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Final Results of Double-Shell Tank 241-AN-106 Ultrasonic Inspection

C. E. Jensen

Lockheed Martin Hanford Corporation, Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-87RL10930

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Abstract: This document presents the results and documentation of the nondestructive ultrasonic examination of tank 241-AN-106. A tank inspection supplier was retained to provide and use an ultrasonic examination system (equipment, procedures, and inspectors) to scan a limited area of double-shell tank 241-AN-106 primary tank wall and welds. The inspection found no reportable indications of thinning, pitting, corrosion, or cracking.

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FINAL RESULTS OF DOUBLE-SHELL TANK
241-AN-106
ULTRASONIC INSPECTION

Prepared By:

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7/9/99

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7/19/99

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7/19/99

**Final Results of Double-Shell Tank 241-AN-106
Ultrasonic Inspection**

July 15, 1999

Prepared by
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COGEMA Engineering Corporation

for

Lockheed Martin Hanford Corporation
Richland, Washington

**Final Results of Double-Shell Tank 241-AN-106
Ultrasonic Inspection**

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**Double-Shell Tank System Integrity Assessment:
FINAL RESULTS OF DOUBLE-SHELL TANK 241-AN-106 ULTRASONIC
INSPECTION**

1.0 INTRODUCTION

In May 1996, the Tank Waste Remediation System (TWRS) Decision Board recommended, and the U.S. Department of Energy-Richland Operations Office (DOE-RL) agreed, that the condition of the double-shell tanks (DST) should be determined by ultrasonic (UT) inspection of a limited area in six of the 28 DSTs. The Washington State Department of Ecology (WDOE) has agreed with the strategy of limited UT inspection of six DSTs. Data collected during the UT inspections will be used to assess the condition of the tanks, judge the effects of past corrosion control practices, and satisfy a regulatory requirement to periodically assess the integrity of waste tanks.

In November 1996, the primary and secondary walls of DST 241-AW-103 were remotely examined to determine if Hanford DST walls could be inspected without removing the existing surface rust and scale. The successful completion of this inspection represented the first UT inspection of a Hanford DST (Leshikar 1997).

Based on the results of the initial inspection, a statement of work (SOW)(Pfluger 1999) was prepared for the remaining DST inspections scheduled for Fiscal Year (FY) 1999. The service of COGEMA Engineering Corporation (COGEMA Engineering) was retained to provide an UT examination system (equipment, procedures, and inspectors) and perform the inspection.

Tank 241-AN-106 was selected as one of the six sample tanks that represent the complete 28-tank population. The tank began receiving waste in 1981 and is currently classified as a Complexed waste tank (CC). The current tank level is approximately 14.2 inches (Hanlon 1999). From 1981 to present, the highest waste temperature recorded was 94.1°F with the average temperature holding at approximately 72°F. Although the tanks are expected to have similar performance, the selection of tanks is purposely biased towards tanks whose primary walls may be more likely to be degraded by corrosion. The tank selection criteria (Schwenk and Scott 1996) considered variables that may influence corrosion, such as waste physical characteristics, waste chemistry, temperature, and age. Tank 241-AN-106 was chosen because it had one of the highest phosphate waste content.

2.0 OBJECTIVE / SCOPE

This report presents the results of the UT examination of DST 241-AN-106 with attention focused on the primary tank wall base metal and welds. Issuance of this report meets Fiscal Year (FY) 1999 Performance Agreement TWR 6.3.1. The criteria, deliverables, and responsibilities for the UT examination are described in Pfluger 1999.

3.0 EXAMINATION EQUIPMENT DESCRIPTION

P-scan – P-scan is the name of the computerized pulse-echo UT inspection system used by the examination vendor. The P-scan system is manufactured by Force Institute in Denmark. It acquires data from zero and angle beam transducers mounted on the crawler, allows real-time analysis, and records the data in electronic memory for post inspection analysis. Force Institute has designated “P-scan mode” to represent the angle beam (flaw length) view and “T-scan mode” to represent the zero beam (thickness) view. T-scan mode is used for normal operation and, if crack-like indications are detected, the P-scan mode is employed. More information on the procedure for the P-scan system is found in Jensen 1999.

Crawler (UT Scanner) – The crawler is a remotely-controlled device that delivers the ultrasonic sensors to the tank walls (Figure 2). It weighs approximately 30 pounds and has dimensions of approximately 21 inches wide x 18 inches long x 6 inches high. The crawler attaches to the tank wall with two pairs of magnetic wheels. A traveling bridge on the crawler is outfitted with ultrasonic sensors. As the crawler moves slowly forward the sensors glide from side-to-side over the tank wall surface. Water couplant is continuously fed to each transducer at a rate needed to maintain an acceptable signal.

Overview Camera – This camera was deployed to observe the area immediately around the inspection area and to aid crawler deployment in the annulus.

Sideview Camera – This camera and light system were installed in a riser adjacent to the inspection riser to provide an overall view of the inspection process.

Data Acquisition Control Center – A pull-type trailer was used to house the crawler controls, video monitors, and the data collection and evaluation hardware. The trailer was located outside the AN tank farm boundary fence (Figure 2).

Deployment Tool – This device was specifically designed to insert and retrieve the scanner from the DST annular space. The scanner sits on a platform that is manually lowered to the appropriate elevation. That platform has cables attached that can be controlled to move the scanner platform into contact with the examination surface. The scanner is then driven onto the surface. The deployment tool is retracted until scanner removal is required.

4.0 PERFORMANCE DEMONSTRATION TESTS

Prior to field use, COGEMA Engineering's UT examination system satisfactorily completed a performance demonstration test (PDT). The test was performed prior to examination of tank 241-AN-107 in FY 1998 (Pfluger 1998). The test was conducted to qualify personnel, test procedures, and ensure the equipment's ability to detect and size wall thinning, pits, and cracks in a series of test plates with artificial and natural defects. The PDT was performed on an actual tank mockup located in the 306E facility located in the Hanford site 300 Area. This mockup also demonstrated the successful deployment and retrieval of the equipment (Pfluger 1998).

5.0 ULTRASONIC EXAMINATION DESCRIPTION

5.1 Primary Wall and Welds Inspection

The tank inspection was performed under Job Control System (JCS) work package 2E-99-01220/W during mid-calendar year 1999. All work steps, guidelines, procedures, personnel responsibilities, and protocol for the inspection (Pfluger 1999) were included in the subject work package.

An updated version of the remotely-controlled, steerable crawler was used to deliver the UT sensors to the tank wall. The crawler was deployed through a 24-inch annulus inspection riser number 6A. The crawler attached to the tank wall with two pairs of magnetic wheels. A traveling bridge on the crawler was outfitted with UT sensors. As the crawler moved slowly forward, the sensors glided from side-to-side over the inspection surface. Water couplant was continuously fed to each transducer at a rate needed to attain an acceptable signal. For examination of the wall, one dual element 0° transducer and two 45° shear wave transducers were used. To detect cracks perpendicular to welds, two opposing 45° shear wave transducers were directed parallel to the weld. To detect cracks parallel to the weld, a 60° shear wave transducer was directed towards the weld and a dual element 0° transducer was also included. Welds were examined from both sides of the weld crown.

Data and images from both systems were returned to a control center located just outside the AN tank farm fence (Figure 2). The control center housed the crawler controls, video monitors, and data collection and evaluation software/hardware. The UT inspector

continuously monitored the signal for reportable indications. The inspection was viewed by a camera and lighting system deployed in an adjacent riser.

6.0 GENERAL REQUIREMENTS AND INSPECTION CRITERIA

The FY 1999 Performance Agreement TWR 6.3.1 is stated below:

“The contractor shall perform ultrasonic examination of four double-shell tanks (primary walls straight portion) to the extent described in HNF-2820, *Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks*. Completion is met when ultrasonic examination on four double-shell tanks is performed, a report of examinations/observations is reviewed and approved by FDH, and the report is submitted to RL by July 31, 1999. The report shall include the extent of the examination, discussion of observations, findings, and conclusions.”

Areas to be examined on the primary tank were identified in the SOW (Pfluger 1999) as:

Primary Tank Wall and Welds:

- A vertical strip, approximately 30 inches wide by 35 feet long. The vertical strip may be comprised of one or more strips whose total width is approximately 30 inches. (The distance from the tank upper haunch transition to the lower knuckle is approximately 35 feet).
- 20 feet of the cylinder-to-lower knuckle weld.
- One vertical weld joining the lowest shell course plates (approximately 10 feet).
- One vertical weld joining the next to the lowest shell course plates (approximately 10 feet).

