



We do the right thing.

In-Service Inspection Program for the SRS Waste Tanks: Update

9/01/09

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SRR, Office of the Chief Engineer

Acronyms

- SRR: Savannah River Remediation
- SI: Structural Integrity
- ISI: In-Service Inspection
- Kgal: Thousands of gallons
- Mgal: Millions of gallons
- SRNL: Savannah River National Laboratory
- SST: Single Shell Tank
- DST: Double Shell Tank
- VSC: Vapor Space Corrosion
- GAO: Government Accountability Office
- DNFSB: Defense Nuclear Facilities Safety Board
- TSIP: Tank Structural Integrity Panel
- SCC: Stress Corrosion Cracking
- AUT: Automated Ultrasonic Inspection

- SRR Committed to Safety and Security Excellence
- Still THE priority
- SRR will continue the SRS safety tradition
- Security is like safety: SRR will keep it front and center

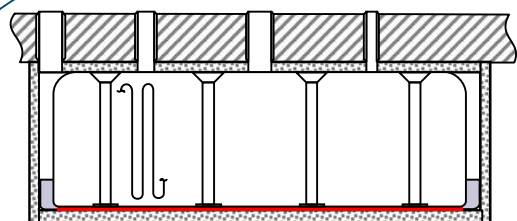


- Calendar Year 2008 Inspection Results
- Waste Tank Design
- Structural Integrity (SI) Program
- Corrosion Control Program
- In-Service Inspection (ISI) Program
- SRR Program Status

CY2008 Inspection Results

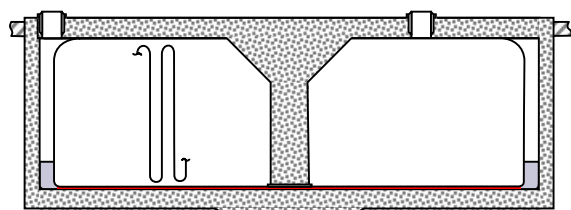
- WSRC-STI-2009-00352, “Annual Radioactive Waste Tank Inspection Program – 2008”
- 6782 photographs
- 1633 visual/video inspections
- Two new leaksites identified
 - Tank 5 (during final cleaning) and Tank 12(during waste removal)
 - Consistent with known degradation mechanisms in non-compliant, old-style Type I/II tanks with partial secondary containment
 - Specific response/communication plans during waste removal and cleaning activities

Waste Tanks



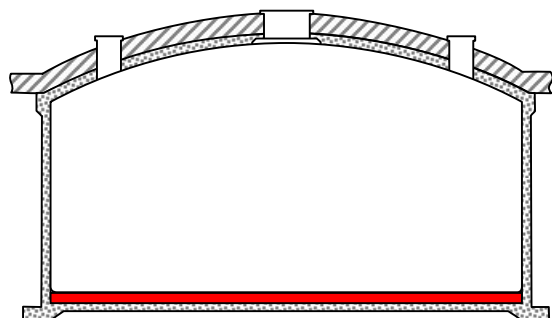
Type I (12)

Old Style
750 kgal
1951-1953



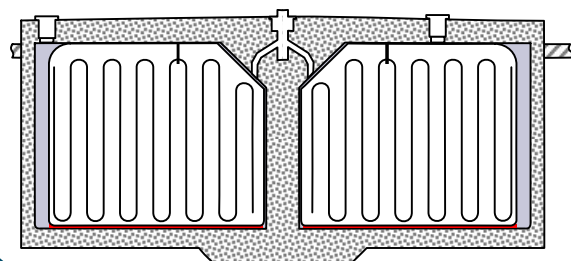
Type II (4)

Old Style
1.0 Mgal
1955-1956



Type IV (8)

