U.S. Department of Energy
Office of River Protection
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

11-TF-039

MAR 1 1 2011

Ms. Jane A. Hedges, Program Manager
Nuclear Waste Program
State of Washington
Department of Ecology
3100 Port of Benton Blvd
Richland, Washington 99352

Dear Ms. Hedges:

COMPLETION OF HANFORD FEDERAL FACILITY AGREEMENT AND CONSENT ORDER (HFFACO) TARGET M-045-91G-T05, DUE MARCH 31, 2011

This letter documents completion of the HFFACO Target Date M-045-91G-T05. This target date requires that the U.S. Department of Energy, Office of River Protection complete a report documenting and evaluating the visual inspection of twelve single-shell tanks, per criteria listed in Table 3.3, "Criteria for Single-Shell Tank Inspections," in document RPP-PLAN-46847, Rev. 0, *Visual Inspection Plan for Single-Shell Tanks and Double-Shell Tanks*, and submit the report to the Washington State Department of Ecology.

Twelve single-shell tanks were inspected during Fiscal Year 2010 in accordance with the *Visual Inspection Plan*, using a video camera inserted into the tank space through an access riser. Based on the inspection results, the structural integrity of the concrete domes were determined to be satisfactory. Small concrete surface anomalies were noted and reviewed, including cold joints, salt lines, and irregular surface patterns. None of these was considered to be structurally significant.

The inspection results have been summarized in report, RPP-RPT-48194 Rev. 0, *Fiscal Year 2010 Visual Inspection Report for Single-Shell Tanks*. A copy of the report is attached for your information.

If you have any questions, please contact me, or your staff may contact Thomas Fletcher, Acting Assistant Manager, Tank Farms Project at (509) 376-3434.

Sincerely,

Jonathan A. Dowell, Acting Manager
Office of River Protection

TF: JMJ

Attachment

cc: See Page 2

cc w/attach:
S. Harris, CTUIR
J. J. Lyon, Ecology
J. B. Price, Ecology
D. A. Faulk, EPA
S. L. Leckband, HAB
J. F. Oilero, MSA
R. E. Piippo, MSA
J. G. Vance, MSA
G. Bohnee, NPT
K. Niles, ODOE
L. Buck, Wanapum
W. T. Dixon, WRPS
J. W. Donnelly, WRPS
R. E. Gregory, WRPS
S. E. Killoy, WRPS
J. J. Luke, WRPS
F. R. Miera, WRPS
R. Jim, YN
Administrative Record
Environmental Portal, LMSI
TPA Administrative Record (S-2-4)
WRPS Correspondence

ATTACHMENT
TO

11-TF-039

RPP-RPT-48194 REV. 0, *FISCAL YEAR 2010 VISUAL INSPECTION REPORT FOR SINGLE-SHELL TANKS*

DOCUMENT RELEASE FORM

(1) Document Number:	RPP-RPT-48194	(2) Revision Number: 0	(3) Effective Date: 11/2010
(4) Document Type:	☐ Digital Image ☐ Hard copy ☒ PDF ☐ Video	(a) Number of pages (including the DRF) or number of digital images	76
(5) Release Type	☒ New ☐ Cancel	☐ Page Change	☐ Complete Revision
(6) Document Title:	Fiscal Year 2010 Visual Inspection Report for Single-Shell Tanks		
(7) Change/Release Description:	New Release		
(8) Change Justification:	N/A		

(9) Associated Structure, System, and Component (SSC) and Building Number:	(a) Structure Location: 241-A, AX, B, BY, C, S, SX, U	(c) Building Number: 241	(e) Project Number: N/A
	(b) System Designator: N/A	(d) Equipment ID Number (EIN): N/A	

(10) Impacted Documents:	(a) Document Type	(b) Document Number	(c) Document Revision
	N/A	N/A	N/A

(11) Approvals:

(a) Author (Print/Sign): J.P. Robocker J P Robocker Date: 11-2-2010

(b) Reviewer (Optional, Print/Sign):

K.D. Boomer Date: 11/2/2010 Date:

J.L. Castleberry Date: 11/1/2010 Date:

Date: Date:

(c) Responsible Manager (Print/Sign): D.J. Washenfelder D J Washenfelder Date: 11-02-2010

(12) Distribution:

(a) Name	(b) MSIN	(a) Name	(b) MSIN
K.D. Boomer	E6-47	J.P. Robocker	E6-47
J.L. Castleberry	R3-26	S.A. Saunders	R2-58
J.K. Engeman	S5-43	T.J. Venetz	E6-47
J.J. Luke	R1-51	D.J. Washenfelder	E6-47
T.C. Mackey	R2-58		
F.R. Miera	E6-32		
R.S. Rast	E6-47		

Release Stamp

NOV 03 2010
DATE:
STA: 15
HANFORD RELEASE
ID: 65

(13) Clearance	(a) Cleared for Public Release	(b) Restricted Information?	(c) Restriction Type:
	☒ Yes ☐ No	☐ Yes ☒ No	

(14) Clearance Review (Print/Sign): NANCY A FOUAD / Nancy A Fouad Date: 11/3/2010

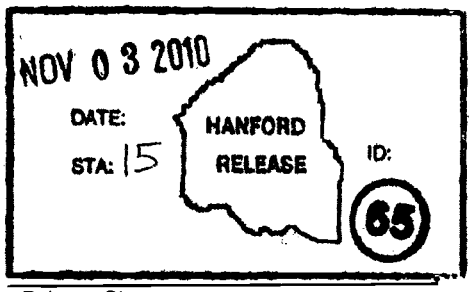
Fiscal Year 2010 Visual Inspection Report for Single-Shell Tanks

J.P. Robocker
Washington River Protection Solutions, LLC
Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-08RV14800

EDT/ECN:	DRF	UC:	N/A
Cost Center:	2KA00	Charge Code:	200660
B&R Code:	N/A	Total Pages:	76

Key Words: SST, Single-Shell Tank, Visual Inspection, 241-A-105, 241-A-106, 241-AX-102, 241-B-102, 241-BY-110, 241-C-110, 241-S-101, 241-S-103, 241-S-104, 241-S-108, 241-SX-101, 241-U-104

Abstract: This report documents the visual inspections of tanks 241-A-105, 241-A-106, 241-AX-102, 241-B-102, 241-BY-110, 241-C-110, 241-S-101, 241-S-103, 241-S-104, 241-S-108, 241-SX-101, and 241-U-104 in fiscal year 2010. No areas of concern were found to indicate structural degredation of the tanks. Condition of steel liners and in-tank equipment are also documented.



Nancy A Fouad 11/3/2010
Release Approval Date

Release Stamp

Approved For Public Release

RPP-RPT-48194
Revision 0

Fiscal Year 2010 Visual Inspection Report for Single-Shell Tanks

J.P. Robocker
Washington River Protection Solutions

Date Published
November 2010

Prepared for the U.S. Department of Energy
Office of River Protection

Contract No. DE-AC27-08RV14800

EXECUTIVE SUMMARY

The mission of the River Protection Project (RPP) is to store, retrieve, treat, and dispose of the highly radioactive waste stored in the Hanford Site tanks in an environmentally-sound, safe, and cost-effective manner. The waste is contained in 149 single-shell tanks (SST) and 28 double-shell tanks (DST). The tanks contain more than 50 million gallons of waste (Rogers, 2010).

The SSTs were constructed between 1944 and 1965. The structural integrity of the SSTs was assessed in 2002(Rifaey, 2002) against an expected retrieval completion date of 2018. Recently the SST retrieval completion date was extended and many of the SSTs are expected to hold waste for an additional 30 years.

As part of an enhanced SST Integrity Project, responding to the need for tank life extension, the visual inspection program was launched in fiscal year (FY) 2010. The program evaluates the structural integrity of the tanks using a digital video camera inserted into the tanks via an access riser. In this way, the visible concrete above the tank liner can be examined. Special attention is paid to the upper haunch area of the tank because it is the area of highest stress. Although not related to structural integrity, video of the inside of the tank also gives insight to the condition of the steel liner and in-tank equipment.

Remote visual inspections were performed on twelve SSTs as shown in Table 1-1. The inspections were performed to identify possible anomalies in the concrete. Exposed portions of the liners and in-tank equipment were also assessed.

Table 1-1: Summary of Visual Inspections

Tank	Date of Inspection	Riser
241-A-105	09-27/09-28-2010	2
241-A-106	08-12-2010	17
241-AX-102	10-14-2010	9G
241-B-102	08-02-2010	7
241-BY-110	07-18-2010	12B
241-C-110	09-07-2010	3
241-S-101	09-12-2010	7
241-S-103	09-14-2010	8
241-S-104	08-26-2010	7
241-S-108	09-16-2010	7
241-SX-101	09-15-2010	19
241-U-104	08-17-2010	2

Based on the review of the in-tank videos, structural integrity of the tanks was satisfactory. Several small anomalies were noted in many of the tanks, such as cold joints, salt lines, and irregular patterns on dome surfaces, but none was considered to be structurally significant. In some cases salt accumulation and surface anomalies were observed on the steel liner and in-tank equipment.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF TERMS

AOR	Analysis of Record
DOE	U.S. Department of Energy
DST	Double-Shell Tank
Ecology	Washington State Department of Ecology
LAI	Liquid-Air Interface
NDE	Nondestructive Evaluation
RPP	River Protection Project
SCC	Stress Corrosion Cracking
SRS	Savannah River Site
SST	Single-Shell Tank
SSTIP	Single-Shell Tank Integrity Program
TIIG	Tank Integrity Inspection Guide
TOC	Tank Operating Contractor
WTP	Waste Treatment and Immobilization Plant
QC	Quality Control

1.0 INTRODUCTION

The mission of the River Protection Project (RPP) is to store, retrieve, treat, and dispose of the highly radioactive waste in Hanford Site tanks in an environmentally sound, safe, and cost-effective manner. Accomplishing the RPP mission requires providing and maintaining adequate tank capacity for waste storage and waste feed delivery to the Waste Treatment and Immobilization Plant (WTP). The use of visual inspections of waste storage tank interiors and annulus spaces provides a qualitative indication of the aging mechanisms present in both single-shell tanks (SSTs) and double-shell tanks (DSTs). This report summarizes the visual inspections of the SSTs conducted during fiscal year (FY) 2010.

The Tank Operating Contractor (TOC) initiated an enhanced Single-Shell Tank Integrity Project (SSTIP) in 2008. This project ensures that the current and continued use of the SSTs to hold waste would be safe and effective, as well as assuring that once retrieved, the tanks will remain structurally sound for many years. An SSTIP expert panel was assembled to identify and recommend ways to ensure tank integrity. The panel recommended a one-time visual inspection as a nondestructive evaluation (NDE) technique to gain insight to the current condition of the tanks.

2.0 TANK DESIGN

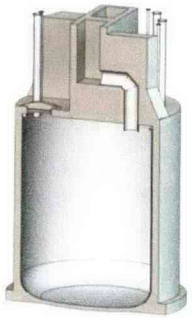
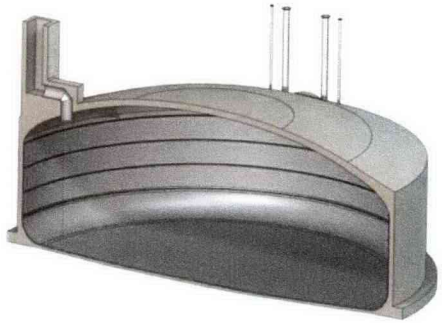
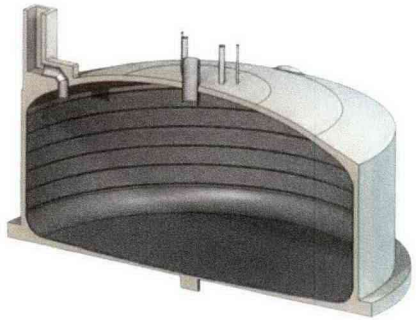
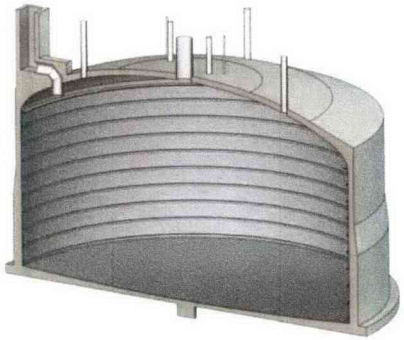
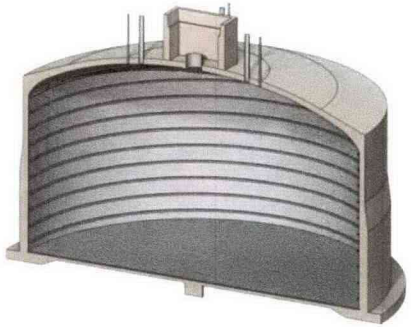
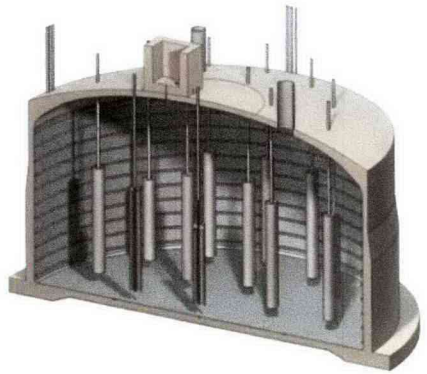
Each tank is unique in type, size and age and has varying waste levels. Specific characteristics of the tanks that were visually inspected can be seen in Table 2-1.

