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Corrosion Control of Aboveground Storage Tank (AST) Bottoms

PHMSA R&D Forum Workgroup 6 – Breakout Tanks

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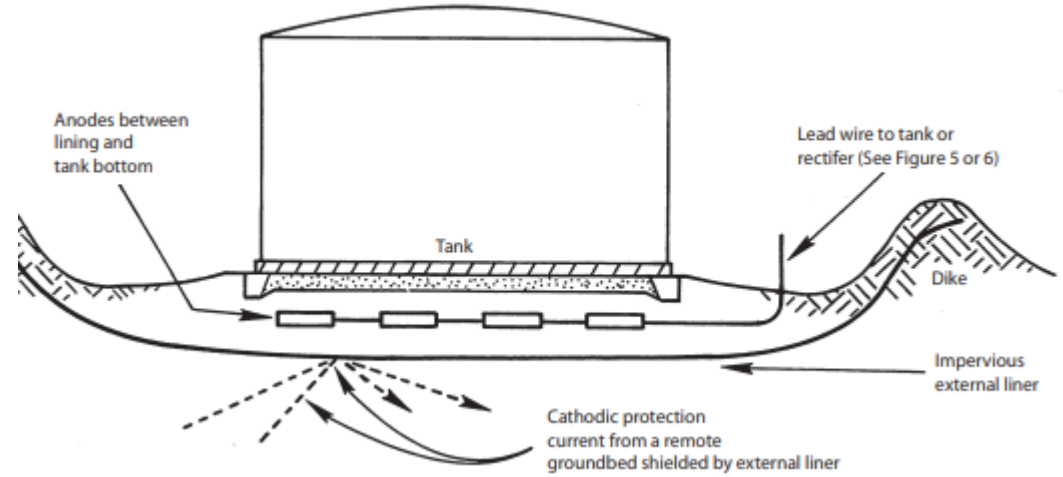


Corrosion Control of AST Bottoms

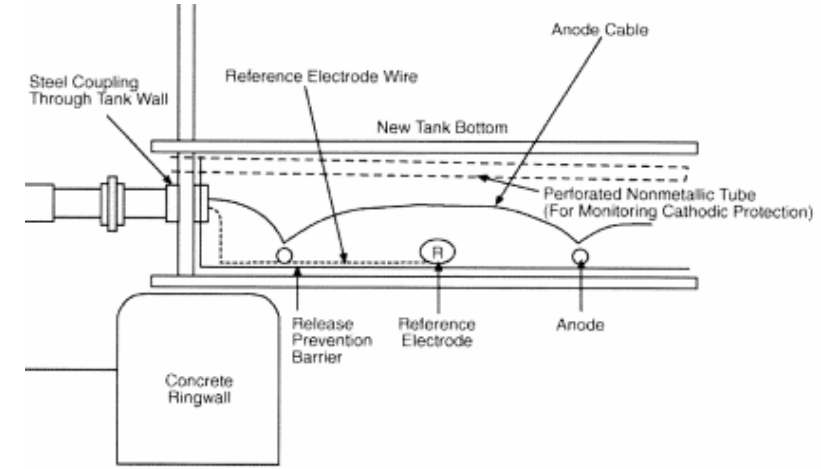
- Objective
 - Manage the corrosion rate to reach the scheduled inspection with no loss of containment
- Corrosion Control Design Considerations
 - New or Existing Tank
 - Foundation Type
 - Bottom Scenario (single vs. double)
 - Tank Pad (sand, concrete, asphalt, etc.)
 - Release Prevention Barrier (RPB)
 - Construction Practices
- Corrosion Control Methods
 - Cathodic Protection (CP)
 - Tank Pad Selection
 - Vapor Phase Corrosion Inhibitors (VCI)

Corrosion Control of AST Bottoms

- CP Pros
 - Common method of corrosion control
 - Performance criteria established
- CP Challenges
 - Contamination of tank pad
 - Voids in protection
 - Tank bottom flexing (tank hydraulics)
 - Monitoring
 - Reference cells
 - Malfunctioning CP System
 - Shorts or cable breaks
 - Depleted under tank CP system
 - Shielding
 - Old floor
 - RPB (HDPE Liner)



¹Figure 1: Impervious External Liner Beneath Storage Tank



²Figure 2: Typical Double-Bottom Cathodic Protection Layout (Impressed or Sacrificial)



¹Cathodic Protection of Aboveground Petroleum Storage Tanks API RECOMMENDED PRACTICE 651 THIRD EDITION, JANUARY 2007
²NACE Standard RP0193-2001 Item No. 21061 Standard Recommended Practice External Cathodic Protection of On-Grade Carbon Steel Storage Tank Bottoms

Corrosion Control of AST Bottoms

- Tank Pad Selection
- Concrete (El Segundo) Pros
 - Generally noncorrosive electrolyte
 - Less component issues
 - Conducive to RPB application
- Concrete Challenges
 - Contamination of tank pad
 - Monitoring
 - How and what to monitor?