Old Style
1.3 Mgal
1956-1960



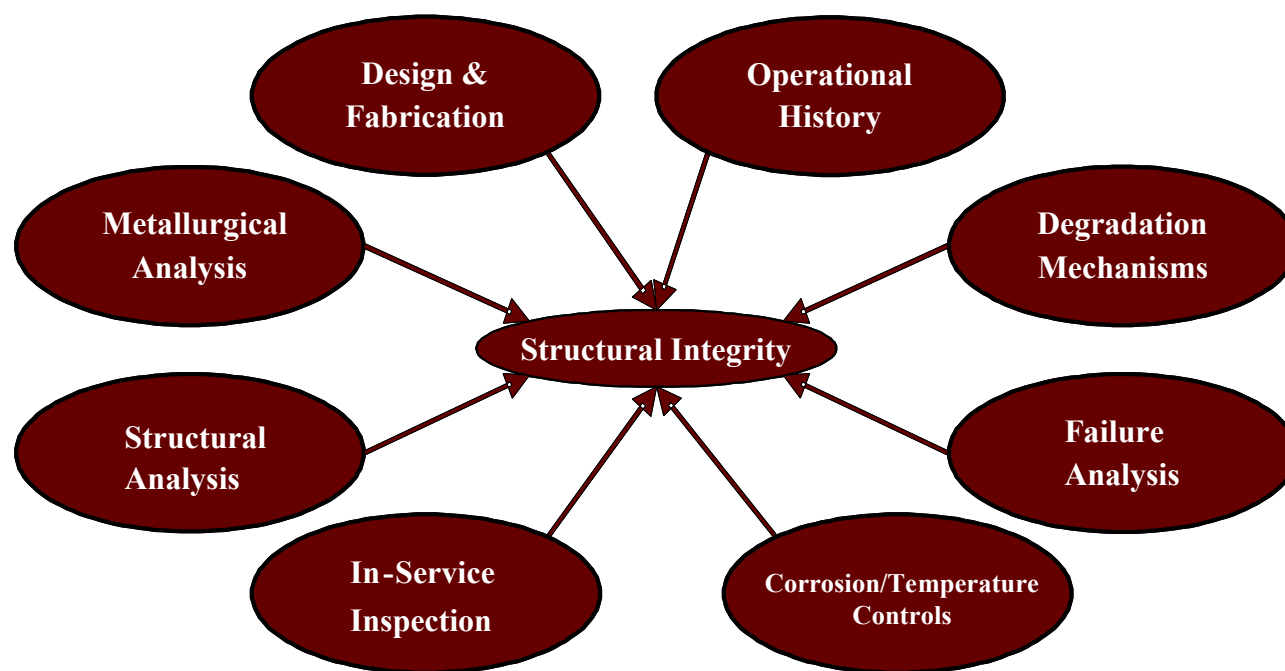
Type III (27)

New Style
1.3 Mgal
1966-1981

- (24) Old Style Tanks
 - Type I/II: partial secondary containment
 - Routine visual inspections of annulus
 - Monitor and visually inspect during waste removal activities
 - Type IV: single shell tanks (SST)
 - Routine internal visual inspections
 - Up to 50 years old
 - Do not have full secondary containment
 - (2) have been closed
 - No active leaksites today
- (27) New-Style Tanks
 - Full secondary containment
 - No leakage history
 - Receive all new waste
 - Used for all processing activities
 - Comprehensive inspection program
 - Visual inspections
 - Volumetric inspection