Table 2-1: Tank Design

Tank	Type	Capacity (Kgal)	Waste Level	First year in Service	Year Deactivated	Years in Active Use	Operation History
241-A-105	IVB	1,000	13.2 in	1962	1979	17	RPP-RPT-42743
241-A-106	IVB	1,000	25.1 in	1957	1980	23	RPP-RPT-42744
241-AX-102	IVC	1,000	11.1 in	1965	1980	15	RPP-RPT-42916
241-B-102	II	530	19.2 in	1945	1978	33	RPP-RPT-42944
241-BY-110	III	758	139.7 in	1951	1979	28	RPP-RPT-43004
241-C-110	II	530	70.8 in	1946	1977	31	RPP-RPT-43037
241-S-101	III	758	137.5 in	1953	1980	27	RPP-RPT-43044
241-S-103	III	758	93.4 in	1953	1980	27	RPP-RPT-43046
241-S-104	III	758	112.0 in	1953	1977	24	RPP-RPT-43047
241-S-108	III	758	162.3 in	1952	1979	27	RPP-RPT-43051
241-SX-101	IVA	1,000	160.1 in	1954	1980	26	RPP-RPT-43056
241-U-104	II	530	35.6 in	1947	1976	29	RPP-RPT-43238

Figure 2-1 shows the different types of single-shell tanks. As can be seen in the figure, each type of tank is constructed differently and holds different amounts of waste. The type IV tanks are similar in size and shape, but are constructed differently and contain unique equipment.

Figure 2-1: Single-shell Tank Types

SST Type I **55,000 gallons** 	**SST Type II** **530,000 gallons** 	**SST Type III** **758,000 gallons** 
SST Type IVA **1,000,000 gallons** 	**SST Type IVB** **1,000,000 gallons** 	**SST Type IVC** **1,000,000 gallons** 

3.0 SCOPE OF SINGLE-SHELL TANK VISUAL INSPECTION

The SSTs were examined visually for conditions inside the tank (above the waste level) on the surface of the steel liner and concrete dome using remote video equipment.

Qualified quality control (QC) personnel were briefed on what and where to look at to ensure a quality inspection was performed to adequately aid the engineering review. Areas of focus were identified from photographs taken from within the tank in past years and assembled into a work package.

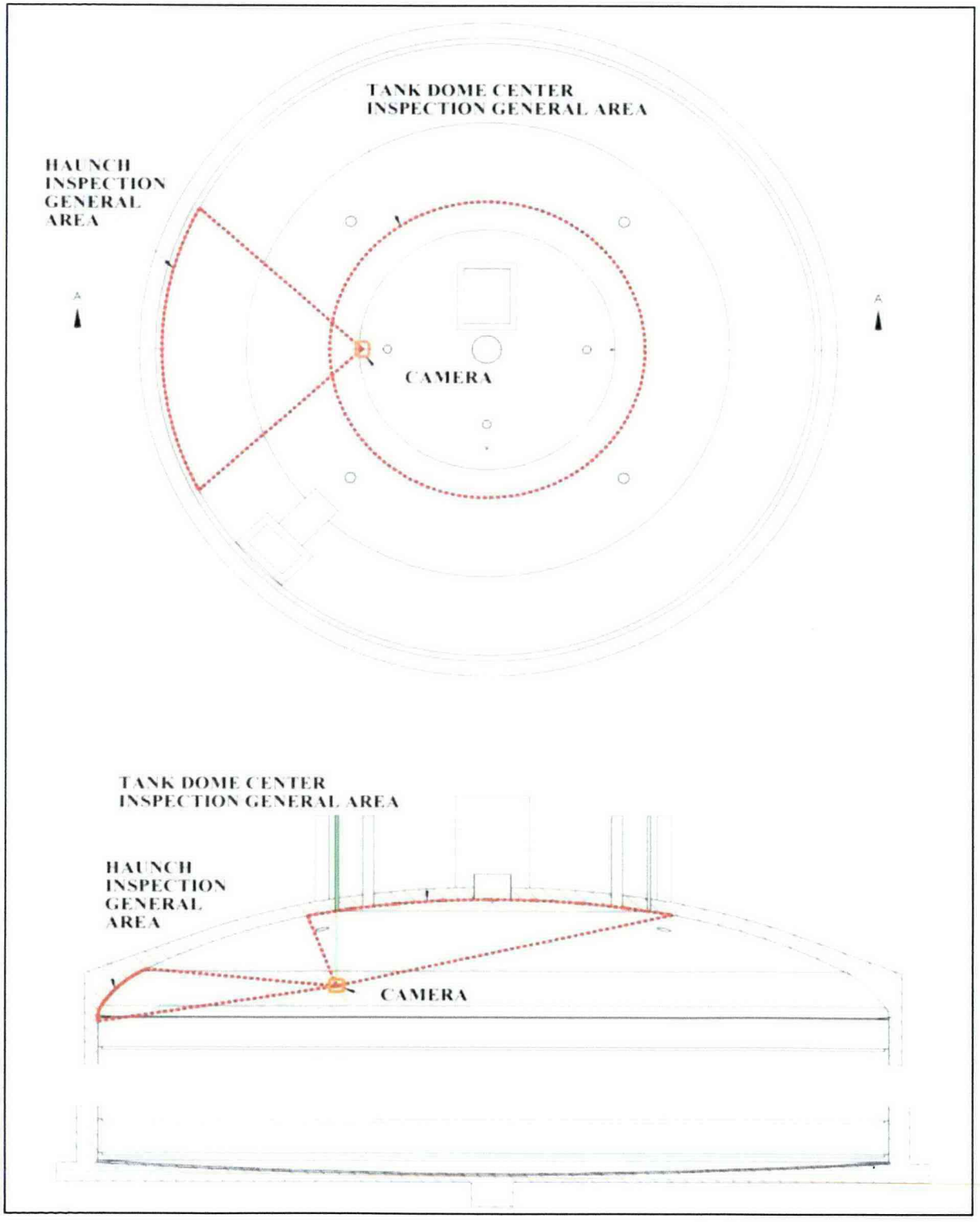
The tank's interior visual examination was performed through one or two of the tank's risers. The combination of the camera system and location of the risers allowed the inspection of the haunch and center dome region for each SST. The SST inspection criteria are listed in Table 3-1.

The SST visual examinations were compared against previous in-tank photographs and videos to aid in determining any potential change in specific areas of interest.

Table 3-1: Criteria for Single-Shell Tank Visual Inspections

Single-shell Tank In-Tank Inspection Criteria			
Tank Feature	**Evaluation Factors**	**Probable Locations**	**Reason to Identify**
Concrete Dome	Cracking in excess of 1/16-inch, rust stains, and spalling	The curved haunch (above the top section of the steel liner) and the center of the tank dome.	Cracking, rust stains, and spalling would result from degradation mechanisms such as rebar corrosion.
Concrete Dome or Waste Surface	Signs of liquid intrusion	Either moisture stains along the tank dome or pooling on the waste surface.	Water intrusion into SSTs should be minimized to prevent liquid levels in the tanks from increasing.
Access Risers	Corrosion of steel access riser penetrations	Along the bottom edge of the riser penetrations.	For steel risers, increased corrosion including metal loss would suggest an environment that is conducive to vapor space corrosion.
Steel Liner	Pitting along the historical liquid-air interfaces	There are typically beach line marks along the steel liner indicating the interface between the head space environment and the liquid waste.	These interfaces could be a region where pitting occurs under certain conditions. Over time and under the right conditions, these pits could have penetrated through the steel liner compromising the liner's integrity.
Steel Liner	Tar Rings	Anywhere along the steel liner.	Several mastic layers were installed between the steel liner and the concrete wall. Evidence of tar on the steel liner may suggest a through wall penetration.
Steel Liner	Cracks	Along the visible surface of the steel liner.	Cracking suggests the liner integrity has been compromised.
In-Tank Equipment	Corrosion	Along the visible surfaces of the tank equipment.	Corrosion of the equipment may provide evidence as to the aggressive/passive nature of the waste and the environment the equipment was used in.

Figure 3-1: SST Concrete Dome General Inspection Regions



3.1 SINGLE-SHELL TANK VISUAL INSPECTION CRITERIA

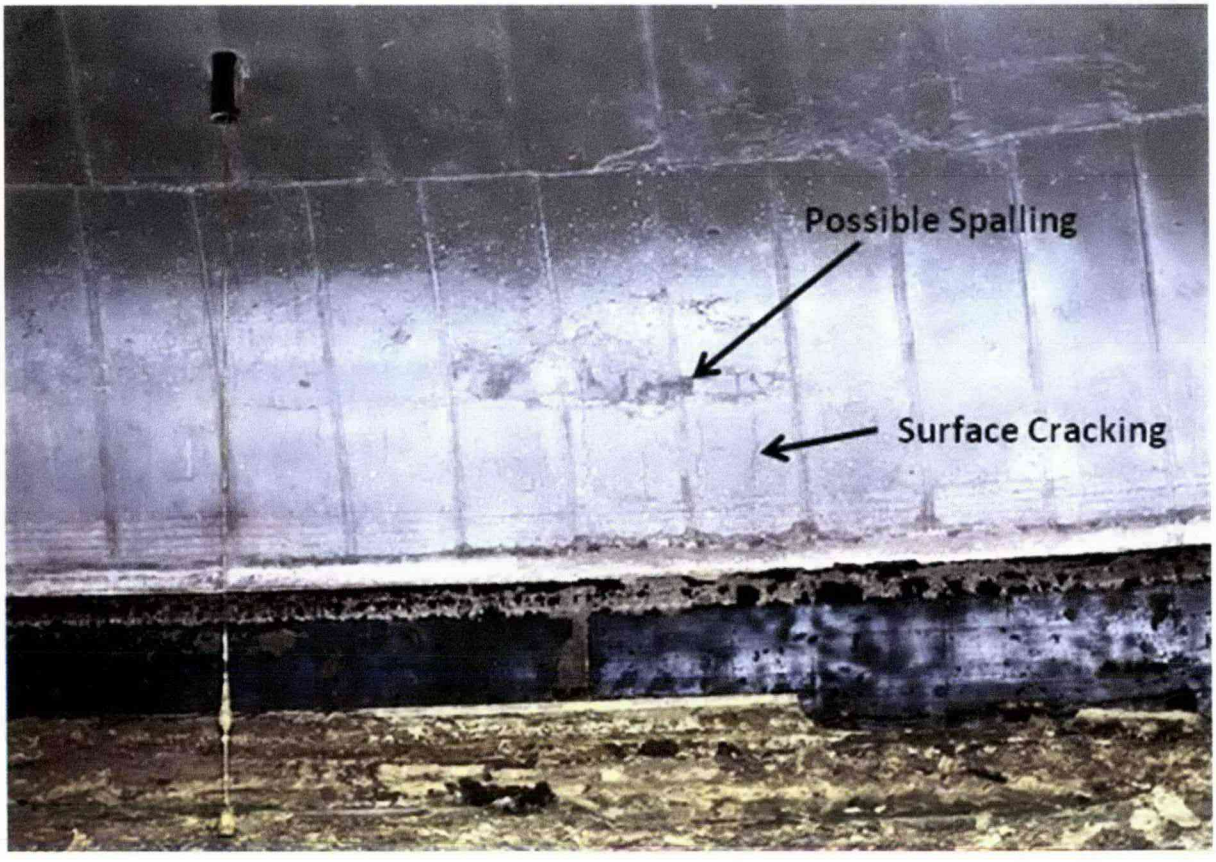
Historic visual inspection records of the SST interiors provide examples of anomalies which current inspections use to help identify areas of interest in other SSTs. These anomalies include but are not limited to reinforced concrete cracking, spalling, or visible rust stains on the dome, signs of liquid intrusion, tar rings along the steel liner, and cracks in the steel liner. All of these visually detectable abnormalities are indicators of various aging mechanisms present in the specific SST.

3.1.1 Reinforced Concrete Cracking, Rust Stains, and Spalling

The regions of the tank dome under the largest amount of stress are the haunch and the peak of the tank dome due to dome loading. Inspection of these two regions provides qualitative evidence as to the current structural integrity of the dome as well as information which can be compared against previous inspections to help identify changes since the last detailed inspection.

In some tanks, minor surface cracking is noted in the haunch region with minor localized spalling. Figure 3-2 shows an example of this in SST 241-S-112.

Figure 3-2: Possible Concrete Cracking and Spalling (Tank 241-S-112)[1]



[1] 8701812-39cn

3.1.2 Tar Rings

Tar rings on the steel liner suggest the potential for through-liner perforations. During tank construction a three-ply asphaltic membrane was applied between the steel liner and the concrete wall. In some cases it appears that the tar-like substance flowed over the edge of the tank flashing. In some cases, the tar appears to be coming through the steel liner itself.

When the discovery of the tar rings in 241-BY-110 was first identified, the report ARH-1496, *Review of Storage Tank Integrity* was issued to document the finding and potential causes. In this review it was noted that the liner perforations occurred horizontally at elevations corresponding to levels at which the tank liquid had been held for long periods. It is known that liquid-air interface (LAI) regions can be susceptible to pitting if waste chemistry and tank headspace conditions are not controlled. The LAI region is an evaluation factor and is included in SST inspections. Since all pumpable liquids have been removed from SSTs as a part of interim stabilization, only historical LAI regions can be inspected.

Figure 3-3: Tar Rings (Tank 241-BY-107)[2]

[2] 094253-4cn

3.1.3 Liquid Intrusion

Intrusion into SSTs that have had all the pumpable liquid removed is cause for concern, especially in SSTs which are assumed leakers. Liquid provides the medium and driving force to carry contaminated materials through the breached liner into the surrounding soil, depending on the location of the flaw in the liner. Intrusions are from sources exterior to the tank. Figure 3-4 provides an example of signs of water intrusion into 241-T-102.