7.0 INDICATION REPORTING CRITERIA

COGEMA Engineering was required to report to the customer the following anomalies (Pfluger 1999):

- Wall thinning that exceeded 10% of the nominal plate thickness
- Pit depths that exceeded 25% of the nominal wall thickness
- Cracks that exceeded 0.18 inches in depth.

8.0 EQUIPMENT SET-UP AT AN TANK FARM

Prior to performing the actual examination, the riser shield plug was removed and replaced with a sheetmetal cover.

A temporary structure, constructed of scaffolding, was erected around the riser to provide the means for deploying the UT equipment (Figure 2). A central I-Beam was secured to the top of the scaffolding and supported a single-line sheave. A manual cable winch was secured to the base with the cable running up to the sheave in a single-line hoisting method for maneuvering the equipment into position. The weather during the examination was cool to moderate so a second temporary structure was erected near the inspection riser. This "tent" was constructed of round tubing and covered with weather resistant material and housed the inspection overview video equipment, deployment tool and video monitor (Figure 2). The tent provided adverse weather protection for the equipment and crew. The control cables leading from the trailer were run along the ground to the equipment located at the riser. The cable was sleeved with plastic to prevent possible contamination

9.0 EXAMINATION RESULTS

The Inspection Data Sheets and an interpretation of the data by a COGEMA Engineering Level III qualified inspector are included in Attachment 2. Tank 241-AN-106 (typical of all double-shell tanks) was fabricated from carbon steel plate. The location of plates as identified in the PNNL report is as follows (See Attachment 1):

Primary knuckle (top) – Connects dome of tank to side-wall.

Primary wall – Consists of (from top to bottom):

Plate #1 – approximately 7 feet 9 inches tall, 1/2" nominal thickness

Plate #2 – approximately 7 feet 9 inches tall, 1/2" nominal thickness

Plate #3 – approximately 7 feet 9 inches tall, 1/2" nominal thickness

Plate #4 – approximately 9 feet tall, 3/4" nominal thickness

Plate #5 – approximately 2 feet tall, 7/8" nominal thickness

Primary knuckle (bottom) – Connects side-wall of tank to primary tank bottom.

All tank welds are in the "as-welded" condition. The primary tanks exterior surface varies from mill scale to a coating of rust caused by the normal weathering of carbon steel. The tank surface also contains chalk marks from hydrostatic test and miscellaneous material identifier markings from construction. In some places, streaks from concrete pouring can be found. The following pages contain tables that present the data as a percent (%) of nominal wall thickness, which was derived from the "241-AN-106 Double-Shell Tank Ultrasonic Examination Data Reports With Data Sheets" (Attachment 2) and Pacific Northwest National Laboratory report PNNL letter (Attachment 1) "Ultrasonic Examination of Double-Shell Tank 241-AN-106".

Table 1 Tank 241-AN-106 Ultrasonic Examination Primary Tank Wall, Scan 1 (Attachment 2)			
Plate	Design Nominal Thickness (inches)	Measured Minimum Thickness (inches)	% Wall Thinning
Plate #1 (upper)	0.50	0.498	0.4% of nominal thickness
Plate #2	0.50	0.473	5.4% of nominal thickness
Plate #3	0.50	0.490	2.0% of nominal thickness
Plate #4	0.75	0.703	6.3% of nominal thickness
Plate #5 (lower)	0.875	0.866	1.0% of nominal thickness

Table 2 Tank 241-AN-106 Ultrasonic Examination Primary Tank Wall, Scan 2 (Attachment 2)			
Plate	Design Nominal Thickness (inches)	Measured Minimum Thickness (inches)	% Wall Thinning
Plate #1 (upper)	0.50	0.493	1.4% of nominal thickness
Plate #2	0.50	0.485	3.0% of nominal thickness
Plate #3	0.50	0.485	3.0% of nominal thickness
Plate #4	0.75	0.730	2.7% of nominal thickness
Plate #5 (lower)	0.875	0.857	2.1% of nominal thickness

<p style="text-align: center;">Table 3 Tank 241-AN-106 Ultrasonic Examination Horizontal and Vertical Primary Tank Weld Scans (Attachment 2)</p>			
Weld	Design Nominal Thickness (inches)	Measured Minimum Thickness (inches)	% Weld Thinning
Vertical Plate #3	0.50	0.485	3.0% of nominal thickness
Vertical Plate #4	0.75	0.715	4.7% of nominal thickness
Vertical Plate #5	0.87	0.844	3.5% of nominal thickness
Plate #5 to Knuckle	0.875	0.848	3.1% of nominal thickness

Note 1: PNNL evaluated the data and concluded that no reportable wall thinning, pitting, corrosion, or cracking is present (see Attachment 1)

Note 2: Although the data is reported to three decimal places, the accuracy of the data, based on the results of the performance demonstration test is ± 0.020 inch for wall thickness.

10.0 EVALUATION OF EXAMINATION RESULTS

The results of the Tank 241-AN-106 UT examination indicated no reportable wall thinning, pitting, corrosion, or cracks. Attachment 1 contains the report prepared by PNNL that analyzes the data gathered from Tank 241-AN-106 (Attachment 2). Figure 1 shows the history of waste level matched with the "as-found" measurements of the primary tank wall generated from the inspection data sheets (Attachment 2). Each wall thickness measurement plotted on the figure is the average of all data collected over a 1 - foot long by 15 -inch wide scan area.

PNNL UT examination experts independently evaluated (Attachment 1) the hard copy scans and inspection data sheets and concurred with the COGEMA Engineering interpretation (see Attachment 2). The following is a summary of the results associated with the areas examined. The data have been reviewed and approved by W. H. Nelson, COGEMA Engineering's NDE Level III qualified inspector (Attachment 2):

Primary Tank Wall Thinning/Pitting/Corrosion/Cracking:

- No reportable thinning, pitting, corrosion, or cracking was detected.

Primary Tank Horizontal and Vertical Welds:

- No reportable thinning, pitting, corrosion, or cracking was detected.

11.0 FINDINGS AND CONCLUSIONS

- The absence of cracks in the plate and HAZ indicates that the pre-service material quality control, weld stress relief treatment, and waste chemistry controls have been effective in preventing cracks.
- Since there were no significant changes in the wall thickness and no cracks were detected at any location, corrosion due to suspected mechanisms is probably not occurring to any significant degree. However, uncertainty on conditions that lead to corrosion degradation, particularly stress corrosion cracking, suggest additional data on other tanks are needed to gain confidence that this result can be applied to the general tank population.

12.0 REFERENCES

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Pfluger, D.C., 1999, *Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks*, HNF-2820, Rev. 2, Lockheed Martin Hanford Corporation, Richland, Washington

Schwenk, E.B., and Scott, K.V., 1996, *Description of Double-Shell Tank Selection Criteria for Inspection*, WHC-SD-WM-ER-529, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Figure 1 - Comparison of As-Measured and ASTM-Specified Plate Thickness with Waste Level, DST 241-AN-106

Figure 2 – Schematic of Inspection Set-up 241-AN-106

ATTACHMENT 1

Ultrasonic Examination of Double Shell Tank 241-AN-106

PNNL Letter

Pacific Northwest National Laboratory

Operated by Battelle for the
U.S. Department of Energy

July 16, 1999

Mr. Chris E. Jensen
Lockheed Martin Hanford Corporation
PO Box 1500 - - MS R1-56
Richland, WA 99352-1505

Dear Mr. Jensen,

Attached is a copy of the PNNL report describing the results of its third party evaluation of the data recorded by COGEMA on the ultrasonic examination of double shell Tank 241-AN-106. Details are given in the report, but the ultrasonic measurements from the tank show little evidence of corrosion in the wall of the tank. No crack-like indications were detected in either the wall or the heat-affected zones of the areas inspected.

If there are questions or if additional information is needed, please contact me.