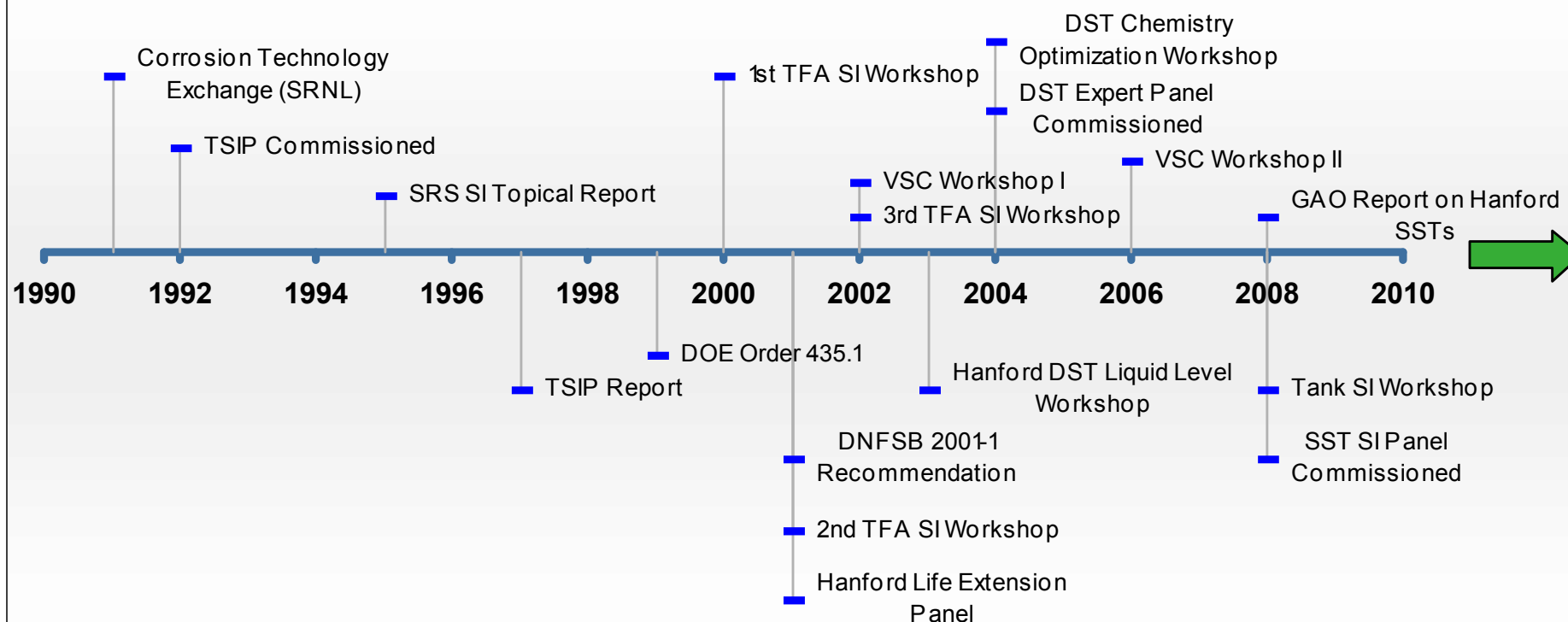
Structural Integrity Program

- Waste tanks provide critical interim containment for waste prior to processing and permanent disposal
- Comprehensive integrated approach to maintaining structural integrity of tanks, a critical component of operations
- Evolving program to successfully address emerging issues and preclude consequential degradation



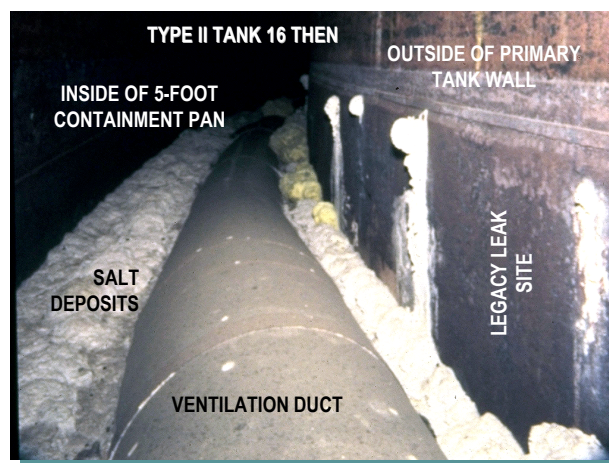
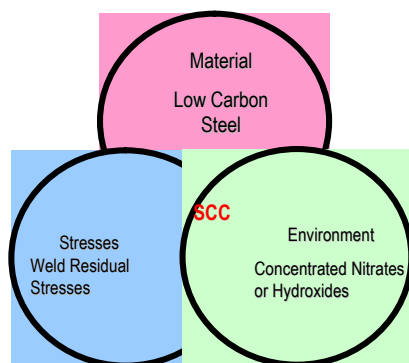
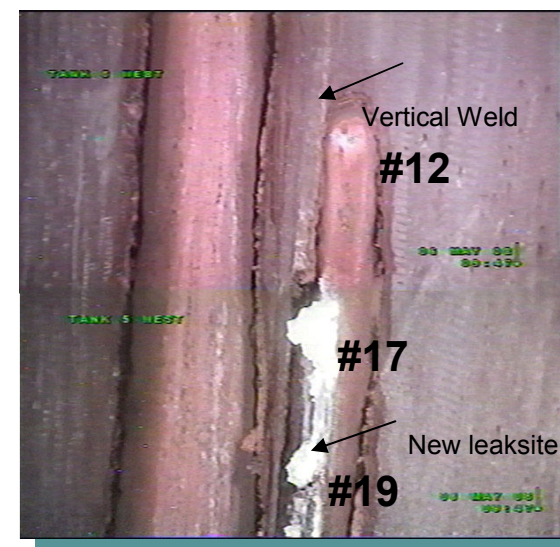
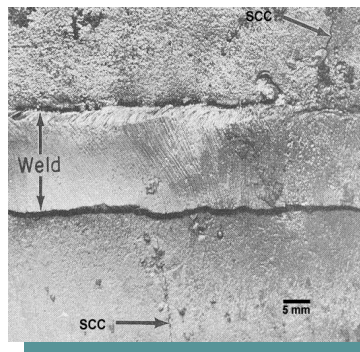
Complex-Wide Tank Farm Structural Integrity Focus