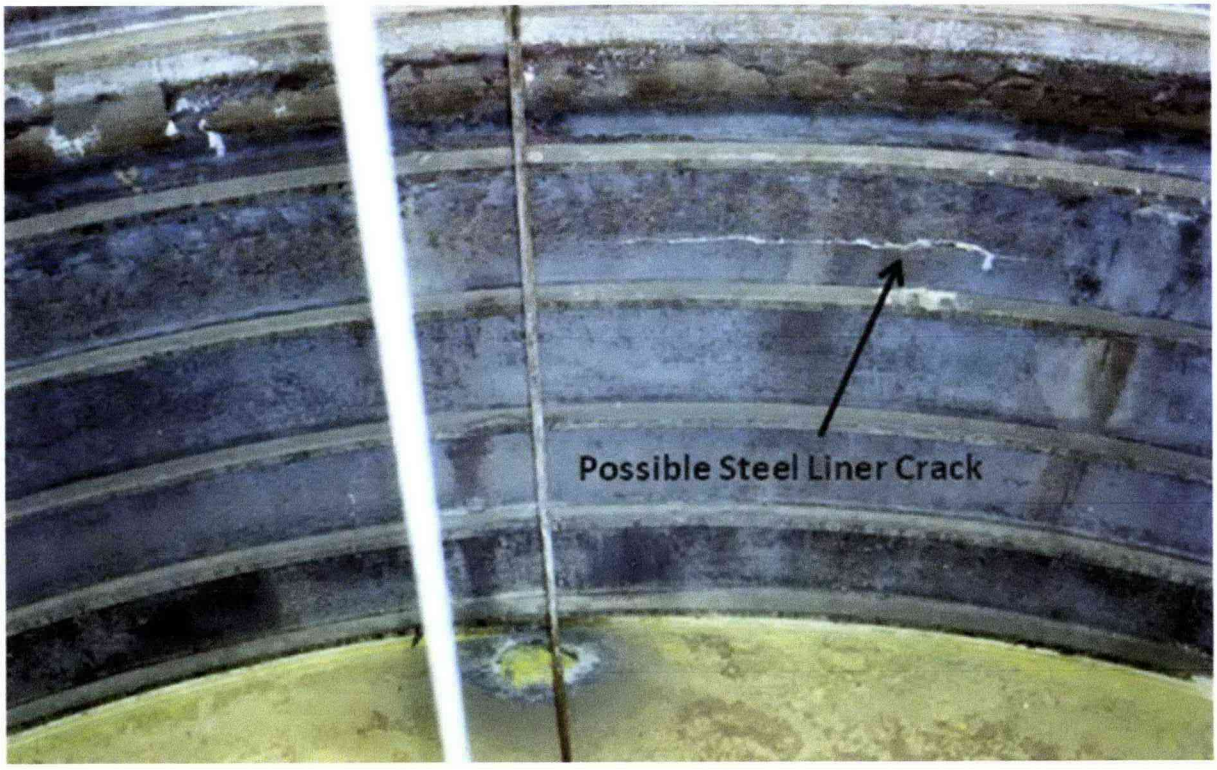
Figure 3-4: Signs of Liquid Intrusion (Tank 241-T-102)[3]

[3] 90972-6cn

3.1.4 Steel Liner Cracks

Confirmation of steel liner cracks is very difficult using standard visual inspection methods in SSTs. To improve the ability to identify cracks in the steel liner multiple riser penetrations could be utilized to allow indirect illumination of the surface at an angle different than the camera is utilizing. Even with ideal illumination, confirmation of the existence, physical size and depth of the crack would require a volumetric form of nondestructive evaluation (NDE) such as an ultrasonic inspection. Figure 3-5 shows an example of a possible crack in the 241-SX-112 steel liner found in 1974 (Moore & Metz, 1974).

Figure 3-5: Possible Steel Liner Crack (Tank 241-SX-112)[4]



[4] 95685-19cn

4.0 METHOD OF INSPECTION

Inspections were performed using a camera, a light source and an access riser. A camera was lowered through a riser into the tank and rotated to make a video recording of the areas of the tank previously mentioned (Figure 3-1). The videos were then analyzed for visual anomalies.

4.1 INSPECTION EQUIPMENT

Each inspection used a light source to illuminate the tank as well as a camera. The access points and the illumination intensity in each tank vary and therefore the observable visual detail was also variable. For example, when the inspection is done from a center riser, all the walls are about 37.5 feet away. With the same light source, when the inspection is done from a near wall riser, one side of the tank is 75 feet away. The illumination of the tank and the capability for the camera to zoom cause these walls to be harder to inspect visually. Table 4-1 displays the different equipment used for each tank during visual inspections.

Table 4-1: Equipment Utilized in Visual Inspection

Tank	Date of Inspection	Riser	Lighting	Camera
241-A-105	09-27/09-28-2010	2	Camera Light	GE-PTZ140
241-A-106	08-12-2010	17	Camera Light	GE-PTZ140
241-AX-102	10-14-2010	9G	Camera Light	GE-PTZ140
241-B-102	08-02-2010	7	Camera Light	GE-PTZ140
241-BY-110	07-18-2010	12B	Camera Light	GE-PTZ140
241-C-110	09-07-2010	3	Camera and Auxiliary Light	GE-PTZ140
241-S-101	09-12-2010	7	Camera Light	GE-PTZ140
241-S-103	09-14-2010	8	Camera Light	GE-PTZ140
241-S-104	08-26-2010	7	Camera Light	GE-PTZ140
241-S-108	09-16-2010	7	Camera Light	GE-PTZ140
241-SX-101	09-15-2010	19	Camera Light	GE-PTZ140
241-U-104	08-17-2010	2	Camera Light	GE-PTZ140

5.0 TANK 241-A-105

5.1 RESULTS AND CONCLUSION

Tank 241-A-105 was visually inspected on September 27 and 28, 2010. Inspection was suspended on September 27th when the camera overheated and resumed on the 28th. The footage taken by the camera was carefully reviewed for any visible anomalies on the inside of the tank (above the waste level) on the surface of the steel liner and concrete dome.

5.1.1 Tank Dome

Figure 5-1 shows a section of tank 241-A-105's concrete dome which can be seen with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the dome of the tank. No areas of concern were found from visual inspection of the dome.

Figure 5-1: Tank 241-A-105 Concrete Dome

Several close-up pictures of the concrete dome have been compiled into one photograph to see the condition of the concrete as a panorama. This can be seen in Figure 5-2. This figure shows

concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank.

Figure 5-2: Compilation of Photographs of Tank 241-A-105 Dome

Figure 5-3 shows a horizontal linear anomaly in the tank's dome. Because it has a shape that does not appear random and stops at a fairly defined line, the most likely cause of this anomaly is a construction patch. Upon review of the complete footage, no critical visual anomalies were observed in the concrete that structures the dome of tank 241-A-105.

Figure 5-3: Concrete Anomaly

5.1.2 Steel Liner

Figure 5-4 shows a section of tank 241-A-105's steel liner. The steel liner can be seen clearly with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the steel liner of the tank. No areas of concern were found from visual inspection of the steel liner.

It is known that on January 28, 1965 a sudden steam release occurred in the tank. The bottom inner liner bulged upward to an estimated height of 8.5 feet at one point, and ripped the liner away from the side wall (74A30-95-018, internal memorandum). When the bulge was discovered, the tank was removed from active service.

The bottom of tank 241-A-105 was not visible during inspection so the damaged area could not be observed. As the camera was lowered into the tank, the quality of the footage degraded because of lack of lighting and radiation, therefore this inspection is limited to the concrete dome and upper portion of the steel liner.

Figure 5-4: Tank 241-A-105 Steel Liner

Several close-up pictures of the steel liner have been compiled into one photograph to see the condition of the steel liner and surrounding concrete as a panorama. This can be seen in Figure 5-5. This figure shows steel that appeared to be without any visual anomalies. Upon review of the complete footage, no critical visual anomalies were observed in the upper portion of the steel that lines tank 241-A-105. When compared to prior photos of the tank taken in the 1970s and

1980s such as in Figure 5-6, it can be seen that the condition of the tank has not changed significantly. This is a good indication of the tank's structural integrity.

Figure 5-5: Compilation of Photographs of Tank 241-A-105 Steel Liner

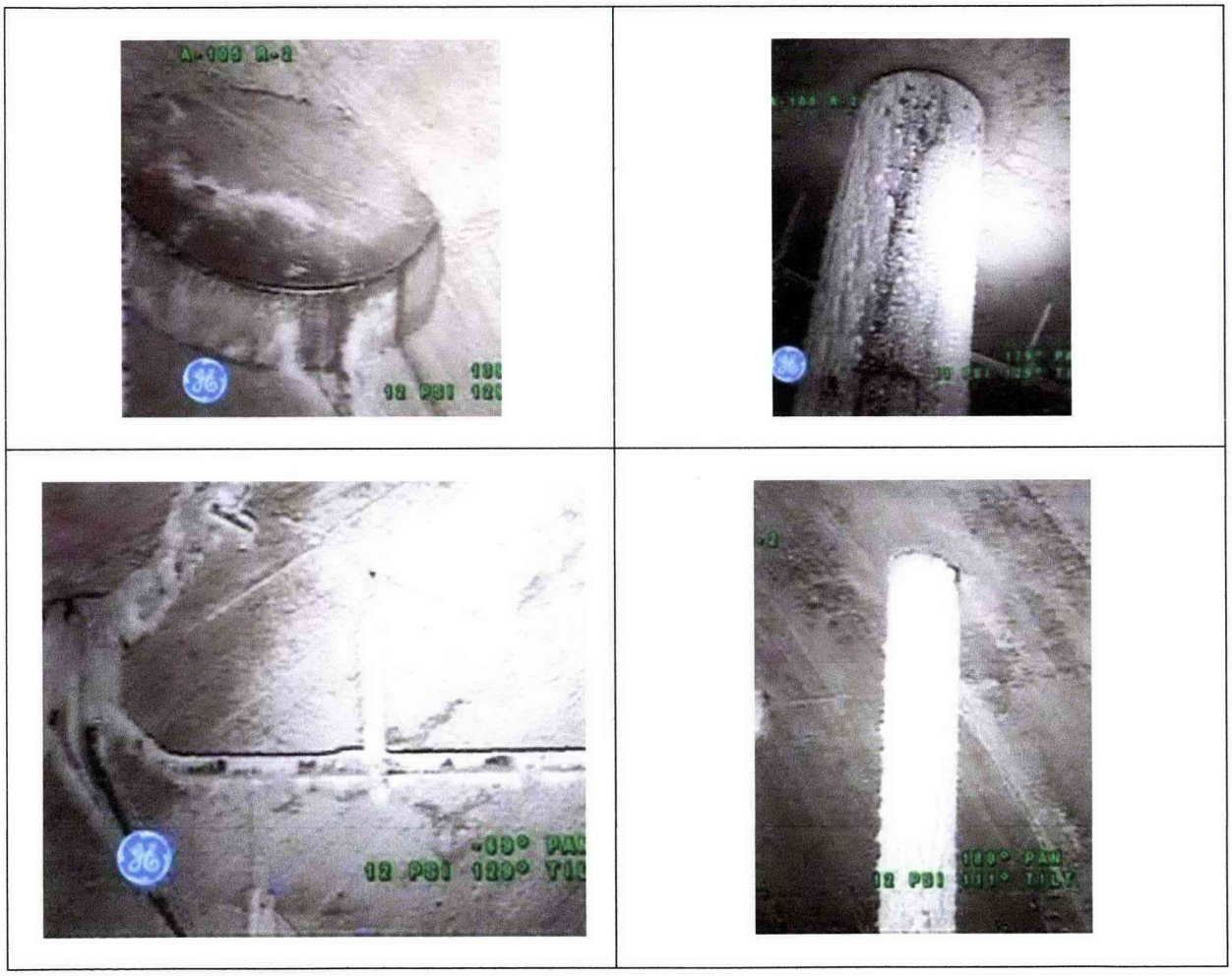
Figure 5-6: Tank 241-A-105[5] in 1981

[5] 95030-6cn

5.1.3 In-Tank Equipment/Risers

All the visible in-tank equipment and risers appeared to be in good condition. Some of these can be seen in Figure 5-7. This tank has a substantial salt covering on the surfaces compared to the other SSTs inspected in FY 2010. These are most likely nitrate salts. This could be because of the nature of the waste composition, humidity, high heat and water additions throughout the use of this tank. The coating does not have the appearance of rust stains from rebar, spalling, cracking, or any other abnormality that might affect the integrity of the stability of the tank and therefore not considered to be structurally significant.

Figure 5-7: Tank 241-A-105 In-Tank Equipment/Risers



When compared to photos taken in 1981 such as Figure 5-8, it can be determined that the salt build up in the tank is more recent than the steam eruption. The likely source is a reaction in the vapor space of the tank.

Figure 5-8: Tank 241-A-105 in 1981[6]

5.2 RECOMMENDATIONS

Tank 241-A-105 was visually inspected on September 27 and 28, 2010. After review of the footage, no visual anomalies were observed that required follow up. The tank appears to be in stable condition based on visual inspection. When compared to prior pictures of the tank from the 1970s and 1980s, there appeared to be no significant changes in the concrete or the steel liner of the tank. Because no areas of concern were identified during visual inspection of this tank, no further action is recommended. The footage did not include the bottom of tank 241-A-105. As the camera was lowered into the tank, the quality of the footage degraded because of lack of lighting and radiation; therefore, this inspection is limited to the concrete dome and upper portion of the steel liner of tank 241-A-105.

If tank 241-A-105 is visually inspected in the future, it is recommended that the referenced images are used as a basis for changes within the concrete and steel liner. Any anomalies that are found will assist in determining changes in tank integrity over time.

[6] 95030-18cn

6.0 TANK 241-A-106

6.1 RESULTS AND CONCLUSION

Tank 241-A-106 was visually inspected on August 12, 2010. The footage taken by the camera was carefully reviewed for any visible anomalies on the inside of the tank (above the waste level) on the surface of the steel liner and concrete dome to identify any areas of concern that would indicate degradation to the structural integrity of the tank.