Sincerely,

G. J. Posakony

Attachment: "Ultrasonic Examination of Double Shell Tank 241-AN-106"

cc: A. F. Pardini - PNNL
T.T. Taylor - PNNL

902 Battelle Boulevard • P.O. Box 999 • Richland, WA 99352

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Ultrasonic Examination of Double Shell Tank 241-AN-106

Gerald J. Posakony and Allan F. Pardini
Pacific Northwest National Laboratory

July 1999

Background

COGEMA Engineering Corporation (COGEMA), under a contract from Lockheed Martin Hanford Corporation (LMHC), has performed an ultrasonic examination of selected portions of Tank 241-AN-106. The purpose of the examination was to provide information that could be used to evaluate the integrity of the primary tank wall. The requirements for the ultrasonic examination of Tank 241-AN-106 were to detect, characterize (identify, size, and locate) and record measurements made of wall thickness and pitting or cracking in the wall or in the heat-affected zone (HAZ) of welds of the primary tank. Any measurements that exceeded the requirements set forth in the contract were to be reported to LMHC for further evaluation. Measurements that are to be specifically recorded include the following:

- Wall thinning that exceeds 10% of the nominal thickness of the plate
- Pits with depths that exceed 25% of the plate thickness
- Stress-corrosion cracks located on the inner wall of the primary tank or in the HAZ of welds that exceed a depth of 0.18 in.

The accuracy requirements for depth measurements for the different types of defects includes:

- Wall thinning—measure thickness within ± 0.02 in.
- Pits—size depths within ± 0.05 in.
- Cracks—size the depth of cracks on the inner wall surfaces within ± 0.100 in.
- Location—locate all reportable indications within ± 1.0 in.

Under the contract with LMHC, all data is to be recorded on disk and hard copies of all measurements are to be provided to PNNL for third party evaluation. PNNL is responsible for preparing report(s) that describe the results of the COGEMA ultrasonic examinations.

Information contained in PNNL Reports No. 11971, 12198 and 12233 provide detailed information on requirements for personnel qualification, ultrasonic test procedure and ultrasonic test equipment that are to be used for the inspection of the double shell tanks.

Ultrasonic Examination

The ultrasonic test system used for the examination of Tank 241-AN-106 consisted of a Force Industries, Inc. P-Scan Model PSP-3 and an AWS-5D remotely controlled, magnetic-wheel mechanical crawler designed for remote inspections. The ultrasonic test procedure developed previously for the examination of the double shell tanks was used for the inspection of 241-AN-106. The personnel involved in the inspection were specifically qualified to perform inspections on the double shell tanks. To perform the ultrasonic examination, the AWS-5D crawler was inserted into the annulus between the primary and secondary tank and positioned to attach to the wall of the primary tank. Two 15-in. wide

scan paths spaced approximately 6-in apart provided wall thickness and crack detection measurements of the full height of the tank. Figure 1 shows the location of the two scan paths used for the inspection of the primary tank wall. To inspect welds in Plates #3, #4, # 5 and the knuckle weld, the crawler was maneuvered over the weld to be inspected and the mechanical scanner was positioned to inspect welds in either the vertical or horizontal directions depending on the direction of the weld.

Figure 1. Sketch of Vertical Scan Paths No. 1 and 2 used for the Ultrasonic Examination of the Primary Wall of Tank 241-AN-106¹

¹ All historical dimensioning for the design, development and construction of this tank are in English units; consequently, English units are the primary units used in this report. Use 1.0 in. equals 25.4 mm to convert to metric.

The cylindrical section of 241-AN-106 is 35-ft high and consists of:

- three 8-ft wide plates with a nominal thickness of 0.500 in.
- one 9-ft wide plate with a nominal thickness of 0.750 in.
- one 2-ft wide transition plate between the shell of the tank and the tank knuckle with a nominal thickness of 0.875 in.

The sketch also includes information on the wall thickness measurements made at the top and bottom of each plate showing the range of wall thickness measured for each plate. A review of the information in the "Automated Ultrasonic Thickness Data Reports" for wall thickness measurements in the wall of the primary tank (See Tables 1 through 5) shows little evidence of corrosion in this tank. No cracks were detected in either the wall or welds of the primary tank.

Results from the Ultrasonic Examination of the Primary Tank Wall in 241-AN-106

The ultrasonic test procedure, established for the examination of the primary tank wall, required the following:

- a zero-degree transducer for detecting and sizing wall thinning/corrosion and pitting
- two separate 45-degree angle beam transducers with opposing ultrasonic beams for detecting and sizing of any cracks that might be present in the plates.

For wall thickness measurements, the scanning bridge, which is incorporated into the AWS-5 magnetic-wheel crawler, translates the transducers over a 15-in. wide scan path. Upon completion of a full scan path, the crawler is indexed downward a distance of 0.100 in. and the scan is repeated. The P-Scan-Model PSP-3 ultrasonic system acquires measurement data every 0.125-in. (pixel) as the scanner traverses the bridge. The thickness value recorded in any 0.125-in. by 0.100-in. pixel is the minimum wall thickness in that pixel. Data from the traverse and index directions are recorded digitally on disks for post analysis.

The data in Tables 1 through 5 were taken from the "Automated Ultrasonic Thickness Data Report" prepared by the COGEMA analyst describing the results of the examination of the primary tank wall. The data that appears on the analyst's data report is the minimum value in any pixel recorded for a 15-in. by 12-in. area. The first column in the tables describes the distance from the top weld of the primary tank (tank to dome). Wall thickness and results from the 45-degree angle beam tests are shown in the columns for Scan Paths No. 1 and 2.

In addition to these reports, hard copy C-scan (area) and B-scan (cross section) color printouts were provided for each vertical foot of the tank wall that was inspected. These printouts provide detailed information of location and size of any anomalies that exceed the inspection criteria. The wall thickness values in the tables are taken from the analyst's report. To obtain detailed information, the procedure followed is to analyze the B-scan and C-scan hard copy records for each foot to the area inspected. Interpreting the data requires analysis of both the analyst's record and the B-scan and C-scan plots.

Table 1. Data from the Vertical UT Scan Paths on the Primary Tank Wall, Plate #1

Distance from the Top Weld (ft)	Results from the Ultrasonic Examination of Plate #1. Vertical Scan Path No. 1		Results from the Ultrasonic Examination of Plate #1. Vertical Scan Path No. 2	
	Minimum Thickness Recorded in Area Scanned (in.)	45-Degree Angle Beam Examination	Minimum Thickness Recorded in Area Scanned (in.)	45-Degree Angle Beam Examination
0 to 1	0.505	No crack-like indications were detected during the examination of this plate	0.485	No crack-like indications were detected during the examination of this plate
1 to 2	0.500		0.485	
2 to 3	0.513		0.493	
3 to 4	0.508		0.490	
4 to 5	0.508		0.500	
5 to 6	0.508		0.498	
6 to 7	0.500		0.485	
7 to 8	0.498		0.490	

The nominal thickness of this plate is 0.500 in. Little or no corrosion is evident from the ultrasonic measurements made on this plate. There was no evidence of cracks in the plate wall.

Table 2. Data from the Vertical UT Scan Paths on the Primary Tank Wall, Plate #2

Distance from the Top Weld (ft)	Results from the Ultrasonic Examination of Plate #2. Vertical Scan Path No. 1		Results from the Ultrasonic Examination of Plate #2. Vertical Scan Path No. 2	
	Minimum Thickness Recorded in Area Scanned (in.)	45-Degree Angle Beam Examination	Minimum Thickness Recorded in Area Scanned (in.)	45-Degree Angle Beam Examination
8 to 9	0.473	No crack-like indications were detected during the examination of this plate	0.485	No crack-like indications were detected during the examination of this plate
9 to 10	0.478		0.485	
10 to 11	0.478		0.493	
11 to 12	0.485		0.490	
12 to 13	0.490		0.500	
13 to 14	0.485		0.498	
14 to 15	0.490		0.485	
15 to 16	0.485		0.490	

The nominal thickness of this plate is 0.500 in. Little or no corrosion is evident from the ultrasonic measurements made on this plate. There was no evidence of cracks in the plate wall.

Table 3. Data from the Vertical UT Scan Paths on the Primary Tank Wall, Plate #3

Distance from the Top Weld (ft)	Results from the Ultrasonic Examination of Plate #3. Vertical Scan Path No. 1		Results from the Ultrasonic Examination of Plate #3. Vertical Scan Path No. 2	
	Minimum Thickness Recorded in Area Scanned (in.)	45-Degree Angle Beam Examination	Minimum Thickness Recorded in Area Scanned (in.)	45-Degree Angle Beam Examination
16 to 17	0.493	No crack-like indications were detected during the examination of this plate	0.493	No crack-like indications were detected during the examination of this plate
17 to 18	0.493		0.490	
18 to 19	0.493		0.498	
19 to 20	0.498		0.498	
20 to 21	0.498		0.498	
21 to 22	0.493		0.493	
22 to 23	0.490		0.485	
23 to 24	0.490		0.485	

The nominal thickness of this plate is 0.500 in. Little or no corrosion is evident from the ultrasonic measurements made on this plate. There was no evidence of cracks in the plate wall.