History of Tank Farms SI



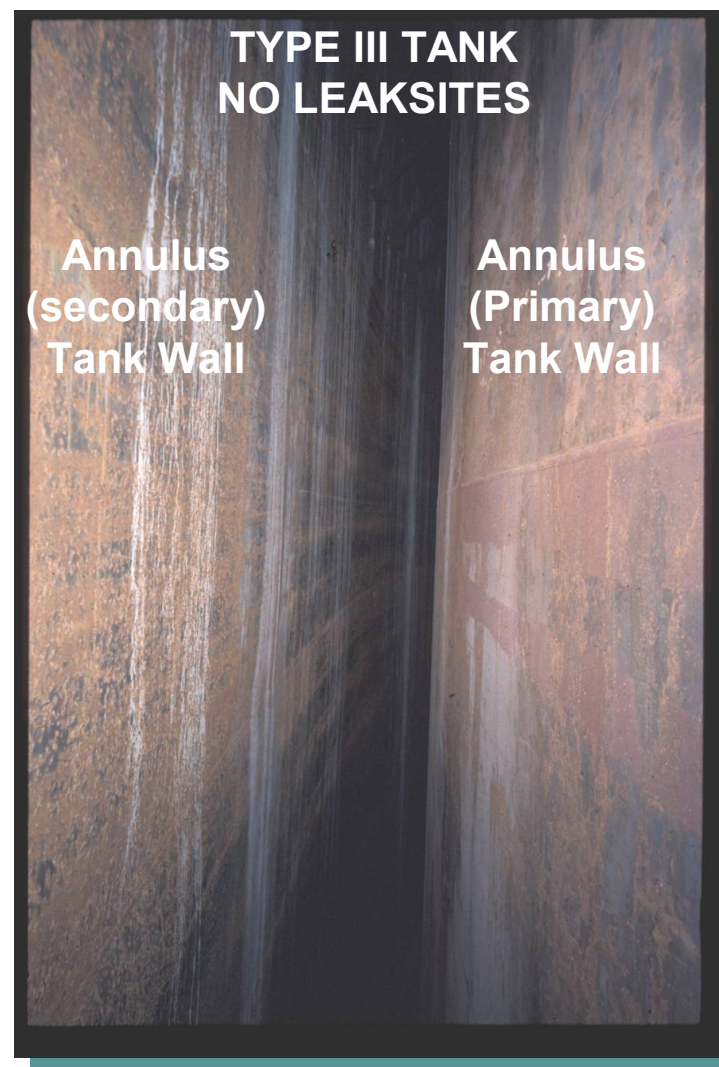
Degradation Mechanisms

- Primary mode of degradation is nitrate-induced stress corrosion (SCC) cracking near fabrication welds or repair welds
- Occurred early in service in non-stress relieved Type I/II Tanks
- Type III Tanks have no known leaksites
 - Better materials of construction
 - Post-weld heat treatment to relieve weld residual stresses
- Corrosion control program to preclude further degradation



Corrosion Control Program

- Maintain corrosion inhibitors
 - Envelope of nitrite, hydroxide, nitrate concentrations
- Maintain temperatures
 - Concentration dependent temperature limits



Comprehensive Inspection Program

- Visual Surveillance
 - Still photography – (~5000 photos/year)
 - Wide Angle
 - Direct
 - Video Camera Inspections (over ~1000 video/visual exams/year)
- In-Service Inspection Program
 - NDE inspections included remote automated ultrasonic (AUT) inspection supplemented by remote visual inspection.

Comprehensive Inspection Program

- Type I/II tanks
 - No active leaksites
 - Use of conductivity probes in annulus
 - Routine visual inspections of annulus
 - Monitor and visually inspect during waste removal activities
- Type III/IIIA tanks
 - Comprehensive visual inspection program
 - Comprehensive volumetric inspection program

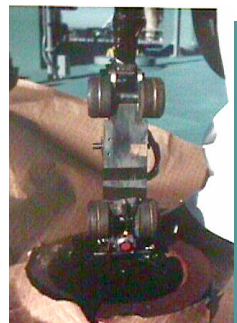
Visual Inspections

- Visual evidence of changes in tank component appearance
 - Leak sites
 - Corrosion
 - Abnormal conditions