6.1.1 Tank Dome

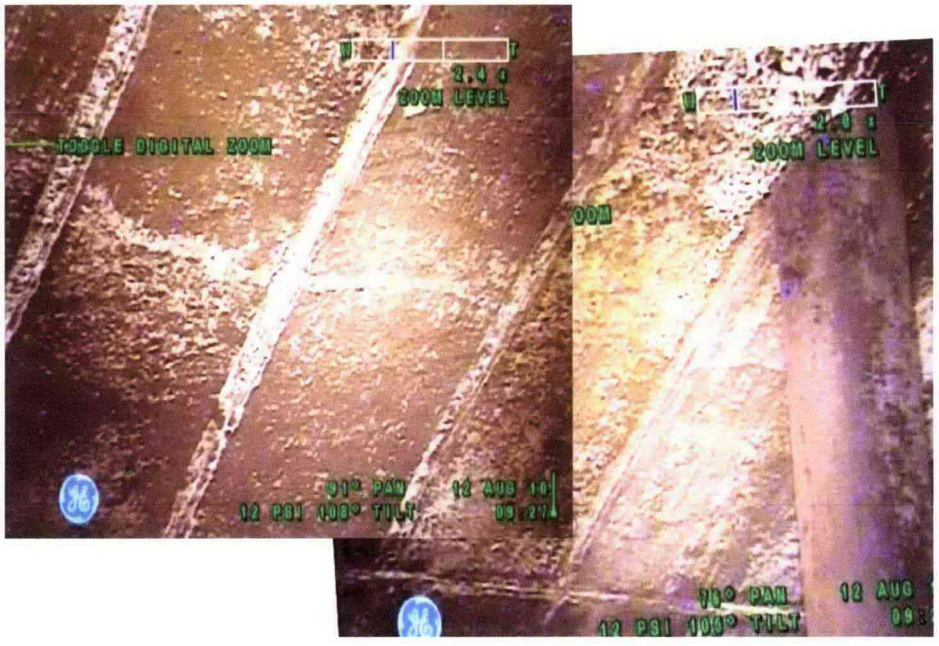
Figure 6-1 shows a section of tank 241-A-106's concrete dome which can be seen with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the dome of the tank. No areas of concern were found from visual inspection of the dome.

Figure 6-1: Tank 241-A-106 Concrete Dome

There were some difficulties with the available lighting and the amount of the tank's dome that could clearly be visually inspected. However, areas that could clearly be seen appeared to be in satisfactory condition.

Figure 6-2 shows a compilation of photographs taken from the footage to get a closer more detailed view of the dome of the tank. It can be seen that there is a horizontal line across the concrete. This occurs at approximately the same level encircling the tank's dome. This appears to be a stable cold joint from the original construction of the tank and is not assumed to jeopardize the integrity of the tank. This figure shows concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank. Upon review of the complete footage, no critical visual structural anomalies were observed in the concrete dome of tank 241-A-106.

Figure 6-2: Compilation of Photographs of Tank 241-A-106 Dome



6.1.2 Steel Liner

Figure 6-3 shows a section of tank 241-A-106's where the concrete dome connects to the steel liner. As can be seen in the figure, the steel liner directly below the flashing can be seen clearly with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the steel liner of the tank. It can also be seen in Figure 6-3 that there are small anomalies on the steel flashing at the top of the tank dome. This is evidence of corrosion of the steel flashing but does not affect the structural integrity of the tank dome. No areas of concern were found from visual inspection of the steel liner.

Figure 6-3: Tank 241-A-106 Steel Liner

Several close-up pictures of the steel liner have been complied to make one photograph to easier see the condition of the steel liner and surrounding concrete. This can be seen in Figure 6-4. This figure shows concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank. The steel also appeared to be without any visual structural anomalies. Upon review of the complete footage, no critical visual structural anomalies were observed in the concrete or the steel that lines tank 241-A-106.

Figure 6-4: Compilation of Photographs of Steel Liner Tank 241-A-106

6.1.3 In-tank Equipment/Risers

All of the visible in-tank equipment and risers appeared to be in good condition. Some of these can be seen in Figure 6-5.

Figure 6-5: Tank 241-A-106 In-Tank Equipment/Risers

6.2 RECOMMENDATIONS

Tank 241-A-106 was visually inspected on August 12, 2010. After review of the footage, no visual anomalies were observed that required follow up. The tank appears to be in stable condition based on visual inspection. Because no areas of concern were found during visual inspection of this tank, no further action is recommended.

If tank 241-A-106 is visually inspected in the future, it is recommended that these findings are used as a basis for changes within the concrete and steel liner. Any anomalies that are found will assist in determining changes in tank integrity over time.

7.0 TANK 241-AX-102

7.1 RESULTS AND CONCLUSION

Tank 241-AX-102 was visually inspected on September 29, 2010. The video quality from this inspection was not sufficient to determine the condition of the concrete, steel or equipment inside the tank. The inspection was then performed a second time to attain a higher quality video. The figures in this section are from the second visual inspection made on October 14, 2010. The footage taken by the camera was carefully reviewed for any visible anomalies on the inside of the tank (above the waste level) on the surface of the steel liner and concrete dome to identify any areas of concern that would indicate degradation to the structural integrity of the tank.

7.1.1 Tank Dome

Figure 7-1 shows a section of tank 241-AX-102's concrete dome which can be seen with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the dome of the tank. No areas of concern were found from visual inspection of the dome.

Figure 7-1: Tank 241-AX-102 Concrete Dome

There were some difficulties with the available lighting and the amount of the tank's dome that could clearly be visually inspected. However, areas that could clearly be seen appeared to be in satisfactory condition.

Figure 7-2 shows a compilation of photographs taken from the footage to get a closer, more detailed view of the dome of the tank. It can be seen that there is a horizontal line across the concrete. This occurs at approximately the same level encircling the tank's dome. This appears to be a stable cold joint from the original construction of the tank and is not assumed to jeopardize the integrity of the tank. This figure shows concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank.

Figure 7-2: Compilation of Photographs of Tank 241-AX-102 Dome

Upon visual inspection of the tank, some dissimilar areas were observed on the concrete dome. Figure 7-3 shows an area on the dome of the tank with irregular lines that do not appear to be cold joints. These linear anomalies run vertically and horizontally, which is not typical of a cold joint line. While this figure shows anomalies in the appearance of the tank's dome, they do not appear to be rust stains from rebar, spalling, cracking, or any other abnormality that might affect the integrity of the stability of the tank and therefore not considered to be structurally significant.

Figure 7-3: Concrete Anomaly

7.1.2 Steel Liner

Figure 7-4 shows a section of tank 241-AX-102's steel liner. As can be seen in the figure, the steel liner directly below the flashing can be seen clearly with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the steel liner of the tank. No areas of concern were found from visual inspection of the steel liner. The steel appeared to be without any visual anomalies. Upon review of the complete footage, no critical visual anomalies were observed in the steel that lines tank 241-AX-102.

Figure 7-4: Tank 241-AX-102 Steel Liner

7.1.3 In-tank Equipment/Risers

All the visible in-tank equipment and risers appeared to be in good condition. Some of these can be seen in Figure 7-5.

Figure 7-5: Tank 241-AX-102 In-Tank Equipment/Risers

7.2 RECOMMENDATIONS

Tank 241-AX-102 was visually inspected on October 14, 2010. After review of the footage, no visual anomalies were observed that required follow up. The tank appears to be in stable condition based on visual inspection. Because no areas of concern were found during visual inspection of this tank, no further action is recommended. Tank 241-AX-102 was the only tank from the 241-AX farm inspected for FY 2010. Future inspections should be used for the comparison of the anomalies found in this tank to the other tanks with a similar waste storage history.

If tank 241-AX-102 is visually inspected in the future, it is recommended that these findings are used as a basis for changes within the concrete and steel liner. Any anomalies that are found will assist in determining changes in tank integrity over time.

8.0 TANK 241-B-102

8.1 RESULTS AND CONCLUSION

Tank 241-B-102 was visually inspected on August 2, 2010. The footage taken by the camera was carefully reviewed for any visible anomalies on the inside of the tank (above the waste level) on the surface of the steel liner and concrete dome to identify any areas of concern that would indicate degradation to the structural integrity of the tank.

8.1.1 Tank Dome

Figure 8-1 shows a section of tank 241-B-102's concrete dome which can be seen with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the dome of the tank. No areas of concern were found from visual inspection of the dome.

Figure 8-1: Tank 241-B-102 Concrete Dome

Several close-up pictures of the concrete dome have been compiled into one photograph to see the condition of the concrete as a panorama. This can be seen in Figure 8-2. This figure shows concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank. Upon review of the complete footage, no critical visual anomalies were observed in the concrete that structures the dome of tank 241-B-102.

Figure 8-2: Compilation of Photographs of Tank 241-B-102 Dome

8.1.2 Steel Liner

Figure 8-3 shows a section of tank 241-B-102's steel liner. As can be seen in the figure, the steel can be seen clearly with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the steel liner of the tank. No areas of concern were found from visual inspection of the steel liner.

Figure 8-3: Tank 241-B-102 Steel Liner

Several close-up pictures of the steel liner have been compiled into one photograph to see the condition of the steel liner and surrounding concrete as a panorama. This can be seen in Figure 8-4. This figure shows concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank. The steel also appeared to be without any visual anomalies. Upon review of the complete footage, no critical visual anomalies were observed in the concrete or the steel that lines tank 241-B-102. When compared to photographs of this tank from 1985 such as in Figure 8-5, it can be seen that the condition of the liner looks as if it has not changed significantly.

Figure 8-4: Compilation of Photographs of Steel Liner Tank 241-B-102

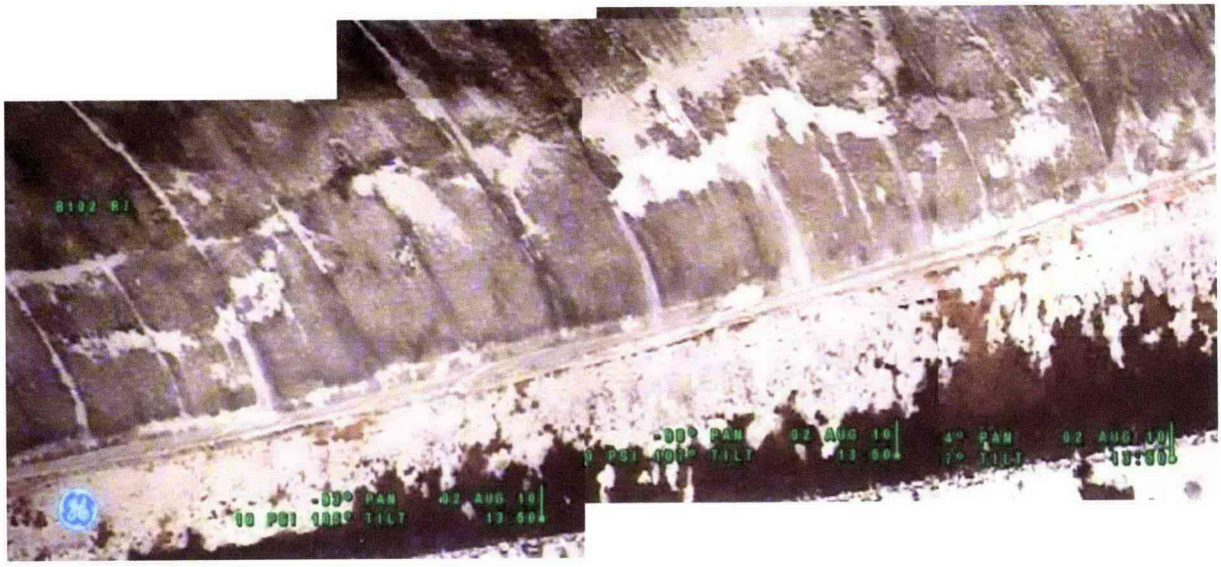
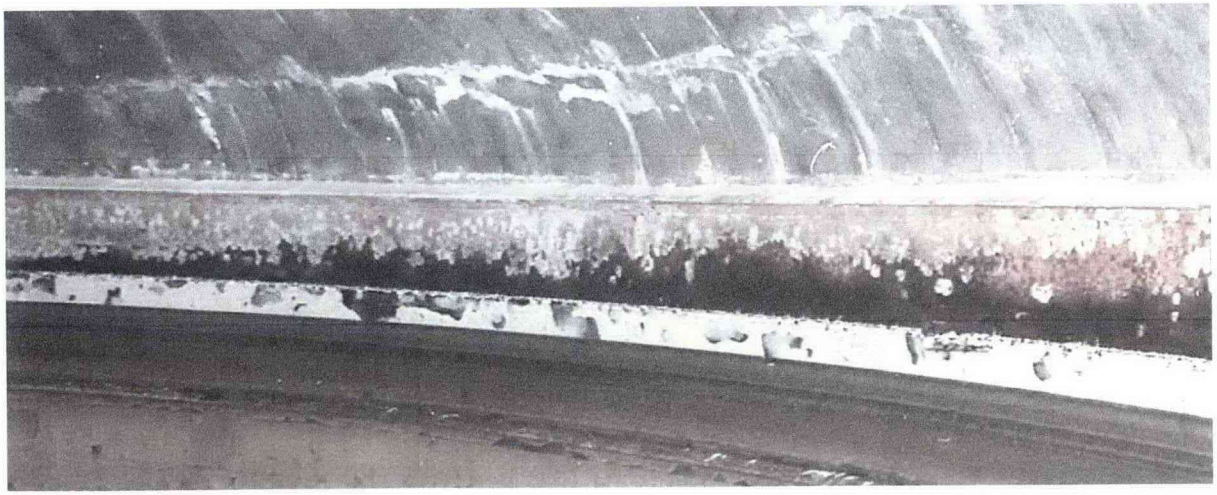


Figure 8-5: Tank 241-B-102[7]



[7] 8505757-6cn

Upon visual inspection of the tank, some dissimilar areas were observed on the steel liner of tank 241-B-102. Figure 8-6 and Figure 8-7 show evidence of corrosion along the steel liner but they do not appear to originate from the concrete dome that might affect the integrity of the stability of the tank and therefore not considered to be structurally significant.