Table 4. Data from the Vertical UT Scan Paths on the Primary Tank Wall, Plate #4

Distance from the Top Weld (ft)	Results from the Ultrasonic Examination of Plate #4. Vertical Scan Path No. 1		Results from the Ultrasonic Examination of Plate #4. Vertical Scan Path No. 2	
	Minimum Thickness Recorded in Area Scanned (in.)	45-Degree Angle Beam Examination	Minimum Thickness Recorded in Area Scanned (in.)	45-Degree Angle Beam Examination
24 to 25	0.737	No crack-like indications were detected during the examination of this plate	0.741	No crack-like indications were detected during the examination of this plate
25 to 26	0.703		0.741	
26 to 27	0.737		0.741	
27 to 28	0.730		0.741	
28 to 29	0.741		0.741	
29 to 30	0.741		0.733	
30 to 31	0.733		0.733	
31 to 32	0.733		0.730	
32 to 33	0.737		0.730	

The nominal thickness of this plate is 0.750 in. Little or no corrosion is evident from the ultrasonic measurements made on this plate. There was no evidence of cracks in the plate wall.

Table 5. Data from the Vertical UT Scan Paths on the Primary Tank Wall, Plate #5

Distance from the Top Weld (ft)	Results from the Ultrasonic Examination of Plate #5. Vertical Scan Path No. 1		Results from the Ultrasonic Examination of Plate #5. Vertical Scan Path No. 2	
	Minimum Thickness Recorded in Area Scanned (in.)	45-Degree Angle Beam Examination	Minimum Thickness Recorded in Area Scanned (in.)	45-Degree Angle Beam Examination
33 to 34	0.870	*	0.857	*
34 to 35	0.866	*	0.861	*

(*) There was no evidence of cracks in the plate wall. The nominal thickness of this plate is 0.875 in. Little or no corrosion is evident from the ultrasonic measurements made on this plate.

Results from the Ultrasonic Examination of Selected Welds in the HAZ of 241-AN-106

The HAZ of welds in the tank wall was defined in the ultrasonic test procedure as an area 1-in. wide and 3/4T (thickness) on the inner surface of the tank wall and on both sides of the weld. The HAZ is measured from edge of the weld crown toward the parent plate material. Cracks to be detected (if present) initiate on the inner surface of the tank wall (see PNNL 11971).

For inspecting the HAZ of welds, the ultrasonic test procedure required use of three separate ultrasonic transducer configurations.

- a zero degree transducer was used to detect wall thinning and corrosion in the HAZ
- two opposing 45-degree angle-beam transducers were used to detect and size cracks that lie perpendicular to the weld in the HAZ
- one 60-degree transducer was used to detect and size cracks that lie parallel to the weld in the HAZ.

Wall thickness readings in the HAZ were recorded on the "Automated Ultrasonic Thickness Reports" prepared by the COGEMA analyst. Hard copy B-scan (cross section) and C-scan (area) color printouts were provided for all HAZ areas examined. Weld examinations were performed on vertical welds in Plates #3, 4 and 5 as well a portion of the knuckle weld. Summarizing the results of these examinations:

- Plate #3 -- 8 ft of vertical weld. The zero degree beam measurements showed values ranging from 0.485 to 0.500 in. No evidence of cracking was detected with either the 45-degree or 60-degree transducers.
- Plate #4 -- 9 ft of vertical weld. The zero degree beam measurements showed values ranging from 0.715 to 0.730 in. No evidence of cracking was detected with either the 45-degree or 60 degree transducers.
- Plate #5 -- 2 ft of vertical weld. The zero degree beam measurements showed values ranging from 0.844 to 0.852 in. No evidence of cracking was detected with either the 45-degree or 60 degree transducers
- Primary Knuckle Weld -- 20 ft of weld. The zero degree beam measurements showed values ranging from 0.848 to 0.880 in. No evidence of cracking was detected with either the 45-degree or 60-degree transducers.

Summary

The ultrasonic measurements of wall thickness of the plates in the primary tank with the nominal 0.500-in. thickness ranged from 0.473 to 0.508. In Plate #4 (nominal thickness of 0.750) the ultrasonic measurements of wall thickness ranged from 0.703 to 0.741 in. In Plate #5 (2-ft section with a nominal thickness of 0.875) the ultrasonic measurements ranged from 0.857 to 0.870. Since these measurements are minimum values recorded in the tank wall, it would indicate minor corrosion occurring in this tank. No crack-like indications were detected in the wall of the tank or in the HAZ of the welds inspected.

ATTACHMENT 2

241-AN-106 Double-Shell Tank Ultrasonic Examination Data Reports With Data Sheets

COGEMA-99-1018

June 30, 1999

COGEMA-99-1018

Mr. Chris E. Jensen
Lockheed Martin Hanford Corporation
Post Office Box 1500, MSIN R1-56
Richland, Washington 99352-1505

Dear Mr. Jensen:

AN-106 DOUBLE SHELL TANK ULTRASONIC EXAMINATION DATA REPORTS

Ultrasonic examination of double shell tank (DST) AN-106 was completed on June 22, 1999. Primary tank wall data showed no reportable indications. Primary tank areas ultrasonically inspected were two vertical wall scans approximately 15 inches wide by 34 feet long, and 20 feet of the vertical weld, and 20 feet of horizontal welds.

COGEMA Engineering is pleased to provide the enclosed AN-106 DST Ultrasonic Examination Calibration Sheets and Ultrasonic Data Reports. This completes our nondestructive examination of DST AN-106. The original ultrasonic report was transferred to Mr. Jerry Posakony at PNNL for final evaluation.

If you have any questions, please feel free to contact me at (509) 376-5403.

Sincerely,

W. H. Nelson
COGEMA NDE Ultrasonic Level III

cjl

Enclosure

P.O. Box 840
Richland, Washington 99352-0840
Phone (509) 372-3572 • Fax (509) 372-3169

CAL. SHEETS FOR AN-106

AUTOMATED ULTRASONIC THICKNESS CALIBRATION SHEET										CALIBRATION REPORT#
LOCATION HANFORD		SYSTEM DST		CALIBRATION BLOCK STEP BLK						
PROCEDURE SDI 2.1 Rev.3				THICKNESS 0.1" - 1.000"			MATERIAL CS			
UT SYSTEM PSP-3		SERIAL # 305		REFERENCE BLOCK TIW						
SOFTWARE VERSION P-SCAN/T-SCAN				REV. 6.05			THICKNESS 1"		MATERIAL CS	
LINEARITY DUE DATE 6-15-99				REFERENCE BLOCK TEMP AMBIENT OF			PYRO SN. N/A			
SCANNER TYPE AWS-5D		SERIAL # 105		COUPLANT WATER			BATCH # N/A			
SCANNER CABLE AWS-5D				CABLE LENGTH 400'			CABLE # N/A			
SIGNAL CABLE BG-59				CABLE LENGTH 400'			CABLE # N/A			
CHANNEL	TRANSDUCER MAKE	MODEL	FREQ.	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE	WEDGE TYPE	IMAGE	
1	KBA	MSEB SE	5 MHz	2/8x2mm	1718	Edge Cont.	0°	N/A	1	
2	KBA	MSEB SE	5 MHz	2/8x2mm	1718	PK-E Cont.	0°	N/A	2	
3				N						
4				A						
INITIAL CALIBRATION					CALIBRATION CHECKS					
DATE		6-7-99	6-7-99	6-8-99	6-8-99	6-18-99	6-18-99			
TIME		13:27	18:58	09:17	19:50	13:08	17:53			
REFLECTOR		BACKWALL	BACKWALL	BACKWALL	BACKWALL	BACKWALL	BACKWALL			
CH. 1	THK. 1	1.000"	0.999"	1.004"	0.995"	0.990"	1.004"	0.999"		
	THK. 2	0.300"	0.304"	0.299"	0.295"	0.290"	0.295"	0.295"	0.295"	
CH. 2	THK. 1	1.000"	0.999"	0.999"	0.995"	0.990"	1.000"	0.995"		
	THK. 2	0.300"	0.304"	0.299"	0.295"	0.295"	0.295"	0.300"		
CH. 3	THK. 1									
	THK. 2									
CH. 4	THK. 1	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
	THK. 2									
FILE #		AN6-CLO1	AN6-CLO2	AN6-CLO3	AN6-CLO4	AN6-CLO5	AN6-CLO6			
DISK #		AN6-1	AN6-3	AN6-4	AN6-8	AN6-8	AN6-9			
EXAMINER		R. SWAIN	R. SWAIN	R. SWAIN	R. SWAIN	R. SWAIN	R. SWAIN			
REMARKS										
N/A										
Examiner Ronald V. Swain		Examiner N/A			Reviewer W. K. Dube			Page		
Level II Date 6-18-99		Level Date 			Level Date 6-29-99			1 of 5		
COGEMA										