Ultrasonic Inspections

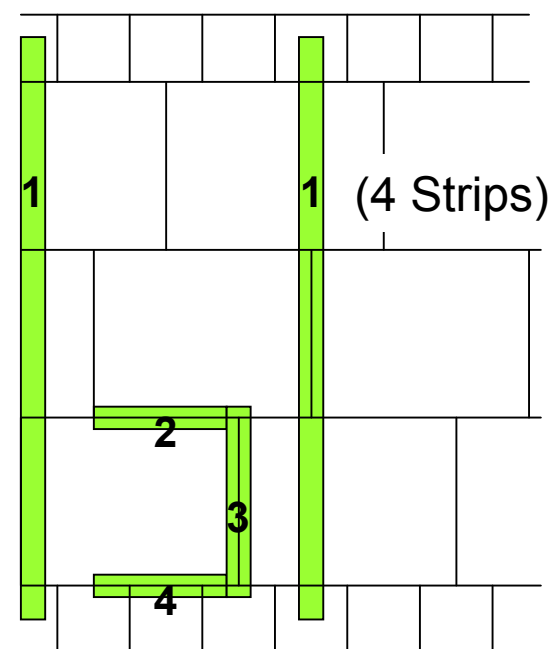
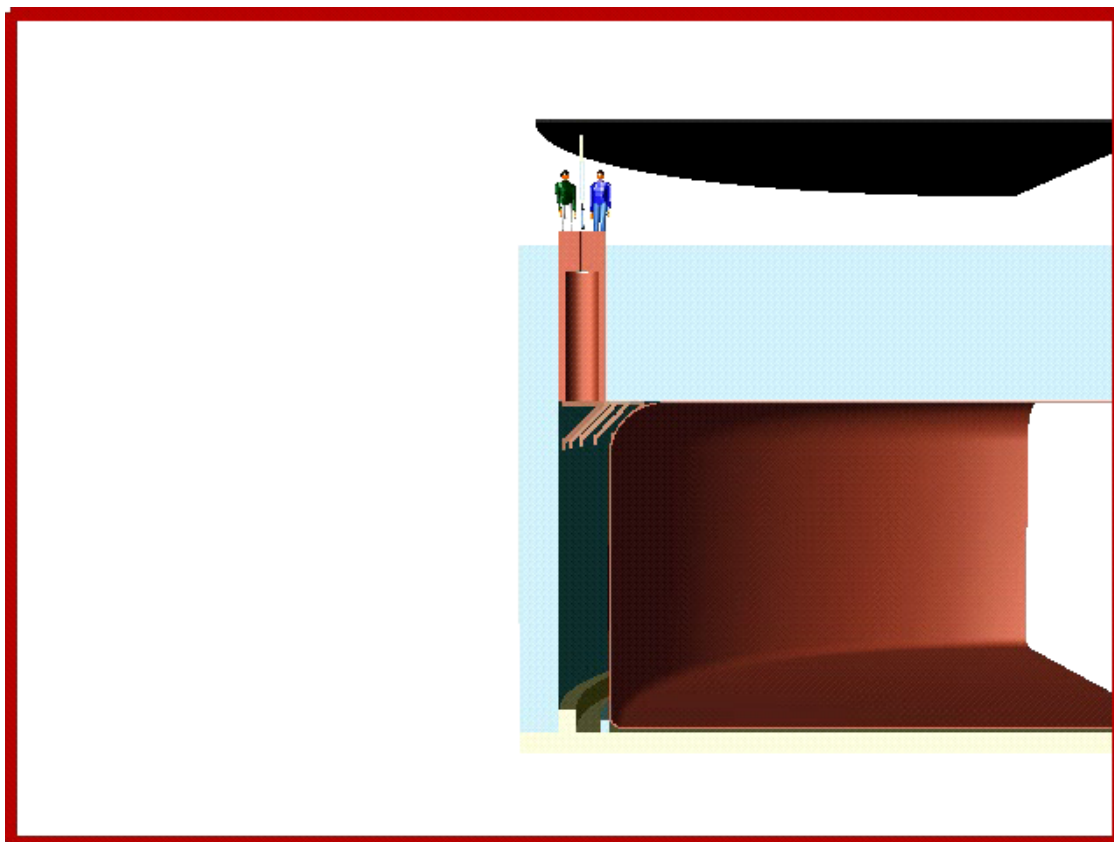
- Historical Volumetric Wall Measurements
 - Data collection initiated in 1967
 - Collected over 24,000 spot measurements thru 1985
- NEW PROGRAM 1st CYCLE COMPLETED
- All 27 Type III tanks inspected with new program
- Examinations look for wall thinning, pitting, and Stress Corrosion Cracking
- Type II Tank 15 inspected twice
- Inspect primary and secondary walls
- Formal methodology for disposition of results