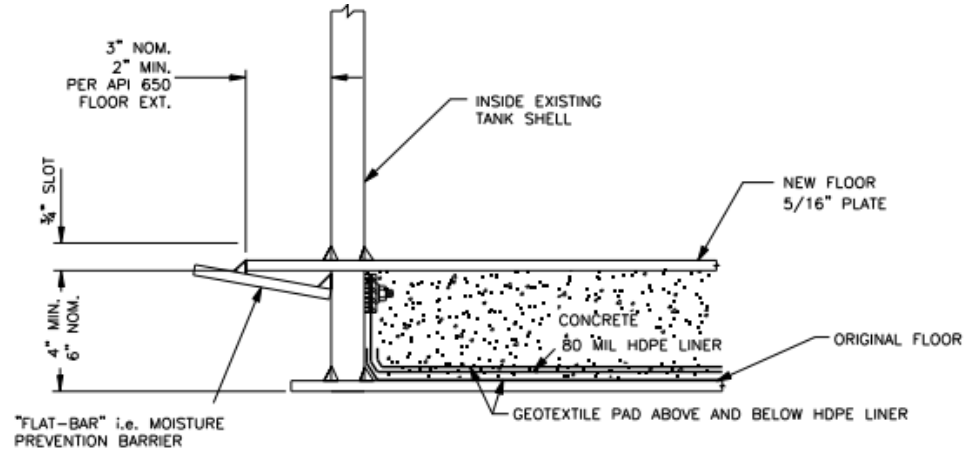


Figure 3: El Segundo Corner and Liner Attachment Details

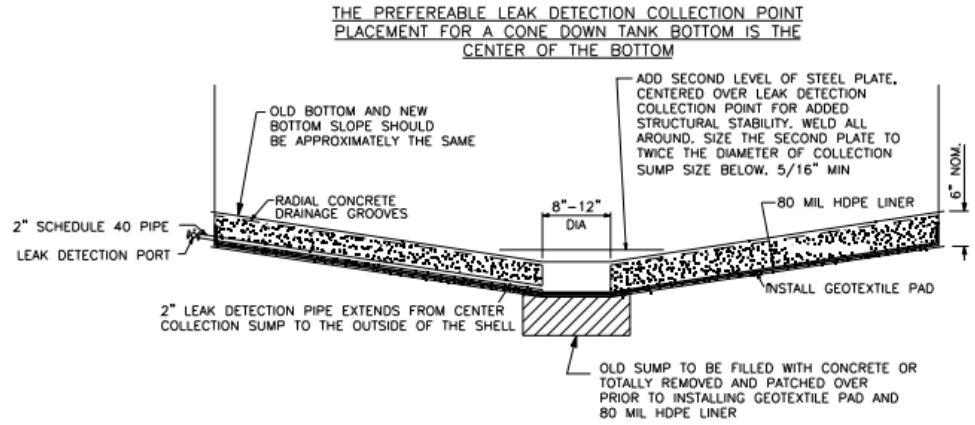


Figure 4: El Segundo Double Bottom Cone Down

Corrosion Control of AST Bottoms

- VCI Pros
 - Addresses voids in protection
 - Supplement existing CP systems
 - No removal of tank floor for application
 - In-service installation
- VCI Challenges
 - Tank Sealing
 - Monitoring
 - How and what to monitor?
 - Compatibility with CP

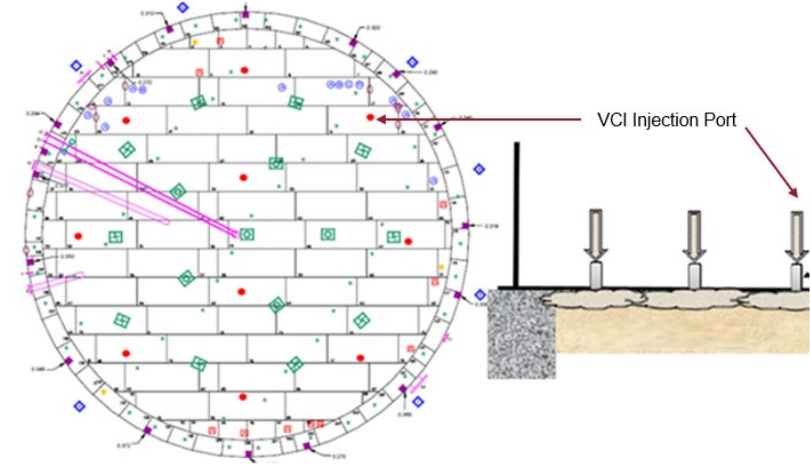


Figure 5: VCI Injection Tank Out of Service Example

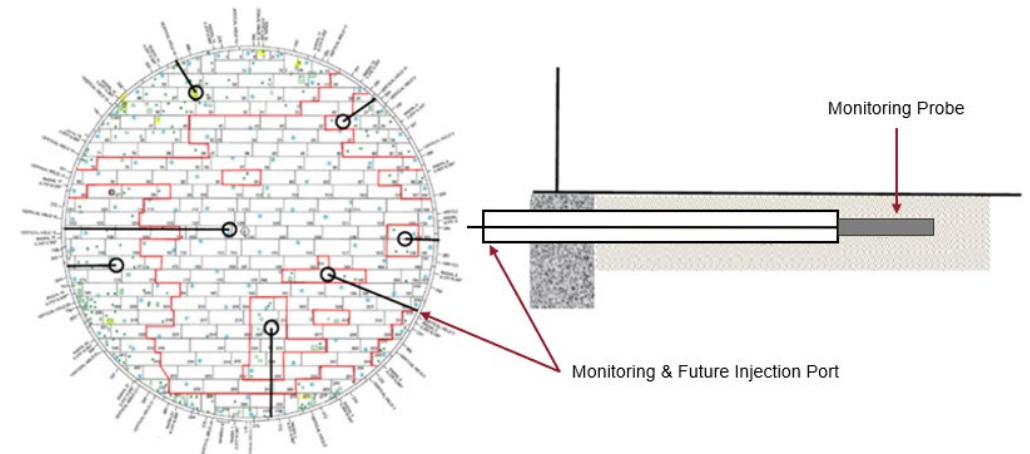


Figure 6: VCI Monitoring & Injection In Service Example

Corrosion Control of AST Bottoms

- Corrosion Control GAPS
 - Application / limitations of corrosion control methods
 - Renewed focus on corrosion control design
 - Monitoring
 - Performance criteria for other corrosion control methods
 - VCI effectiveness stand alone
 - VCI compatibility with CP