AUTOMATED ULTRASONIC P-SCAN CALIBRATION SHEET										CALIBRATION REPORT#
LOCATION HANFORD		SYSTEM DST			CALIBRATION BLOCK SDI PT-1					
PROCEDURE SDI 2.1 Rev. 3					THICKNESS 0.75"		MATERIAL CS			
UT SYSTEM RSP-3		SERIAL # 305			REFERENCE BLOCK IIW					
SOFTWARE VERSION P-SCAN-T-SCAN		REV. 6.05			THICKNESS 1" 4" SP		MATERIAL CS			
LINEARITY DUE DATE 9-17-99					REFERENCE BLOCK TEMP AMBIENT °F		PYRO SN N/A			
SCANNER TYPE AWS-5		SERIAL # 501			COUPLANT WATER		BATCH # N/A			
SCANNER CABLE AWS-5					CABLE LENGTH 400'		CABLE # N/A			
SIGNAL CABLE RG-59					CABLE LENGTH 400'		CABLE # N/A			
CHANNEL	TRANSDUCER MAKE	MODEL	FREQ.	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE NOM./ACT.	WEDGE TYPE	IMAGE	
1	KRAUTKRAMER	MWB 45-04	4MHz	8X9mm	30042	N/A	45°/45°	INT.	132	
2	KRAUTKRAMER	MWB 45-04	4MHz	8X9mm	2415	A	45°/46°	INT.	334	
3				N						
4				A						
INITIAL CALIBRATION					CALIBRATION CHECKS					
DATE		6-18-99	6-18-99	6-19-99	6-19-99					
TIME		18:25	22:37	08:23	16:57					
REFLECTOR / ORIENTATION		0.050" ID NOTCH	0.050" ID NOTCH	0.050" ID NOTCH	0.050" ID NOTCH					
CH. 1	AMPLITUDE	79dB	79dB	80dB						
	LOCATION	ID	ID	ID	ID					
CH. 2	AMPLITUDE	75dB	75dB	77dB						
	LOCATION	ID	ID	ID	ID					
CH. 3	AMPLITUDE	N/A	N/A	N/A	N/A					
	LOCATION	N/A	N/A	N/A	N/A					
CH. 4	AMPLITUDE	N/A	N/A	N/A	N/A					
	LOCATION	N/A	N/A	N/A	N/A					
FILE #		AN6CL4A1	AN6CL4A2	AN6CL4A3	AN6CL4A4					
DISK #		AN6-9	AN6-12	AN6-12	AN6-17					
EXAMINER		R. SWAIN	R. SWAIN	R. SWAIN	R. SWAIN					
REMARKS N/A										
Examiner Ronald V. Swain		Examiner N/A			Reviewer W.D. Nelson			Page 2 of 5		
Level II Date 6-14-99		Level A Date 6-14-99			Level III Date 6-29-99					
COGCMO										

AUTOMATED ULTRASONIC P-SCAN CALIBRATION SHEET										CALIBRATION REPORT#
LOCATION <u>HANFORD</u>		SYSTEM <u>DST</u>			CALIBRATION BLOCK <u>SDI PT-1</u>					
PROCEDURE <u>SDI 2.1 REV.3</u>					THICKNESS <u>0.75"</u>		MATERIAL <u>CS</u>			
UT SYSTEM <u>PSP-3</u>		SERIAL # <u>305</u>			REFERENCE BLOCK <u>ITW</u>					
SOFTWARE VERSION <u>P-SCAN/T-SCAN</u>			REV. <u>6.05</u>		THICKNESS <u>1" 4" SP</u>		MATERIAL <u>CS</u>			
LINEARITY DUE DATE <u>9-17-99</u>					REFERENCE BLOCK TEMP <u>AMBIENT</u> °F		PYRO SN. <u>N/A</u>			
SCANNER TYPE <u>AWS-5</u>		SERIAL # <u>501</u>			COUPLANT <u>WATER</u>		BATCH # <u>N/A</u>			
SCANNER CABLE <u>AWS-5</u>					CABLE LENGTH <u>400'</u>		CABLE # <u>N/A</u>			
SIGNAL CABLE <u>RG-59</u>					CABLE LENGTH <u>400'</u>		CABLE # <u>N/A</u>			
CHANNEL	TRANSDUCER MAKE	MODEL	FREQ.	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE NOM./ACT.	WEDGE TYPE	IMAGE	
1	KBA	MWB 60-4E	4 MHz	8x9mm	1855	N/A	60°/59°	INT.	1 & 2	
2	KBA	MWB 60-4E	4 MHz	8x9mm	1854	A	60°/59°	INT.	3 & 4	
3				N						
4				A						
INITIAL CALIBRATION					CALIBRATION CHECKS					
DATE		<u>6-23-99</u>	<u>6-23-99</u>							
TIME		<u>08:28</u>	<u>11:56</u>							
REFLECTOR / ORIENTATION		<u>0.050" ID NOTCH</u>	<u>0.050" ID NOTCH</u>							
CH. 1	AMPLITUDE	<u>66 dB</u>	<u>66</u>							
	LOCATION	<u>ID</u>	<u>ID</u>							
CH. 2	AMPLITUDE	<u>63 dB</u>	<u>63</u>							
	LOCATION	<u>ID</u>	<u>ID</u>							
CH. 3	AMPLITUDE									
	LOCATION	<u>N</u>								
CH. 4	AMPLITUDE		<u>A</u>							
	LOCATION									
FILE #		<u>ANG6L6A1</u>	<u>ANG6L6A2</u>							
DISK #		<u>ANG-22</u>	<u>ANG-25</u>							
EXAMINER		<u>R. SWAIN</u>	<u>R. SWAIN</u>							
REMARKS <u>N/A</u>										
Examiner <u>Ronald V. Swain</u>		Examiner <u>N/A</u>			Reviewer <u>W.D. Nelson</u>			Page <u>3</u> of <u>5</u>		
Level <u>II</u> Date <u>6-23-99</u>		Level <u>A</u> Date <u>6-23-99</u>			Level <u>II</u> Date <u>6-23-99</u>			COG 6500		

AUTOMATED ULTRASONIC P-SCAN CALIBRATION SHEET										CALIBRATION REPORT#	
LOCATION HANFORD			SYSTEM DST			CALIBRATION BLOCK SDI PT-1					
PROCEDURE SDI 2.1 Rev. 3						THICKNESS 6.75"		MATERIAL CS			
UT SYSTEM PSP-3			SERIAL # 305			REFERENCE BLOCK TIW					
SOFTWARE VERSION P-SCAN/T-SCAN			REV. 6.05			THICKNESS 1" 4" S.P.		MATERIAL CS			
LINEARITY DUE DATE 9-17-99						REFERENCE BLOCK TEMP AMBIENT OF		PYROSEN N/A			
SCANNER TYPE AWS-5			SERIAL # 501			COUPLANT WATER		BATCH # N/A			
SCANNER CABLE AWS-5						CABLE LENGTH 400'		CABLE # N/A			
SIGNAL CABLE RG-59						CABLE LENGTH 400'		CABLE # N/A			
CHANNEL	TRANSDUCER MAKE	MODEL	FREQ.	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE NOM./ACT.	WEDGE TYPE	IMAGE		
1	KBA	MWB45-4E	4 MHz	8X9mm	30042	/	45°/44°	INT.	1		
2	KBA	MWB45-4E	4 MHz	8X9mm	2415	N/A	45°/47°	INT.	2		
3	KBA	MWB45-4E	4 MHz	8X9mm	30043	A	45°/44°	INT.	3		
4	KBA	MWB45-4E	4 MHz	8X9mm	30049	/	45°/46°	INT.	4		
INITIAL CALIBRATION					CALIBRATION CHECKS						
DATE		6-23-99	6-23-99	6-24-99	6-24-99						
TIME		12:11	16:24	08:45							
REFLECTOR / ORIENTATION		0.050" ID NOTCH	0.050" ID NOTCH	0.050" ID NOTCH	0.050" ID NOTCH						
CH. 1	AMPLITUDE	78 dB	80 dB	82 dB	83 dB						
	LOCATION	ID	ID	ID	ID						
CH. 2	AMPLITUDE	75 dB	75 dB	79 dB	79 dB						
	LOCATION	ID	ID	ID	ID						
CH. 3	AMPLITUDE	78 dB	80 dB	83 dB	83 dB						
	LOCATION	ID	ID	ID	ID						
CH. 4	AMPLITUDE	81 dB	83 dB	86 dB	86 dB						
	LOCATION	ID	ID	ID	ID						
FILE #		AN6CL4C1	AN6CL4C2	AN6CL4C3	AN6CL4C4						
DISK #		AN6-26	AN6-27	AN6-27	AN6-32						
EXAMINER		R. SWAIN	R. SWAIN	R. SWAIN	R. SWAIN						
REMARKS											
N/A											
Examiner <u>Ronald V. Swain</u>			Examiner <u>N/A</u>			Reviewer <u>W.D. Nelson</u>			Page		
Level <u>II</u> Date _____			Level _____ Date _____			Level <u>III</u> Date <u>6-29-99</u>			<u>4</u> of <u>5</u>		
			A			COGEMO					

