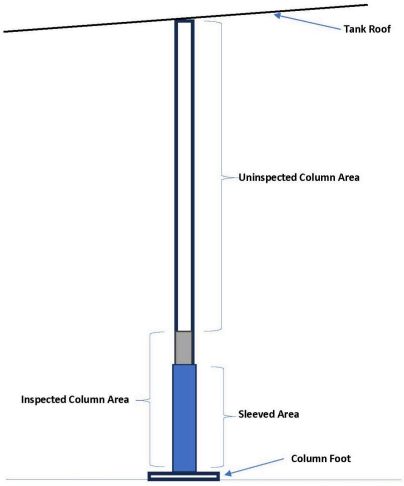
Tank 93 Roof Support Column Inspection & Repair Issues



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Tank 93 Roof Support Column Inspection Issues

- **The Engineering Summary report indicated that corrosion identified on the columns was most severe at the lower portion of the columns.**
  - **No data was provided to support that finding.**

- **Values for the column minimum remaining effective structural thickness (T_{EST}) and minimum required remaining effective structural thickness (60% T_{NOM}) of the outer columns were provided but no calculations were provided for ascertaining those values.**

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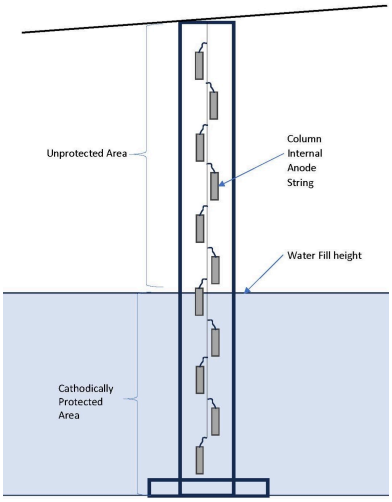
Tank 93 Roof Support Column Repair Issues

The Engineering Summary Report States "The internal column anode strings are expected to significantly reduce the rate of corrosion within the columns"



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Tank 93 Summary

- **Conflicting APSC tank inspection reports**
  - **Creates unnecessary risk**
- **APSC CP collection practices**
  - **Not following industry standards**
  - **Not monitoring outermost 10-feet (location of corrosion)**
- **Perimeter CP Is insufficient**
  - **Active corrosion on the perimeter plates**
  - **Annular ring replacement was necessary due to corrosion**
- **Roof support column condition is not fully documented in the API 653 Report or Engineering Summary Report.**

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Tank 93 Recommendations

- **Utilize the deepest floorplate corrosion as the basis for corrosion rate and service interval calculations in all reports.**
- **Adjust CP monitoring practices**
  - **Follow NACE SP-0193 & MP-166 3.23. Measure the formation or decay of polarization.**
  - **Collect CP data for the tank perimeter area (0-10 feet in from shell)**
- **Upgrade the perimeter CP**
- **Better define the column condition**
  - **Determine the condition above 20-feet**
  - **Provide calculations for remaining effective structural thickness (T_{EST}) and for defining the minimum allowable remaining effective structural thickness as (60% T_{NOM}).**

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