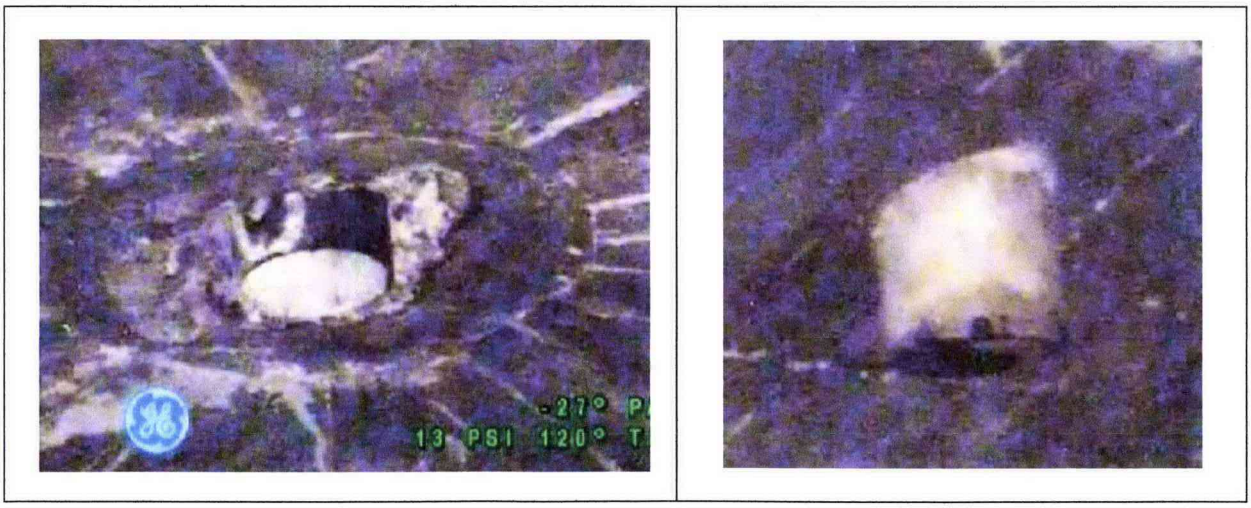
Figure 8-6: Steel Anomaly

Figure 8-7: Steel Anomaly

8.1.3 In-tank Equipment/Risers

All the visible in-tank equipment and risers appeared to be in good condition. Some of these can be seen in Figure 8-8.

Figure 8-8: Tank 241-B-102 In-Tank Equipment/Risers



8.2 RECOMMENDATIONS

Tank 241-B-102 was visually inspected on August 2, 2010. After review of the footage, no visual anomalies were observed that required follow up. The tank appears to be in stable condition based on visual inspection. When compared to prior pictures of the tank from the 1970s and 1980s, there appeared to be no significant changes in the concrete or the steel liner of the tank. Because no problems were found during visual inspection of this tank, no further action is recommended.

If tank 241-B-102 is visually inspected in the future, it is recommended that these findings are used as a basis for changes within the concrete and steel liner. Any anomalies that are found will assist in determining changes in tank integrity over time.

9.0 TANK 241-BY-110

9.1 RESULTS AND CONCLUSION

Tank 241-BY-110 was visually inspected on July 18, 2010. The footage taken by the camera was carefully reviewed for any visible anomalies on the inside of the tank (above the waste level) on the surface of the steel liner and concrete dome to identify any areas of concern that would indicate degradation to the structural integrity of the tank.

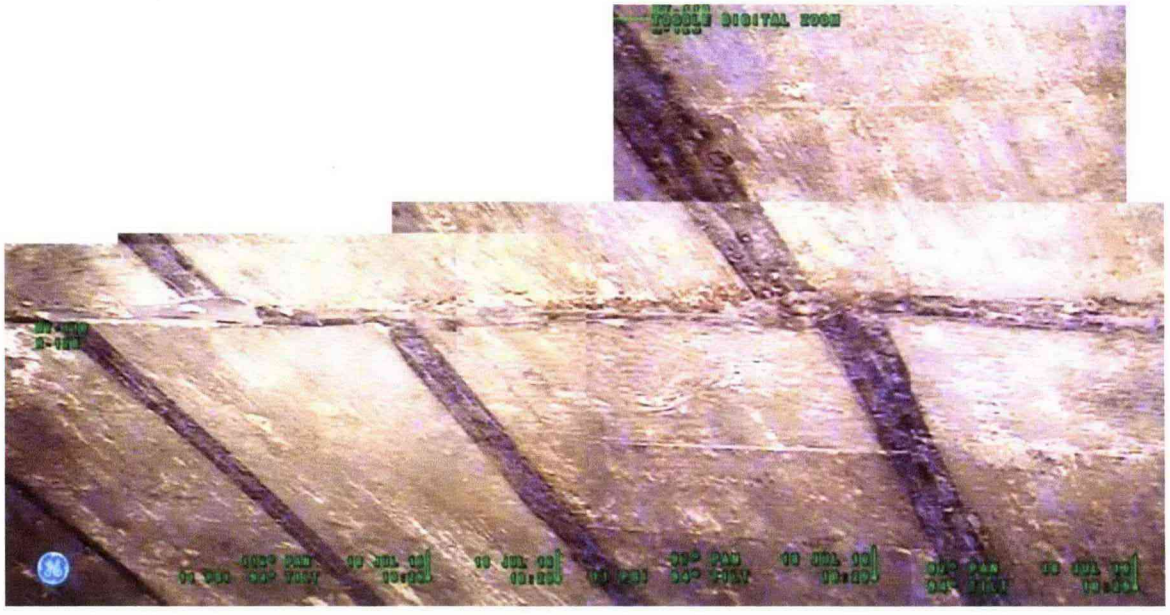
9.1.1 Tank Dome

Figure 9-1 shows a section of tank 241-BY-110's concrete dome which can be seen with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the dome of the tank. No areas of concern were found from visual inspection of the dome.

Figure 9-1: Tank 241-BY-110 Concrete Dome

Several close-up pictures of the concrete dome have been compiled into one photograph to see the condition of the concrete as a panorama. This can be seen in Figure 9-2. This figure shows concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank. Upon review of the complete footage, no critical visual anomalies were observed in the concrete that structures the dome of tank 241-BY-110.

Figure 9-2: Compilation of Photographs of Tank 241-BY-110 Dome



Upon visual inspection of the tank, some dissimilar areas were observed on the concrete dome. Figure 9-3 shows an area near the center of the tank's dome. There appears to be some sort of a build up on the concrete. Figure 9-4 shows the development of a checkered pattern close to the center on the dome's east side. While these two figures show anomalies in the appearance of the tank's dome, they do not appear to be rust stains from rebar, spalling, cracking, or any other abnormality that might affect the integrity of the stability of the tank and therefore not considered to be structurally significant.

Figure 9-3: Concrete Anomaly

Figure 9-4: Concrete Anomaly

9.1.2 Steel Liner

Figure 9-5 shows a section of tank 241-BY-110's where the concrete dome connects to the steel liner. As can be seen in the figure, the steel liner directly below the flashing can be seen clearly with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the steel liner of the tank. No areas of concern were found from visual inspection of the steel liner.

Figure 9-5: Tank 241-BY-110 Steel Liner

Several close-up pictures of the steel liner have been compiled into one photograph to see the condition of the steel liner and surrounding concrete as a panorama. This can be seen in Figure 9-6. This figure shows concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank. The steel also appeared to be without any visual anomalies. Upon review of the complete footage, no critical visual anomalies were observed in the concrete or the steel that lines tank 241-BY-110. When compared to photographs of this tank from 1984 such as in Figure 9-7, it can be seen that the condition of the liner looks as if it has not changed significantly.

Figure 9-6: Compilation of Photographs of Steel Liner Tank 241-BY-110

Figure 9-7: Tank 241-BY-110[8]

The lighting in the tank was not sufficient to observe the steel liner below the first stiffener ring. Because the images in the video were too dark to inspect it has been determined that the condition of the steel liner in the lower part of the tank is indeterminate.

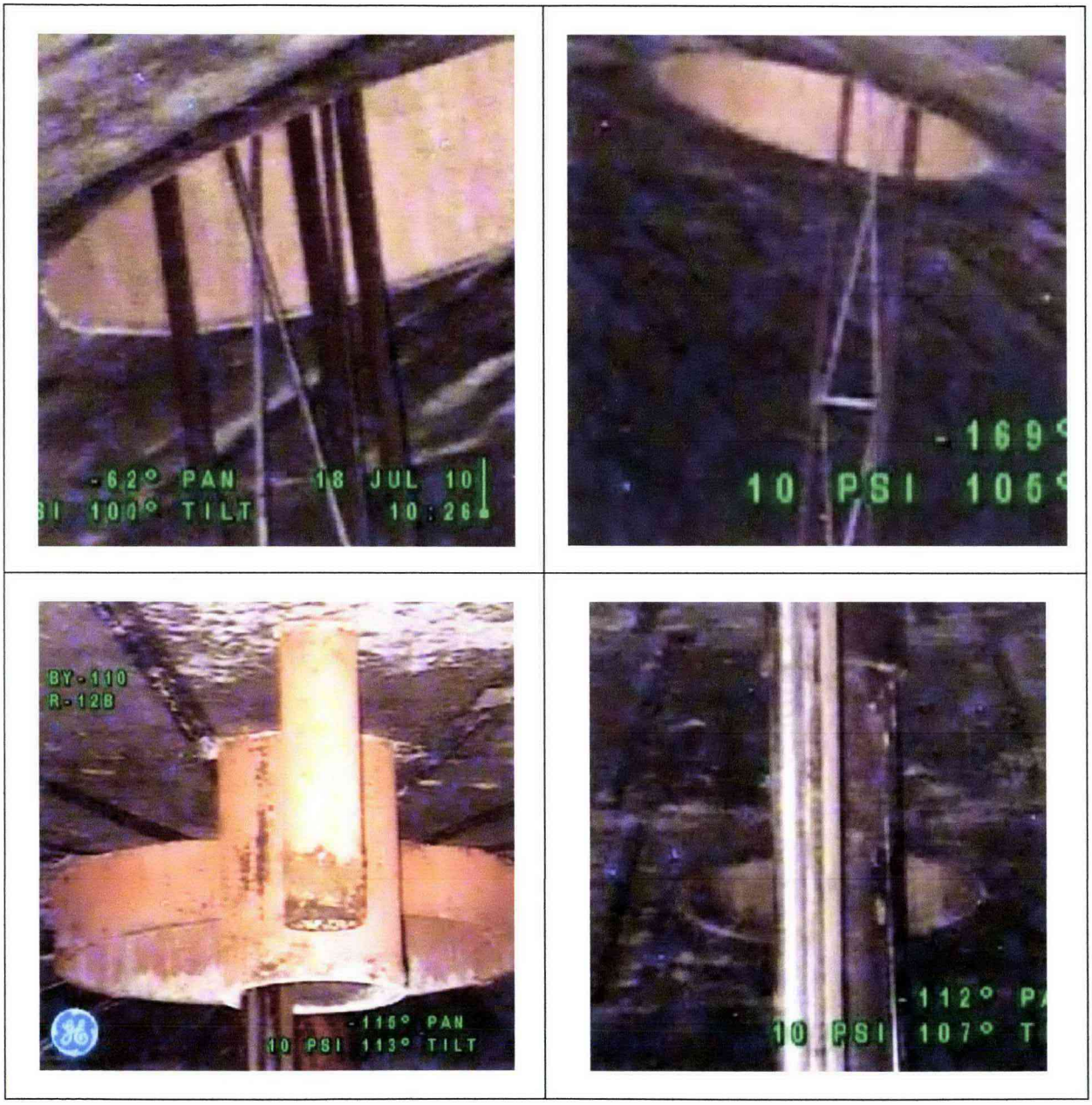
"Tar rings," as discussed in section 3.1.2, were previously observed in tank 241-BY-110 (ARH-1496, *Review of Storage Tank Integrity*). These tar rings were observed in the visual inspections and can be seen in Figure 9-5 and compared to a prior visual inspection photo in Figure 9-6. It can be seen in comparison that the rings do not appear to be more pronounced and is therefore a good indication that they are stable.

[8] 8405108-3cn

9.1.3 In-Tank Equipment/Risers

All the visible in-tank equipment and risers appeared to be in good condition. Some of these can be seen in Figure 9-8.

Figure 9-8: Tank 241-BY-110 In-Tank Equipment/Risers



9.2 RECOMMENDATIONS

Tank 241-BY-110 was visually inspected on July 18, 2010. After review of the footage, no visual anomalies were observed that required follow up. The tank appears to be in stable condition based on visual inspection. When compared to prior pictures of the tank from the 1970s and 1980s, there appeared to be no significant changes in the concrete or the steel liner of the tank. Because no problems were found during visual inspection of this tank, no further action is recommended.

If tank 241-BY-110 is visually inspected in the future, it is recommended that these findings are used as a basis for changes within the concrete and steel liner. Any anomalies that are found will assist in determining changes in tank integrity over time.

10.0 TANK 241-C-110

10.1 RESULTS AND CONCLUSION

Tank 241-C-110 was visually inspected on September 7, 2010. The footage taken by the camera was carefully reviewed for any visible anomalies on the inside of the tank (above the waste level) on the surface of the steel liner and concrete dome to identify any areas of concern that would indicate degradation to the structural integrity of the tank.

10.1.1 Tank Dome

Figure 10-1 shows a section of tank 241-C-110's concrete dome which can be seen with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the dome of the tank. No areas of concern were found from visual inspection of the dome.