AUTOMATED ULTRASONIC THICKNESS CALIBRATION SHEET										CALIBRATION REPORT#					
LOCATION HANFORD		SYSTEM DST			CALIBRATION BLOCK STEP BLOCK										
PROCEDURE SDI 2.1 Rev. 3					THICKNESS 0.1" - 1.000"		MATERIAL CS								
UT SYSTEM PSP-3		SERIAL # 305			REFERENCE BLOCK IIW										
SOFTWARE VERSION P-SCAN/T-SCAN			REV. 6.05		THICKNESS 1"		MATERIAL CS								
LINEARITY DUE DATE 9-17-99					REFERENCE BLOCK TEMP AMBIENT °F			PYRO SN. N/A							
SCANNER TYPE AWS-5		SERIAL # 501			COUPLANT WATER			BATCH # N/A							
SCANNER CABLE AWS-5					CABLE LENGTH 400'		CABLE # N/A								
SIGNAL CABLE RG-59					CABLE LENGTH 400'		CABLE # N/A								
CHANNEL	TRANSDUCER MAKE	MODEL	FREQ.	SIZE	SERIAL #	GATE EVAL METHOD	ANGLE	WEDGE TYPE	IMAGE						
1	KBA	MSEB SE	5 MHz	2(8x2mm)	1709	Edge Cont	0°	N/A	1						
2	KBA	MSEB SE	5 MHz	2(8x2mm)	1709	PR-E Cont	0°		2						
3	KBA	MSEB SE	5 MHz	2(8x2mm)	1718	Edge Cont	0°		3						
4	KBA	MSEB SE	5 MHz	2(8x2mm)	1718	PR-E Cont	0°	✓	4						
INITIAL CALIBRATION					CALIBRATION CHECKS										
DATE		6-22-99		6-22-99											
TIME		11:01		21:23											
REFLECTOR		Step		BACK-WALL											
CH. 1	THK. 1	0.3"	0.295"	0.304"	N A										
	THK. 2	1.0"	0.995"	1.000"											
CH. 2	THK. 1	0.3"	0.295"	0.304"											
	THK. 2	1.0"	0.995"	1.000"											
CH. 3	THK. 1	0.3"	0.295"	0.290"											
	THK. 2	1.0"	1.004"	0.990"											
CH. 4	THK. 1	0.3"	0.295"	0.290"											
	THK. 2	1.0"	1.004"	0.990"											
FILE #		ANCL201		ANCL202											
DISK #		AN6-18		AN6-21											
EXAMINER		R. SWAIN		R. SWAIN											
REMARKS															
N/A															
Examiner Ronald V. Swain		Examiner Level _____ Date _____			Reviewer W. B. Nelson			Page 5 of 5							
Level II Date 6-22-99		Level _____ Date _____			Level VE Date 6-24-99			C O G U M A							

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2/99						AUTOMATED ULTRASONIC THICKNESS DATA REPORT			REPORT# N/A	
LOCATION HAWFORD						SYSTEM DST TANK AN106		EXAM START 1650		EXAM END 1822
COMPONENT ID PRIMARY WALL SCAN 1, PLATE 3						EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		NOM. THICKNESS 0.5"		
CONFIGURATION PRIMARY WALL SCAN 1 TO PLATE 3 0°						CALIBRATED RANGE 0.3 - 1.0"		TEMP Ambient OF		
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 92.6"						SCAN LENGTH/PART 12"		REF. LEVEL CORRECTION (TRANS. CORR) 0 DB		
PROCEDURE SDI 2.1						REV 3		MATERIAL TYPE ☐ SS ☒ CS OTHER		CONDITION FAIL
FILE NAME/ITEM# AN6PW310						DATA DISK# AN6-1-32		TRANSDUCER ☒ DUAL ☐ SGL ☒ ODEG ☐ ANGLE		
X ₀ REF. POINT (L ₀) 1" from toe of top weld						Y ₀ REF. POINT (W ₀) - Riser &		SCAN WIDTH 15"		
PART #/ INDICATION	L START	L STOP	W START	W STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	COMMENTS		
1					.517	.493	NO	N/A		
2					.514	.493	NO			
3					.518	.493	NO			
4					.519	.498	NO			
5					.519	.498	NO			
6					.519	.493	NO			
7					.515	.490	NO			
8					.514	.490	NO			
SUMMARY MERGED RESULTS										
REMARKS N/A										
Examiner RONALD V SWAN <i>RVS</i>										
Analyst James B. <i>JB</i>										
Reviewer W.H. <i>W.H.</i>										
Level II Date 6/7/99										
Level III Date 6/21/99										
Level III Date 6/29/99										
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2/99							REPORT#	
AUTOMATED ULTRASONIC THICKNESS DATA REPORT							REF. CAL. #	
LOCATION HANFORD		SYSTEM DST TANK AN 106		EXAM START 0945	EXAM END 1111	JOB # N/A		
COMPONENT ID PRIMARY WALL PLATE 4, SEAM 1, 0°				EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		NOM. THICKNESS 0.75"		
CONFIGURATION TO PRIM. WALL PLATE 4				CALIBRATED RANGE 0.3 - 1.0		TEMP AMBIENT °F		
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 105		SCAN LENGTH/PART 12		REF. LEVEL CORRECTION (TRANS. CORR)			0 DB	
PROCEDURE SDI 2.1		REV 3		MATERIAL TYPE ☐ SS ☒ CS OTHER		CONDITION FAR		
FILE NAME/ITEM# AN6 PW 410		DATA DISK# AN6-1-32		TRANSDUCER ☒ DUAL ☐ SGL ☒ ODEG ☐ ANGLE		SCAN WIDTH 15"		
X ₀ REF. POINT (L ₀) 1" from top toe		Y ₀ REF. POINT (W ₀) ~RISER E						
PART # / INDICATION	L START	L STOP	W START	W STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	COMMENTS
1					.758	.737	NO	
2					.757	.703	NO	
3					.757	.737	NO	
4					.758	.730	NO	
5					.757	.741	NO	
6					.757	.741	NO	
7					.755	.741	NO	
8					.754	.733	NO	
9					.755	.737	NO	
SUMMARY								
MERGED RESULTS								
REMARKS								
<div style="display: flex; justify-content: space-between;"> <div> Examiner <u>RONALD V. SWAN</u> Level <u>II</u> Date <u>6/8/99</u> </div> <div> Analyst <u>James B. Soper</u> Level <u>III</u> Date <u>6/21/99</u> </div> <div> Reviewer <u>W.D. Nelson</u> Level <u>III</u> Date <u>6-29-99</u> <u>COGEMA</u> </div> <div> Page <u>4</u> of <u>32</u> </div> </div>								