- Access thru small-diameter riser
- On-board cameras



Ultrasonic Inspection of a Tank



Probe travels over
1 mile during a
tank inspection

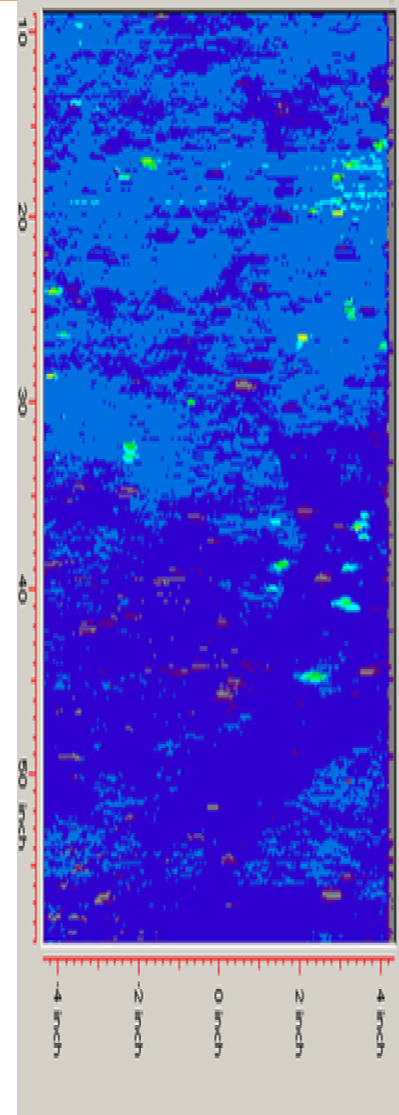
- Consistent with understanding of waste chemistry and known mechanisms
- One-riser inspections as likely to find pitting as four-riser inspections
- No reportable, service induced indications (i.e., wall thinning, pitting, or cracking) on the primary tank wall.
- Revealed incipient pitting and non-reportable indications on the interior of the few primary tank walls.
 - Most are pre-service
- Revealed reportable wall thickness and locally thin areas on the secondary wall and floor.

Tank #	Inspection Year (FY) / Inspection Type *	Incipient Pitting Indications	Comments
25	2004 / A	One 0.35" diameter pit 0.036" deep.	Isolated, broad shallow pitting
29	2006 / FS	Four 0.5" diameter pits 0.019 – 0.065" deep	Isolated, broad shallow pitting
31	2003 / A	One ~0.37" diameter pit 0.046" deep	Isolated, broad shallow pitting
32	2003 / FS	Three pits, max 0.75" diameter and 0.055" deep	Isolated, broad shallow pitting.
49	2005 / A	A band of pitting ~85 to 114 inches tank elevation. Up to 0.75" diameter and 0.040" deep.	Broad shallow pitting

* FS = Full Scope A= Augmented

Baseline Data: Incipient Pitting Definition

- Incipient pitting is a term used to describe small pit-like indications prior to them becoming reportable or actionable
- The term describes a shallow indication
- The term does not necessarily imply that the pit has recently developed or that it is still growing
- Many incipient pits may have developed pre-service



Tank 49
2004

2nd Cycle ISI Plan

- Revised SRS ISI Program for waste tanks inspects all 27 Type III/IIIA tanks
 - Incipient interior tank wall indications
 - Wall thickness of secondary
 - Knuckle region in select tanks
 - High stress region: Tank 50
- Frequency
 - All 27 type III/IIIA tanks shall be inspected every 6-10 years
 - Tank 15 shall be inspected seven years after the most recent inspection
 - A formal review of the ISI program shall be performed every three years
- Acceptance Criteria outlines actions in response to indications consistent with national “Tank Structural Integrity Panel” recommendations

2009 Tank 29 Inspection

- Special inspection performed on Tank 29 to confirm assumption of circumferential uniformity of service-induced pitting
- One-strip inspection covers all historical interfaces (e.g., liquid-air) known to be the highest risk areas for corrosion
- Tank 29 inspected through all accessible risers (16) to provide the rigorous technical bases prior to launching of the next cycle of inspections

Summary

- The structural integrity program for the SRS tanks has over 50 years of successful operation
- Program aggressively addresses emerging issues
- Program proactively evolves in support of mission goals
- Technology-based evolution of programs
- *POISED TO SUPPORT THE FUTURE*

- Questions?