Figure 10-1: Tank 241-C-110 Concrete Dome

Several close-up pictures of the concrete dome have been compiled into one photograph to see the condition of the concrete as a panorama. This can be seen in Figure 10-2. This figure shows concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank. Upon review of the complete footage, no critical visual anomalies were observed in the concrete that structures the dome of tank 241-C-110.

Figure 10-2: Compilation of Photographs of Tank 241-C-110 Dome

10.1.2 Steel Liner

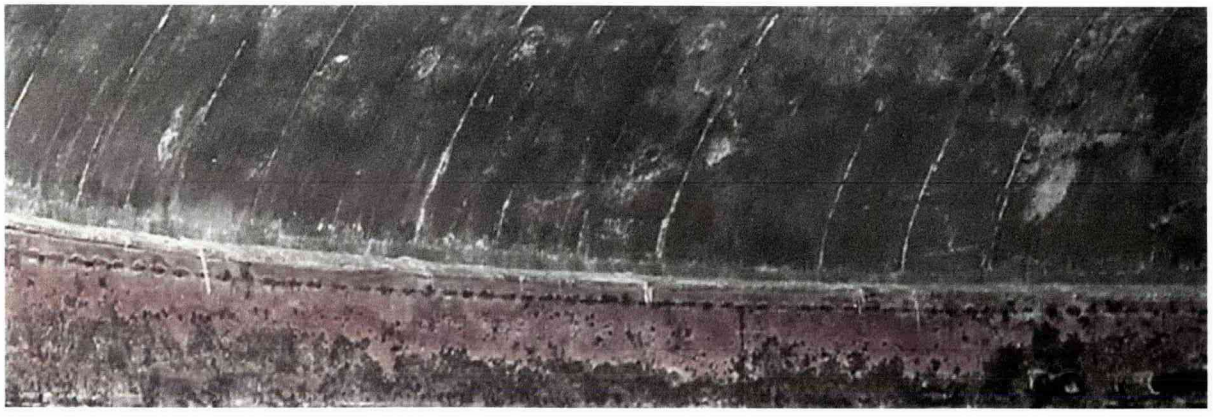
Figure 10-3 shows a section of tank 241-C-110's where the concrete dome connects to the steel liner. As can be seen in the figure, the steel liner directly below the flashing can be seen clearly with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the steel liner of the tank. No areas of concern were found from visual inspection of the steel liner.

Figure 10-3: Tank 241-C-110 Steel Liner

Several close-up pictures of the steel liner have been compiled into one photograph to see the condition of the steel liner and surrounding concrete as a panorama. This can be seen in Figure 10-4. This figure shows concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank. The steel also appeared to be without any visual anomalies. Upon review of the complete footage, no critical visual anomalies were observed in the concrete or the steel that lines tank 241-C-110. When compared to photographs of this tank from 1986 such as in Figure 10-5, it can be seen that the condition of the liner looks as if it has not changed significantly.

Figure 10-4: Compilation of Photographs of Steel Liner Tank 241-C-110

Figure 10-5: 241-C-110[9]

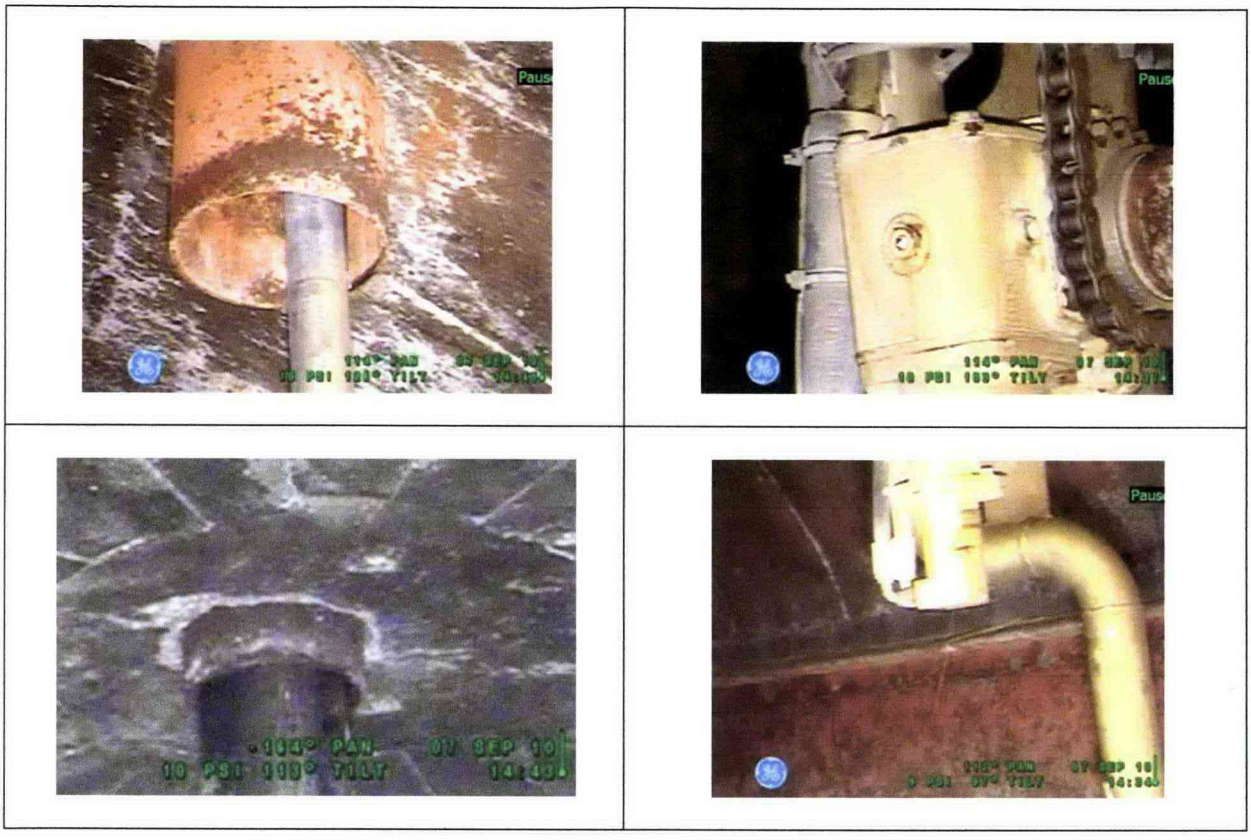


[9] 8605264-4cn

10.1.3 In-Tank Equipment/Risers

All the visible in-tank equipment and risers appeared to be in good condition. Some of these can be seen in Figure 10-6.

Figure 10-6: Tank 241-C-110 In-Tank Equipment/Risers



10.2 RECOMMENDATIONS

Tank 241-C-110 was visually inspected on September 7, 2010. After review of the footage, no visual anomalies were observed that required follow up. The tank appears to be in stable condition based on visual inspection. When compared to prior pictures of the tank from the 1970s and 1980s, there appeared to be no significant changes in the concrete or the steel liner of the tank. Because no problems were found during visual inspection of this tank, no further action is recommended.

If tank 241-C-110 is visually inspected in the future, it is recommended that these findings are used as a basis for changes within the concrete and steel liner. Any anomalies that are found will assist in determining changes in tank integrity over time.

11.0 TANK 241-S-101

11.1 RESULTS AND CONCLUSION

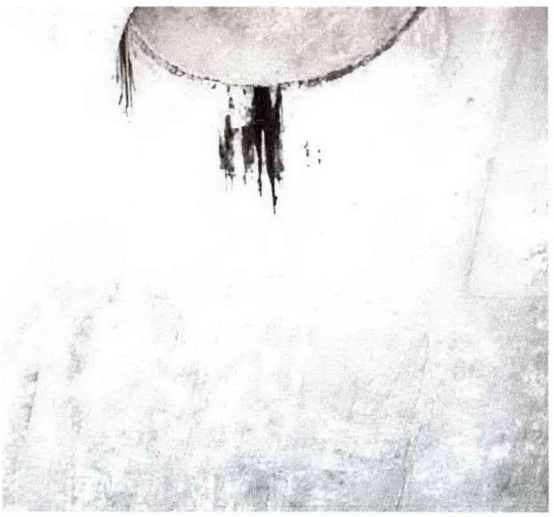
Tank 241-S-101 was visually inspected on September 21, 2010. The footage taken by the camera was carefully reviewed for any visible anomalies on the inside of the tank (above the waste level) on the surface of the steel liner and concrete dome to identify any areas of concern that would indicate degradation to the tank's structural integrity.

11.1.1 Tank Dome

Figure 11-1 shows a section of tank 241-S-101's concrete dome which can be seen with minimal visual obstructions. This figure shows concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank. Upon review of the complete footage, no critical visual anomalies were observed in the concrete that structures the dome of tank 241-S-101. This figure is representative of the findings from the rest of the footage taken of the visible area of the dome of the tank. When compared to photographs of this tank from 1988 such as in Figure 11-2, it can be seen that the condition of the concrete looks as if it has not changed significantly. No areas of concern were found from visual inspection of the dome.

Figure 11-1: Tank 241-S-101 Concrete Dome

Figure 11-2: Prior photo of Tank 241-S-101[10]



Upon visual inspection of the tank, some dissimilar areas were observed on the concrete dome. Figure 11-3 shows some spots on the tank's dome. These appear to be uniform on the concrete and can be seen throughout the video inspection. While this figure shows an anomaly in the appearance of the tank's dome, it does not appear to be rust stains from rebar, spalling, cracking or any other abnormality that might affect the integrity of the stability of the tank and therefore not considered to be structurally significant.

[10] 8801412-4cn

Figure 11-3: Concrete Anomaly

11.1.2 Steel Liner

Figure 11-4 shows a section of tank 241-S-101 where the concrete dome connects to the steel liner. As can be seen in the figure, the steel liner directly below the flashing can be seen with minimal visual obstructions. The lighting in the tank was not sufficient to observe the steel liner as can be seen in Figure 11-5. Because the images in the video were too dark to inspect it has been determined that the condition of the steel liner of the tank is indeterminate. When compared to photographs of this tank from 1987 such as in Figure 11-6, it can be seen that the visibility of the steel liner in the tank is impaired by the lack of lighting and darkness of the liner itself.

Figure 11-4: Tank 241-S-101 Steel Liner

Figure 11-5: Tank 241-S-101 Steel Liner

Figure 11-6: Tank 241-S-101[11] in 1987

11.1.3 In-Tank Equipment/Risers

All the visible in-tank equipment and risers appeared to be in good condition. Some of these can be seen in Figure 11-7.

[11] 87267-12cn

Figure 11-7: Tank 241-S-101 In-Tank Equipment/Risers

11.2 RECOMMENDATIONS

Tank 241-S-101 was visually inspected on September 21, 2010. After review of the footage, no visual anomalies were observed that required follow up. The tank appears to be in stable condition based on visual inspection. When compared to prior pictures of the tank from the 1970s and 1980s, there appeared to be no significant changes in the concrete of the tank. Because no problems were found during visual inspection of this tank, no further action is recommended.

If tank 241-S-101 is visually inspected in the future, it is recommended that these findings are used as a basis for changes within the concrete and steel liner. Any anomalies that are found will assist in determining changes in tank integrity over time.

12.0 TANK 241-S-103

12.1 RESULTS AND CONCLUSION

Tank 241-S-103 was visually inspected on September 14, 2010. The footage taken by the camera was carefully reviewed for any visible anomalies on the inside of the tank (above the waste level) on the surface of the steel liner and concrete dome to identify any areas of concern that would indicate degradation to the structural integrity of the tank.

12.1.1 Tank Dome

Figure 12-1 shows a section of tank 241-S-103's concrete dome which can be seen with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the dome of the tank. No areas of concern were found from visual inspection of the dome.

Figure 12-1: Tank 241-S-103 Concrete Dome

Several close-up pictures of the concrete dome have been compiled into one photograph to see the condition of the concrete as a panorama. This can be seen in Figure 12-2. This figure shows concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank. Upon review of the complete footage, no critical visual anomalies were observed in the concrete that structures the dome of tank 241-S-103.

Figure 12-2: Compilation of Photographs of Tank 241-S-103Dome

Upon visual inspection of the tank, some dissimilar areas were observed on the concrete dome. Figure 12-3 shows a section of the tanks dome. The concrete looks like it is streaked with something from outside the tank. This streak originates from the top of the tank and continues down the side. It appears that it might have been a liquid of some sort that came in through the top of the tank and ran down the dome. Figure 12-4 shows a small void in the dome's concrete. This could have been formed during the construction of this tank as it does not look fragmented or cracked. While these two figures show anomalies in the appearance of the tank's dome, they do not appear to be rust stains from rebar, spalling, cracking, or any other abnormality that might affect the integrity of the stability of the tank and therefore not considered to be structurally significant.