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2/99							AUTOMATED ULTRASONIC THICKNESS DATA REPORT			REPORT# N/A		
LOCATION <u>Hanford</u>							SYSTEM <u>DST TANK AN 106</u>		EXAM START <u>1450</u>		EXAM END <u>1604</u>	
COMPONENT ID <u>PRIMARY WALL SCAN 2, PLATE 3,</u>							EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED		NOM. THICKNESS <u>0.5</u>			
CONFIGURATION <u>TO</u>							CALIBRATED RANGE <u>0.3-1.0</u>		TEMP <u>AMBIENT</u> °F			
CIRCUMFERENCE/TOTAL LENGTH EXAMINED <u>89.5"</u>							SCAN LENGTH/PART <u>12"</u>		REF. LEVEL CORRECTION (TRANS. CORR) <u>0</u> DB			
PROCEDURE <u>SDI 2.1</u>							REV <u>3</u>		MATERIAL TYPE ☐ SS ☒ CS OTHER _____		CONDITION <u>FAIR</u>	
FILE NAME/ITEM# <u>AN6PW320</u>							DATA DISK# <u>AN6-1-37</u>		TRANSDUCER ☒ DUAL ☐ SGL ☒ 0 DEG ☐ ANGLE _____			
X ₀ REF. POINT (L ₀) <u>~1" from toe of top weld</u>							Y ₀ REF. POINT (W ₀) <u>~15" from RISER E</u>		SCAN WIDTH <u>15"</u>			
PART #/INDICATION	L START	L STOP	W START	W STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	COMMENTS				
1					.518	.493	NO	N/A				
2					.516	.490	NO					
3					.517	.498	NO					
4					.518	.498	NO					
5					.517	.498	NO					
6					.516	.493	NO					
7					.512	.485	NO					
8					.510	.485	NO					
SUMMARY MERGED RESULTS												
REMARKS <u>N/A</u>												
<div style="display: flex; justify-content: space-between;"> <div> Examiner <u>RONALD V. SWANN</u> Level <u>I</u> Date <u>6/8/99</u> </div> <div> Analyst <u>James B. Ellis</u> Level <u>III</u> Date <u>6/21/99</u> </div> <div> Reviewer <u>W. H. Nelson</u> Level <u>III</u> Date <u>6-29-99</u> <u>COGEMA</u> </div> <div> Page <u>8</u> of <u>32</u> </div> </div>												

2/99						AUTOMATED ULTRASONIC THICKNESS DATA REPORT			REPORT# N/A	
									REF. CAL. # N/A	
LOCATION HANFORD		SYSTEM DST TANK AN106		EXAM START 1600/1645		EXAM END 1702/1717		JOB # N/A		
COMPONENT ID PRIMARY WALL, PLATE 4, SCAN 2, 0°						EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED			NOM. THICKNESS 0.75	
CONFIGURATION TO PRIM. WALL PLATE 4						CALIBRATED RANGE 0.3-1.0			TEMP AMBIENT of	
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 105.5				SCAN LENGTH/PART 13		REF. LEVEL CORRECTION (TRANS. CORR) 0 DB				
PROCEDURE SDI 2.1				REV 3		MATERIAL TYPE ☐ SS ☒ CS OTHER _____			CONDITION FAIR	
FILE NAME/ITEM# AN6PW 420		DATA DISK# AN6-1-32		TRANSDUCER ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE _____			SCAN WIDTH 15"			
X ₀ REF. POINT (L ₀) ~1" from toe of top weld		Y ₀ REF. POINT (W ₀) ~15" from RISER E								
PART #/ INDICATION	L START	L STOP	W START	W STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	COMMENTS		
1					.766	.741	NO	<div style="font-size: 4em; transform: rotate(-45deg); display: inline-block;">N/A</div>		
2					.762	.741	NO			
3					.766	.741	NO			
4					.761	.741	NO			
5					.760	.741	NO			
6					.767	.733	NO			
7					.768	.733	NO			
8					.763	.730	NO			
9					.765	.730	NO			
								NEW CALIBRATION		
								6/18/99		
								N/A		
								A		
<div style="font-size: 4em; transform: rotate(-45deg); display: inline-block;">N/A</div>										
SUMMARY MERGED RESULTS										
REMARKS										
SCANNER FAILURE AFTER PART 5 ON 6/8/99, EQ OPERABLE AND SCAN RESUMED ON 6/18/99 at PART 6. WITH NEW CALIBRATION. <i>ADS</i>										
Examiner ROBERT V. SWAIN Level <u>II</u> Date 6/8/99/6/18/99		Analyst James Belden Level <u>III</u> Date 6/21/99		Reviewer W.H. Nelson Level <u>III</u> Date 6-29-99 COGEMA		Page 9 of 32				

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2/99 ULTRASONIC P-SCAN DATA REPORT										REPORT # N/A	
LOCATION HANFORD			SYSTEM DST TANK AN106			EXAM START 0855		EXAM END 0921		JOB # N/A	
COMPONENT ID PRIMARY WALL VERT. WELD 3, 60°						EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED			NOM. THICKNESS 0.5"		
CONFIGURATION TO PRIM. WALL PLATE 3 TO PLATE 3						CALIBRATED RANGE 0-3.51			TEMP AMBIENT OF		
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 90.7"				SCAN LENGTH/PART 12		REF. LEVEL CORRECTION (TRANS. CORR) 0 DB					
PROCEDURE SDI 2.1				REV 3		MATERIAL TYPE ☐ SS ☒ CS OTHER			CONDITION FAIR		
FILE NAME/ITEM# AN6VU364			DATA DISK# AN6-1-32			TRANSDUCER ☐ DUAL ☒ SGL ☐ ODEG ☒ ANGLE 60°					
X ₀ REF. POINT (L ₀) ~1" from toe of top weld			Y ₀ REF. POINT (W ₀) WELD E			SCAN WIDTH 5"					
SIZING METHOD		ANGLE		REFERENCE CAL. SHEET				SET-UP			
1 45 DEGREE SHEAR				N/A							
2 60 DEGREE SHEAR											
3 AATT											
4 DUAL 0 DEGREE											
INDICATION INFORMATION											
IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	L1	LENGTH	L2	W1	WIDTH	W2	INDICATION TYPE
	No CRACKLIKE INDICATIONS										
REMARKS											
NOISE INDICATIONS THROUGHOUT EXAM AREA, ENTRY SURFACE AND PROBE ROCKING.											
No CRACKLIKE INDICATIONS											
Examiner RONALD V SWAIN Level II Date 6/23/99			Analyst James Bille Level III Date 6/25/99			Reviewer W. J. Niles Level III Date 6-29-99 COGEMA			Page 23 of 32		