Figure 12-3: Concrete Anomaly

Figure 12-4: Concrete Anomaly

12.1.2 Steel Liner

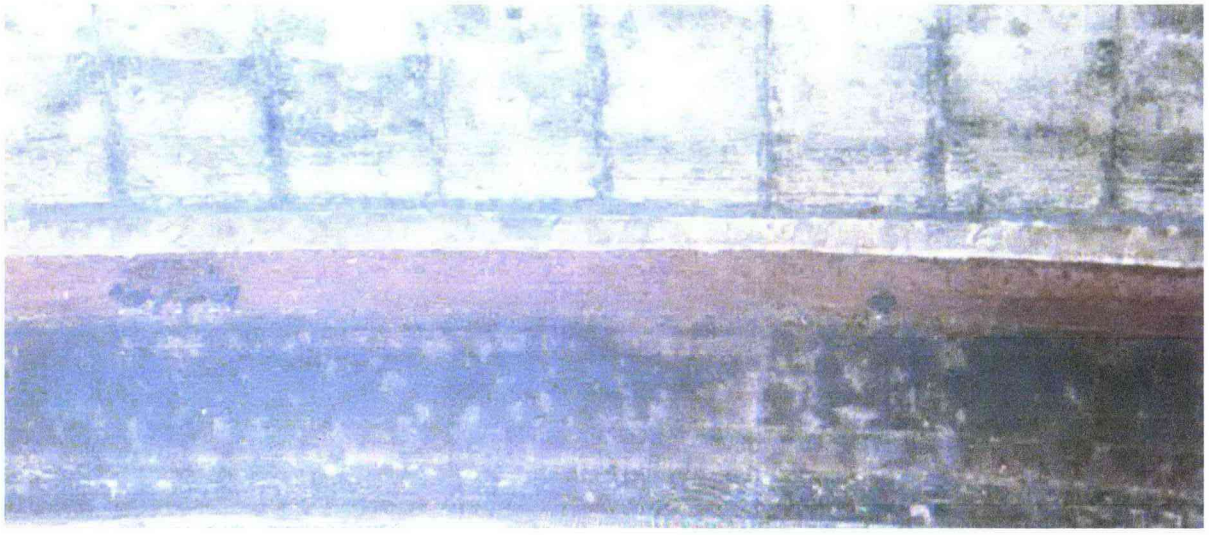
Figure 12-5 shows a section of tank 241-S-103's steel liner. As can be seen in the figure, the steel liner can be seen clearly with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the steel liner of the tank. No areas of concern were found from visual inspection of the steel liner.

Figure 12-5: Tank 241-S-103 Steel Liner

Several close-up pictures of the steel liner have been compiled into one photograph to see the condition of the steel liner and surrounding concrete as a panorama. This can be seen in Figure 12-6. This figure shows concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank. The steel also appeared to be without any visual anomalies. Upon review of the complete footage, no critical visual anomalies were observed in the concrete or the steel that lines tank 241-S-103. When compared to photographs of this tank from 1984 such as in Figure 12-7, it can be seen that the condition of the liner looks as if it has not changed significantly.

Figure 12-6: Compilation of Photographs of Steel Liner Tank 241-S-103

Figure 12-7: Tank 241-S-103[12] in 1984



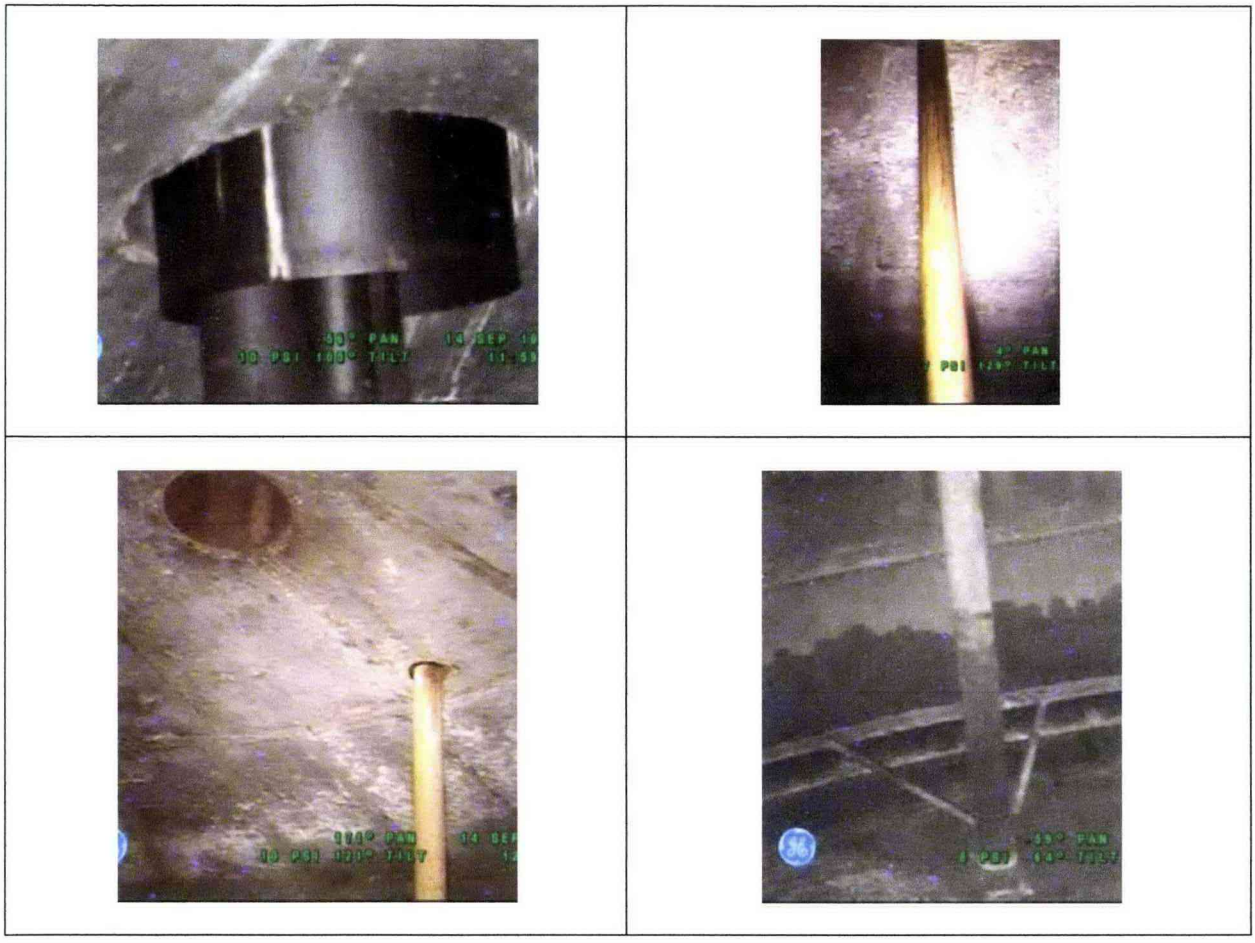
The lighting in the tank was not sufficient to observe the steel liner below the first stiffener ring. Because the images in the video were too dark to inspect it has been determined that the condition of the steel liner in the lower part of the tank is indeterminate.

12.1.3 In-Tank Equipment/Risers

All the visible in-tank equipment and risers appeared to be in good condition. Some of these can be seen in Figure 12-8.

[12] 111728-04cn

Figure 12-8: Tank 241-S-103 In-Tank Equipment/Risers



12.2 RECOMMENDATIONS

Tank 241-S-103 was visually inspected on September 14, 2010. After review of the footage, no visual anomalies were observed that required follow up. The tank appears to be in stable condition based on visual inspection. When compared to prior pictures of the tank from the 1970s and 1980s, there appeared to be no significant changes in the concrete or the steel liner of the tank. Because no problems were found during visual inspection of this tank, no further action is recommended.

If tank 241-S-103 is visually inspected in the future, it is recommended that these findings are used as a basis for changes within the concrete and steel liner. Any anomalies that are found will assist in determining changes in tank integrity over time.

13.0 TANK 241-S-104

13.1 RESULTS AND CONCLUSION

Tank 241-S-104 was visually inspected on August 26, 2010. The footage taken by the camera was carefully reviewed for any visible anomalies on the inside of the tank (above the waste level) on the surface of the steel liner and concrete dome to identify any areas of concern that would indicate degradation to the structural integrity of the tank.

13.1.1 Tank Dome

Figure 13-1 shows a section of tank 241-S-104's concrete dome which can be seen with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the dome of the tank. No areas of concern were found from visual inspection of the dome. This figure shows concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank. Upon review of the complete footage, no critical visual anomalies were observed in the concrete that structures the dome of tank 241-S-104.

Figure 13-1: Tank 241-S-104 Concrete Dome

Upon visual inspection of the tank, some dissimilar areas were observed on the concrete dome. Figure 13-2 shows the tank's dome where there are some surface defects that look like they could be possible pitting. While this figure shows anomalies in the appearance of the tank's dome and steel liner, they do not appear to be rust stains from rebar, spalling, cracking, or any other abnormality that might affect the integrity of the stability of the tank and therefore not considered to be structurally significant.

Figure 13-2: Concrete Anomaly

13.1.2 Steel Liner

Figure 13-3 shows a section of tank 241-S-104's steel liner. As can be seen in the figure, the steel liner directly below the flashing can be seen clearly with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the steel liner of the tank. No areas of concern were found from visual inspection of the steel liner.

Figure 13-3: Tank 241-S-104 Steel Liner

This figure shows steel that appeared to be without any visual anomalies. Upon review of the complete footage, no critical visual anomalies were observed in the concrete or the steel that lines tank 241-S-104. Upon review of the complete footage, no critical visual anomalies were observed in the concrete or the steel that lines tank 241-S-104. When compared to photographs of this tank from 1984 such as in Figure 13-4, it can be seen that the condition of the liner looks as if it has not changed significantly.

Figure 13-4: Tank 241-S-104[13] in 1984

Figure 13-5 shows steel liner with some surface defect and possible pitting of the steel. This figure shows anomalies in the appearance of the tank's steel liner. Because these anomalies are in the steel liner of the tank, they are not considered to be structurally significant.

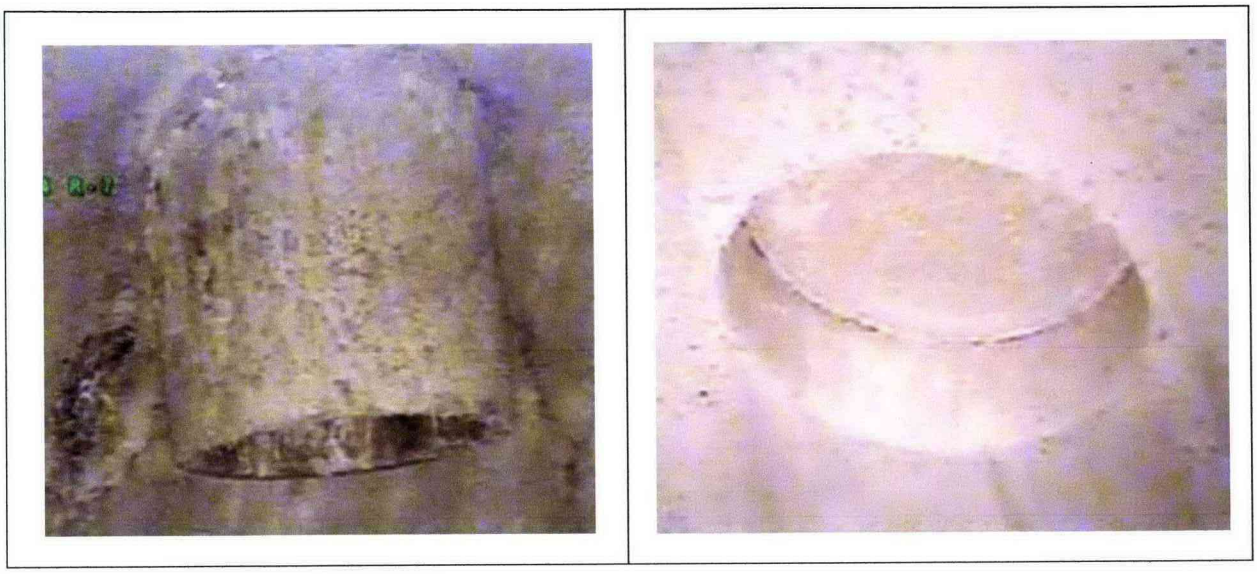
Figure 13-5: Steel Anomaly

[13] 8408365-8cn

13.1.3 In-Tank Equipment/Risers

All the visible in-tank equipment and risers appeared to be in good condition. Some of these can be seen in Figure 13-6.

Figure 13-6: Tank 241-S-104 In-Tank Equipment/Risers



13.2 RECOMMENDATIONS

Tank 241-S-104 was visually inspected on August 26, 2010. After review of the footage, no visual anomalies were observed that required follow up. The tank appears to be in stable condition based on visual inspection. Because no problems were found during visual inspection of this tank, no further action is recommended.

If tank 241-S-104 is visually inspected in the future, it is recommended that these findings are used as a basis for changes within the concrete and steel liner. Any anomalies that are found will assist in determining changes in tank integrity over time.

14.0 TANK 241-S-108

14.1 RESULTS AND CONCLUSION

Tank 241-S-108 was visually inspected on September 16, 2010. The footage taken by the camera was carefully reviewed for any visible anomalies on the inside of the tank (above the waste level) on the surface of the steel liner and concrete dome to identify any areas of concern that would indicate degradation to the structural integrity of the tank.

14.1.1 Tank Dome

Figure 14-1 shows a section of tank 241-S-108's concrete dome which can be seen with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the dome of the tank. No areas of concern were found from visual inspection of the dome.

Figure 14-1: Tank 241-S-108 Concrete Dome

Several close-up pictures of the concrete dome have been compiled into one photograph to see the condition of the concrete as a panorama. This can be seen in Figure 14-2. This figure shows concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank. Upon review of the complete footage, no critical visual anomalies were observed in the concrete that structures the dome of tank 241-S-108.

Figure 14-2: Compilation of Photographs of Tank 241-S-108 Dome

Upon visual inspection of the tank, some dissimilar areas were observed on the concrete dome. Figure 14-3 shows an area near the center of the tank's dome. There appears to be some sort of void where the concrete slabs come together. Figure 14-4 shows a raised section on the joint of the concrete. Most of the joints are flush with the concrete. This one appears to have some build up on it. This has not been seen in any other visual inspections of the single-shell tanks. While these two figures show anomalies in the appearance of the tank's dome, they do not appear to be rust stains from rebar, spalling, cracking, or any other abnormality that might affect the integrity of the stability of the tank and therefore not considered to be structurally significant.

Figure 14-3: Concrete Anomaly

Figure 14-4: Concrete Anomaly

14.1.2 Steel Liner

Figure 14-5 shows a section of tank 241-S-108 where the concrete dome connects to the steel liner. As can be seen in the figure, the steel liner directly below the flashing can be seen clearly with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the steel liner of the tank. There is too much build up on

the liner of the tank to get a definitive view of the steel liner. Because the images in the video were obstructed by the salt build up from the waste it has been determined that the condition of the steel liner of the tank is indeterminate.

Figure 14-5: Tank 241-S-108 Steel Liner

14.1.3 In-Tank Equipment/Risers

All the visible in-tank equipment and risers appeared to be in good condition. Some of these can be seen in Figure 14-6.

Figure 14-6: Tank 241-S-108 In-Tank Equipment/Risers

14.2 RECOMMENDATIONS

Tank 241-S-108 was visually inspected on September 16, 2010. After review of the footage, no visual anomalies were observed that required follow up. The tank appears to be in stable condition based on visual inspection. Because no problems were found during visual inspection of this tank, no further action is recommended.

If tank 241-S-108 is visually inspected in the future, it is recommended that these findings are used as a basis for changes within the concrete and steel liner. Any anomalies that are found will assist in determining changes in tank integrity over time.

15.0 TANK 241-SX-101

15.1 RESULTS AND CONCLUSION

Tank 241-SX-101 was visually inspected on September 15, 2010. The footage taken by the camera was carefully reviewed for any visible anomalies on the inside of the tank (above the waste level) on the surface of the steel liner and concrete dome to identify any areas of concern that would indicate degradation to the structural integrity of the tank.

15.1.1 Tank Dome

Figure 15-1 shows a section of tank 241-SX-101's concrete dome which can be seen with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the dome of the tank. No areas of concern were found from visual inspection of the dome. This figure shows concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank. Upon review of the complete footage, no critical visual anomalies were observed in the concrete dome of tank 241-SX-101.

Figure 15-1: Tank 241-SX-101 Concrete Dome

15.1.2 Steel Liner

Figure 9-5 shows a section of tank 241-SX-101 where the concrete dome connects to the steel liner. As can be seen in the figure, the steel liner directly below the flashing can be seen clearly with minimal visual obstructions. This figure shows several dissimilar areas in the steel liner of the tank. Although there appear to be several dissimilar areas in the steel liner, when compared

to prior in-tank photos such as Figure 15-3, it can be seen that the condition of the tank has not changed significantly since 1982, which is a good indication of structural integrity.

Figure 15-2: Tank 241-SX-101 Steel Liner

Figure 15-3: Tank 241-SX-101 in 1982[14]

Figure 15-4 shows what appears to be either a crack or salt line in the steel liner. Below in the figure an inverse tar ring can also be seen. This is where the mastic is assumed to have seeped out of a perforation in the steel liner of the tank while there was still liquid waste in the tank. Because the mastic was less dense than the fluid in the tank at the time, it floated up the wall giving it the "V" like appearance in the figure.

[14] 100305-8cn

Figure 15-5 is a zoomed in photo of the horizontal linear anomaly seen throughout the tank. This line can be seen most of the way around the tank. Also seen in Figure 15-4, this anomaly could be either a crack or a salt line. The appearance of the steel is the same on both sides of the anomaly which would indicate a crack, while the uniform horizontal behavior of the anomaly would indicate a salt line. Because it is not clear what these anomalies are, the condition of the steel liner is indeterminate.

While these two figures show anomalies in the appearance of the tank, they are not load bearing and appear in the steel liner of the tank and therefore, not considered to be structurally significant.

Figure 15-4: Steel Anomaly

Figure 15-5: Steel Anomaly

15.1.3 In-Tank Equipment/Risers

All the visible in-tank equipment and risers appeared to be in good condition. Some of these can be seen in Figure 15-6.

Figure 15-6: Tank 241-SX-101 In-Tank Equipment/Risers

15.2 RECOMMENDATIONS

Tank 241-SX-101 was visually inspected on September 15, 2010. After review of the footage, no visual anomalies were observed that required follow up. The tank appears to be in stable condition based on visual inspection. When compared to prior pictures of the tank from the 1970s and 1980s, there appeared to be no significant changes in the concrete or the steel liner of the tank. Because no problems were found during visual inspection of this tank, no further action is recommended.

If tank 241-SX-101 is visually inspected in the future, it is recommended that these findings are used as a basis for changes within the concrete and steel liner. Any anomalies that are found will assist in determining changes in tank integrity over time.

16.0 TANK 241-U-104

16.1 RESULTS AND CONCLUSION

Tank 241-U-104 was visually inspected on August 17, 2010. The footage taken by the camera was carefully reviewed for any visible anomalies on the inside of the tank (above the waste level) on the surface of the steel liner and concrete dome to identify any areas of concern that would indicate degradation to the structural integrity of the tank.

16.1.1 Tank Dome

Figure 16-1 shows a section of tank 241-U-104's concrete dome which can be seen with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the dome of the tank. No areas of concern were found from visual inspection of the dome.

Figure 16-1: Tank 241-U-104 Concrete Dome

Several close-up pictures of the concrete dome have been compiled into one photograph to see the condition of the concrete as a panorama. This can be seen in Figure 16-2. This figure shows concrete with no visible cracks, spalling or other anomalies that might jeopardize the integrity of the tank. Upon review of the complete footage, no critical visual anomalies were observed in the concrete that structures the dome of tank 241-U-104.

Figure 16-2: Compilation of Photographs of Tank 241-U-104Dome

Upon visual inspection of the tank, some dissimilar areas were observed on the concrete dome. Figure 16-3 shows a concrete area near the steel liner of the tank. There appears to be an anomaly that runs parallel to the steel liner. Figure 16-4 shows what appears to be a cold joint or minor crack near the haunch of the tank's dome. While these two figures show anomalies in the appearance of the tank's dome, they do not appear to be rust stains from rebar, spalling, cracking, or any other abnormality that might affect the integrity of the stability of the tank and therefore not considered to be structurally significant.

Figure 16-3: Concrete Anomaly

Figure 16-4: Concrete Anomaly

16.1.2 Steel Liner

Figure 16-5 shows a section of tank 241-U-104 where the concrete dome connects to the steel liner. As can be seen in the figure, the steel liner directly below the flashing can be seen clearly with minimal visual obstructions. This figure is representative of the findings from the rest of the footage taken of the visible area of the steel liner of the tank. No areas of concern were found from visual inspection of the steel liner.

Figure 16-5: Tank 241-U-104 Steel Liner

Several close-up pictures of the steel liner have been compiled into one photograph to see the condition of the steel liner as a panorama. This can be seen in Figure 16-6. This figure shows steel that appears to be without any visual anomalies. The surface of the steel liner appears to be dissimilar from other tanks inspected for FY 2010. This could possibly be a coating of waste on the steel liner or corrosion of the steel. Upon review of the complete footage, no critical visual anomalies were observed in the concrete or the steel that lines tank 241-U-104. When compared to prior photos of the tank such as in Figure 16-7, it can be seen that the condition of the tank has not changed significantly.

Figure 16-6: Compilation of Photographs of Steel Liner Tank 241-U-104

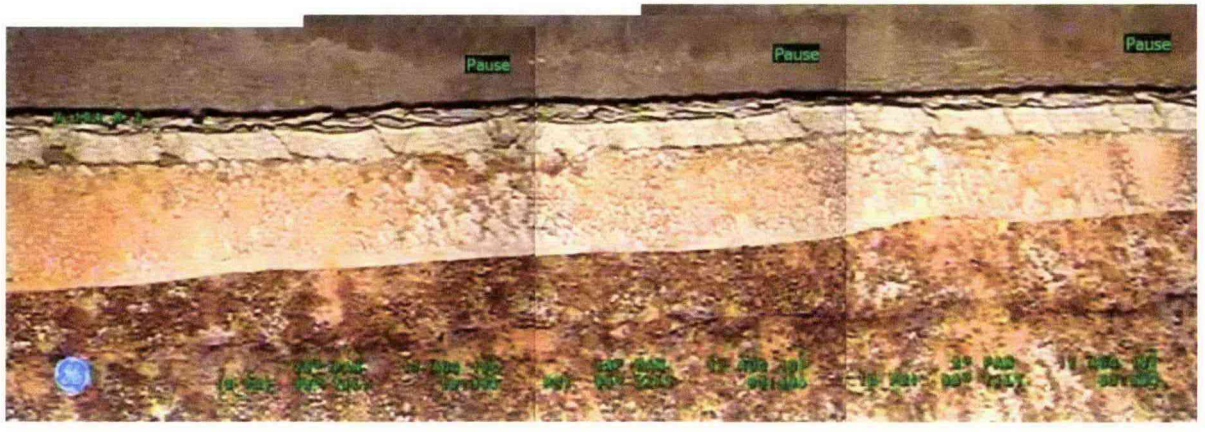
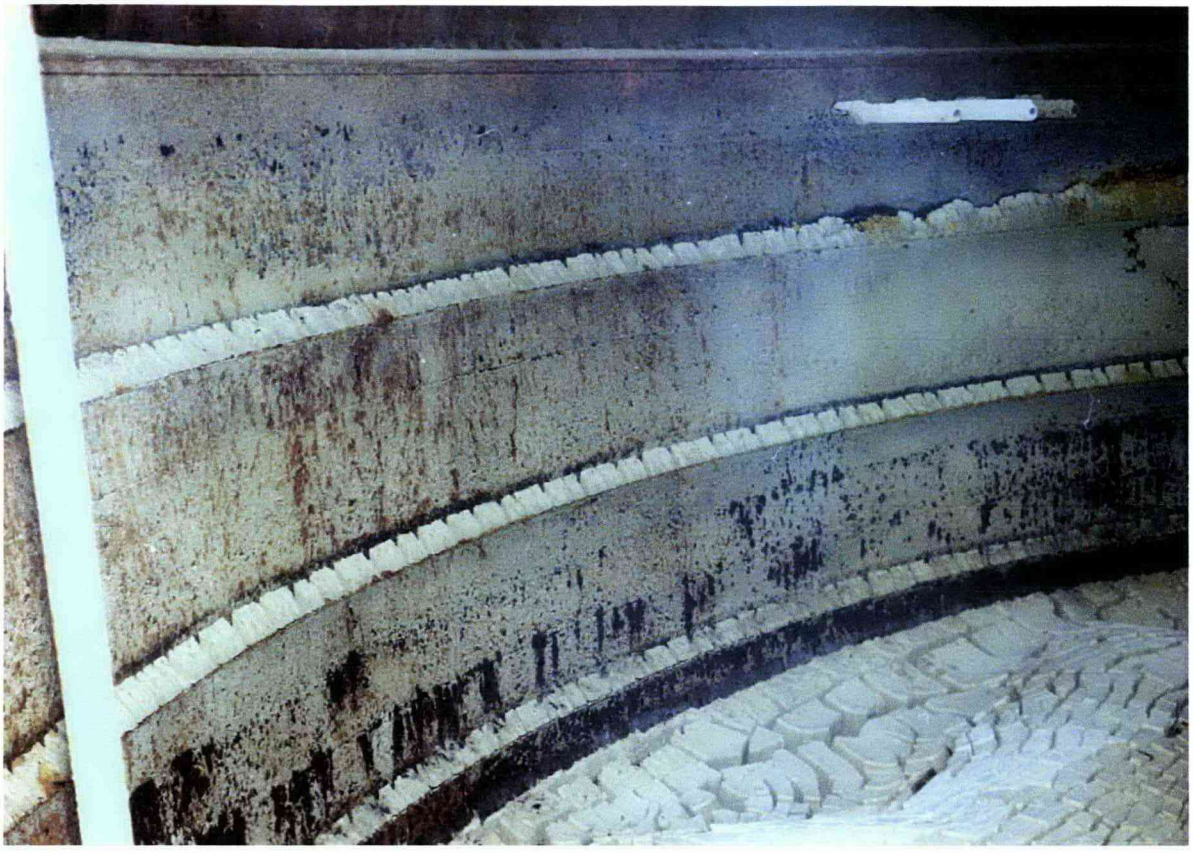


Figure 16-7: Tank 241-U-104[15] in 1989



16.1.3 In-Tank Equipment/Risers

All the visible in-tank equipment and risers appeared to be in good condition. Some of these can be seen in Figure 16-8.

[15] 89081042-06cn

Figure 16-8: Tank 241-U-104 In-Tank Equipment/Risers

16.2 RECOMMENDATIONS

Tank 241-U-104 was visually inspected on August 17, 2010. After review of the footage, no visual anomalies were observed that required follow up. The tank appears to be in stable condition based on visual inspection. When compared to prior pictures of the tank from the 1970s and 1980s, there appeared to be no significant changes in the concrete or the steel liner of the tank. Because no problems were found during visual inspection of this tank, no further action is recommended.

If tank 241-U-104 is visually inspected in the future, it is recommended that these findings are used as a basis for changes within the concrete and steel liner. Any anomalies that are found will assist in determining changes in tank integrity over time.

17.0 WORKS CITED

ARH-1496. (1969). *Review of Storage Tank Integrity* . Richland, WA: Atlantic Richfield Hanford Company.

Engeman, J. (2010). *RPP-PLAN-46847 Visual Inspection Plan for Single-Shell Tanks and Double-Shell Tanks.* Richland: Washington River Protection Solutions.

Moore, E., & Metz, W. (1974, July 26). Apparent Liner Crack In SX 112. Richland: Atlantic Richfield Hanford Company.

Rifaey, S. (2002). *Single-Shell Tank System Integrity Assessment Report.* Richland, WA: CH2M Hill Hanford Group, Inc.

Rogers, M. (2010). *Waste Tank Summary Report for Month Ending September 30, 2010.* Richland: Washington River Protection Solutions.

Shallman, E. (2010). *RPP-PLAN-45082 Implementation Plan for the Single-Shell Tank Integrity Project.* Richland: Washington River Protection Solutions.