2/99						AUTOMATED ULTRASONIC THICKNESS DATA REPORT			REPORT# N/A		
LOCATION HANFORD			SYSTEM DST TANK AN/OG			EXAM START 1820		EXAM END 1853		JOB # N/A	
COMPONENT ID PRIMARY WALL, PLATE 4 VERT WELD, 0°						EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED			NOM. THICKNESS 0.75"		
CONFIGURATION PLATE 4 TO PLATE 4 VERT WELD						CALIBRATED RANGE 0.3 - 1.0"			TEMP AMBIENT °F		
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 106.38						SCAN LENGTH/PART 12"			REF. LEVEL CORRECTION (TRANS. CORR) 0 DB		
PROCEDURE SD12.1						REV 3			MATERIAL TYPE ☐ SS ☒ CS OTHER		
FILE NAME/ITEM# AN6VW4-0						DATA DISK# AN6-1-32			TRANSDUCER ☒ DUAL ☐ SGL ☒ ODEG ☐ ANGLE		
X ₀ REF. POINT (L ₀) 2" from toe of upper weld						Y ₀ REF. POINT (W ₀) WELD 2			SCAN WIDTH 15" x 5"		
PART #/ INDICATION	L START	L STOP	W START	W STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	COMMENTS			
1					.760	.730	NO	N/A			
2					.765	.733	NO				
3					.761	.722	NO				
4					.758	.715	NO				
5					.759	.726	NO				
6					.757	.722	NO				
7					.756	.726	NO				
8					.756	.726	NO				
9					.762	.730	NO				
SUMMARY MERGED RESULTS											
REMARKS N/A											
Examiner RONALD V. SWAIN Level II Date 6/22/99											
Analyst James B. Sile Level III Date 6/24/99											
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ULTRASONIC P-SCAN DATA REPORT										REPORT # N/A		
LOCATION <u>HANFORD</u>			SYSTEM <u>DST TANK AN106</u>			EXAM START <u>0932</u>		EXAM END <u>0956</u>		JOB # <u>N/A</u>		
COMPONENT ID <u>PRIMARY WALL PLATE 4, VERT. WELD 60°</u>						EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED			NOM. THICKNESS <u>0.75"</u>			
CONFIGURATION <u>PRIM WALL PLATE 4 TO PLATE 4 VERT WELD</u>						CALIBRATED RANGE <u>0-3.51"</u>			TEMP <u>AMBIENT OF</u>			
CIRCUMFERENCE/TOTAL LENGTH EXAMINED <u>106.5"</u>				SCAN LENGTH/PART <u>12"</u>		REF. LEVEL CORRECTION (TRANS. CORR) <u>0</u> DB						
PROCEDURE <u>SDI 2.1</u>						REV <u>3</u>		MATERIAL TYPE ☐ SS ☒ CS OTHER			CONDITION <u>FAIR</u>	
FILE NAME/ITEM# <u>AN6VW46A</u>			DATA DISK# <u>AN6-1-32</u>			TRANSDUCER ☐ DUAL ☒ SGL ☐ ODEG ☒ ANGLE <u>60°</u>			SCAN WIDTH <u>5"</u>			
X ₀ REF. POINT (L ₀) <u>~1" from toe of top weld</u>			Y ₀ REF. POINT (W ₀) <u>WELD E</u>									
SIZING METHOD		ANGLE		REFERENCE CAL. SHEET				SET-UP				
1 45 DEGREE SHEAR				N A								
2 60 DEGREE SHEAR												
3 AATT												
4 DUAL 0 DEGREE												
INDICATION INFORMATION												
IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	L1	LENGTH	L2	W1	WIDTH	W2	INDICATION TYPE	
No CRACKLIKE INDICATIONS N A												
REMARKS												
<u>NO CRACKLIKE INDICATIONS.</u>												
<u>NOISE THROUGHOUT SCAN. (WELD GEOMETRY and SURFACE NOISE)</u>												
Examiner <u>RONALD V. SWAN</u>			Analyst <u>James B. Eble</u>			Reviewer <u>W.H. Nelson</u>			Page <u>24 of 32</u>			
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LOCATION HAWFORD							SYSTEM DST TANK AN106			EXAM START 1930	
COMPONENT ID PRIMARY WALL, PRIMARY KNUCKLE WELD							EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED			NOM. THICKNESS .875"	
CONFIGURATION TO PRIM. KNUCKLE HORIZ. WELD 0°							CALIBRATED RANGE 0.3-1.0			TEMP AMBIENT OF	
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 235.8"							SCAN LENGTH/PART 12"			REF. LEVEL CORRECTION (TRANS. CORR) 0 DB	
PROCEDURE SD1 2.1							REV 3			MATERIAL TYPE ☐ SS ☒ CS OTHER	
FILE NAME/ITEM# AN6 HKWO							DATA DISK# AN6-1-32			TRANSDUCER ☒ DUAL ☐ SGL ☒ 0DEG ☐ ANGLE	
Xo REF. POINT (Lo)							Yo REF. POINT (Wo) WELD 2			SCAN WIDTH 5"	
PART #/ INDICATION	L START	L STOP	W START	W STOP	AVE. THK.	MIN. THK. R. LIG.	AREA REPORTABLE	COMMENTS			
1					.879	.848	NO				
2					.879	.857	NO				
3					.883	.852	NO				
4					.887	.857	NO				
5					.892	.857	NO				
6					.905	.874	NO				
7					.883	.857	NO				
8					.892	.861	NO				
9					.896	.861	NO				
10					.887	.857	NO				
11					.901	.866	NO	VERY WELD KNUCKLE 128.9-130.5"			
12					.905	.874	NO				
13					.901	.874	NO				
14					.905	.874	NO				
15					.905	.874	NO				
16					.909	.879	NO				
17					.905	.874	NO				
18					.905	.874	NO				
19					.901	.870	NO	OBST. 212.3-216.9"			
20					.901	.870	NO	OBST. 221.1-222.4"			
21								N/A			
SUMMARY MERGED RESULTS											
REMARKS											
Examiner RONALD V SWAIN Level II Date 6/22/99			Analyst [Signature] Level III Date 6/24/99			Reviewer [Signature] Level III Date 6-29-99 COGEM A			Page 30 of 32		

2/99						ULTRASONIC P-SCAN DATA REPORT				REPORT # N/A											
LOCATION HANFORD		SYSTEM DST TANK AN106		EXAM START 1029		EXAM END 1121		JOB # N/A													
COMPONENT ID PRIMARY WALL, PRIMARY KNUCKLE WELD 45°				EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED			NOM. THICKNESS 0.875"														
CONFIGURATION TO PRIM. KNUCKLE WELD 45° SCAN				CALIBRATED RANGE 0 - 2.56"			TEMP AMBIENT °F														
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 237.6"				SCAN LENGTH/PART 12		REF. LEVEL CORRECTION (TRANS. CORR) 0 DB															
PROCEDURE SDI 2.1				REV 3		MATERIAL TYPE ☐ SS ☒ CS OTHER			CONDITION FAIR												
FILE NAME/ITEM# AN6HKW4C		DATA DISK# AN6-1-32		TRANSDUCER ☐ DUAL ☒ SGL ☐ 0DEG ☒ ANGLE 45°																	
X ₀ REF. POINT (L ₀)		Y ₀ REF. POINT (W ₀) WELD 2		SCAN WIDTH 5"																	
SIZING METHOD		ANGLE		REFERENCE CAL. SHEET			SET-UP														
1 45 DEGREE SHEAR																					
2 60 DEGREE SHEAR																					
3 AATT																					
4 DUAL 0 DEGREE																					
INDICATION INFORMATION																					
IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	L1	LENGTH	L2	W1	WIDTH	W2	INDICATION TYPE										
	No	CRACKLIKE	INDICATIONS																		
REMARKS																					
No CRACKLIKE INDICATIONS																					
Examiner RONALD V. SWAN		Analyst James B. Elder		Reviewer W. J. Nelson			Page 31 of 32														
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LOCATION HARTFORD			SYSTEM DST TANK AN106			EXAM START 1015		EXAM END 1116		JOB # N/A			
COMPONENT ID PRIMARY WELD, KNUCKLE WELD 60°						EXAMINATION SURFACE ☒ OD ☐ ID ☐ PAINTED			NOM. THICKNESS 0.875				
CONFIGURATION TO PRIMARY KNUCKLE WELD, 60°						CALIBRATED RANGE 0-3.51"			TEMP AMBIENT OF				
CIRCUMFERENCE/TOTAL LENGTH EXAMINED 2378"				SCAN LENGTH/PART 12"		REF. LEVEL CORRECTION (TRANS. CORR)			0 DB				
PROCEDURE SDI 2.1				REV 3		MATERIAL TYPE ☐ SS ☒ CS OTHER			CONDITION FAIR				
FILE NAME/ITEM# AN6HKW 6A			DATA DISK# AN6-1-32			TRANSDUCER ☐ DUAL ☒ SGL ☐ ODEG ☒ ANGLE 60							
X ₀ REF. POINT (L ₀)			Y ₀ REF. POINT (W ₀) WELD 8			SCAN WIDTH 5"							
SIZING METHOD		ANGLE		REFERENCE CAL. SHEET				SET-UP					
1 45 DEGREE SHEAR													
2 60 DEGREE SHEAR													
3 AATT													
4 DUAL 0 DEGREE													
INDICATION INFORMATION													
IND	METHOD	WELD SIDE	DEPTH R. LIG.	MAX AMP	L1	LENGTH	L2	W1	WIDTH	W2	INDICATION TYPE		
1	2	+	N/A	+7dB	0	*INT.	*1	+0.6"	N/A	N/A	WELD GEOMETRY		
2	2	-	N/A	-4dB	0	*INT.	*1	-49"	N/A	N/A	WELD GEOMETRY		
3	2	+	N/A	+12dB	12.2	N/A	18.1	+0.75"	N/A	N/A	NOISE		
4	2	+	N/A	+8dB	133.1	*INT.	141"	+0.8	N/A	2.5"	NOISE *2		
No CRACKLIKE INDICATIONS													
REMARKS													
*1 INTERMITTENT WELD GEOMETRY, ENTIRE WELD													
Noise throughout scan from rough surface and probe rocking													
OBSTRUCTION/NO SCAN 35"-37.38" & 212.4-214.3"													
*2 INTERMITTENT NOISE THROUGHOUT WELD													
NO CRACKLIKE INDICATIONS													
Examiner RONALD V. SWAN			Analyst James B. Elder			Reviewer W. J. Nelson			Page 32 of 32				
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		EDT No. 623401
		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./Appendix Only	EDT/ECN Only
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D. L. Becker	R3-73	x			
B. G. Erlandson	R1-51				x
E. A. Fredenburg	R1-56	x			
H. R. Hopkins, III	R2-58	x			
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D. S. Rewinkel	S7-40	x			
S. H. Rifaey	R1-56	x			
W. E. Ross	R2-50	x			
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