

Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

March 2, 2009

10 CFR 50.55a(g)(5)(iii)

U.S. Nuclear Regulatory Commission ATTN: Document Control Desk Mail Stop: OWFN P1-35 Washington, D.C. 20555-0001

In the Matter of Docket No. 50-260
Tennessee Valley Authority )

BROWNS FERRY NUCLEAR PLANT (BFN) - UNIT 2 - AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) SECTION XI, INSERVICE INSPECTION PROGRAM FOR THE THIRD TEN-YEAR INSPECTION INTERVAL - REQUEST FOR RELIEF 2-ISI-19, REVISION 1

In accordance with 10 CFR 50.55a(g)(5)(iii), TVA is requesting relief from certain inservice inspection (ISI) requirements in Section XI of the ASME Boiler and Pressure Vessel Code. The need for this request for relief was identified during ISI examinations during the BFN Unit 2 Cycles 12 and 14 refueling outages. The enclosure to this letter contains BFN Unit 2 request for relief 2-ISI-19, Revision 1.

TVA has determined that certain BFN Unit 2 welds had nondestructive examination (NDE) coverage limitations (less than 90 percent coverage completed) which exceed that specified in ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 welds, Section XI, Division 1." The components are Reactor Pressure Vessel (RPV) nozzles (ASME Section XI, Code Category B-D, Nozzle-To-Vessel Welds) which had calculated NDE examination coverage ranging between 27 and 69 percent completed. The limitations encountered during the performance of ultrasonic (UT) examinations were caused by component configuration. The limitations are inherent to the barrel-type nozzle-to-vessel weld design and are compounded by the close proximity of the biological shield wall.

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Hence, TVA is requesting approval of Unit 2 request for relief 2-ISI-19, Revision 1. TVA has determined that the performance of essentially 100 percent UT examination for the subject welds is impractical. Further, TVA considers that performance of UT examinations, to the maximum extent practical, furnishes sufficient information to judge the overall integrity of the welds and provides an acceptable level of quality and safety.

This request is consistent with 2-ISI-19, Revision 0, which was submitted by letter dated June 2, 2003, for other nozzle-to-vessel weld examinations, with less than 90 percent examination coverage, completed during the Unit 2 Cycle 12 refueling outage. NRC approved TVA's request for relief by letter dated April 12, 2004.

There are no new regulatory commitments in this letter. If you have any questions, please contact me at (256) 729-2636.

Sincerely,

F. R. Godwin

Manager of Licensing and Industry Affairs

Enclosure

cc: See Page 3

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JEE:JWD:LAJ Enclosure

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# TENNESSEE VALLEY AUTHORITY BROWNS FERRY NUCLEAR PLANT (BFN) UNIT 2

# AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) SECTION XI, INSERVICE INSPECTION (ISI) PROGRAM

THIRD TEN-YEAR INSPECTION INTERVAL

**REQUEST FOR RELIEF 2-ISI-19, REVISION 1** 

(SEE ATTACHED)

## TENNESSEE VALLEY AUTHORITY BROWNS FERRY NUCLEAR PLANT (BFN) UNIT 2

# AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) SECTION XI, INSERVICE INSPECTION (ISI) PROGRAM

### THIRD TEN-YEAR INSPECTION INTERVAL

### REQUEST FOR RELIEF 2-ISI-19, REVISION 1

### **EXECUTIVE SUMMARY:**

This request for relief addresses one (1) Reactor Pressure Vessel (RPV) nozzle-to-head full penetration weld examined during Cycle 12, (in the first period) and nineteen (19) Reactor Pressure Vessel (RPV) nozzle-to-vessel full penetration welds examined during Cycle 14 (in the second period) of the Third Ten-Year ISI interval.

The design configuration of the RPV nozzle-to-vessel weld precludes a 100 percent ultrasonic (UT) examination of the required volume for the full penetration welds of the nozzles listed in Table 1 of this enclosure. These limitations occur when the ASME Section XI, 1995 Edition, 1996 Addenda examination requirements are applied in areas of components constructed and fabricated to early plant designs. Based on a construction permit date prior to

January 1, 1971, BFN is exempt from meeting certain provisions of the Code requirements for examination access, to the extent practical, within the limitations of design, geometry and materials of construction of the components in accordance with 10 CFR 50.55a(g)(4).

A UT examination was performed on accessible areas to the maximum extent practical given the physical limitations of the subject nozzle welds utilizing equipment, personnel and techniques qualified in accordance with ASME Section XI, Appendix VIII. The design configuration limits UT examination of the RPV nozzle-to-vessel weld coverage (percentage) as shown in Table 1. TVA concludes that performance of an UT examination of essentially 100 percent of the RPV nozzle-to-vessel full penetration welds would be impractical. The performance of the UT examination of the subject areas to the maximum extent practical provides an acceptable level of quality and safety because the information and data obtained from volume examined provides sufficient information to judge the overall integrity of the welds. Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), it is requested that relief be granted for the Third Ten-Year ISI inspection interval.

<u>Unit</u>: Two (2)

**ISI Interval**: ASME Section XI, Third Ten-Year ISI Inspection Interval (May 25, 2001 to May 24, 2011)

Systems: Reactor Pressure Vessel (RPV), System 329

Components: 20 RPV Nozzles, Full Penetration Welds as listed in Table 1

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Hence, TVA is requesting approval of Unit 2 request for relief 2-ISI-19, Revision 1. TVA has determined that the performance of essentially 100 percent UT examination for the subject welds is impractical. Further, TVA considers that performance of UT examinations, to the maximum extent practical, furnishes sufficient information to judge the overall integrity of the welds and provides an acceptable level of quality and safety.

This request is consistent with 2-ISI-19, Revision 0, which was submitted by letter dated June 2, 2003, for other nozzle-to-vessel weld examinations, with less than 90 percent examination coverage, completed during the Unit 2 Cycle 12 refueling outage. NRC approved TVA's request for relief by letter dated April 12, 2004.

There are no new regulatory commitments in this letter. If you have any questions, please contact me at (256) 729-2636.

Sincerely,

F. R. Godwin
Manager of Licensing
and Industry Affairs

Enclosure cc: See Page 3

ASME Code Class: ASME Code Class 1 (Equivalent)

ASME Section XI Code Edition: 1995 Edition, 1996 Addenda

Code Table: IWB-2500-1

**Examination Category:** B-D, Full Penetration Welds of Nozzles in Vessels

**Examination Item Number**: B3.90, Reactor Vessel Nozzle-to-Vessel Welds

<u>Code Requirement</u>: ASME Section XI, Table IWB-2500-1, Examination Category B-D, Item No. B3.90 requires a volumetric examination of essentially 100 percent of the weld and adjacent base material as depicted in Figure IWB-2500-7(a).

<u>Code Requirement From Which Relief Is Requested</u>: Relief is requested from the requirement of ASME Section XI, Table IWB-2500-1, Examination Category B-D, Item No. B3.90 which requires a volumetric examination of essentially 100 percent of the weld and adjacent base material as depicted in Figure IWB-2500-7(a).

### LIST OF ITEMS ASSOCIATED WITH THE RELIEF REQUEST:

N6A-NV: RPV Nozzle-to-Head Weld, Cycle 12

N1B-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N2A-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N2B-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N2C-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N2D-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N2G-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N2H-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N2K-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N3A-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N3B-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N3C-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N4B-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N4C-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N4E-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N4F-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N5A-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N5B-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N7-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

N9-NV: RPV Nozzle-to-Vessel Weld, Cycle 14

BASIS FOR RELIEF REQUEST: The design configuration of the RPV nozzle-to-vessel weld precludes an ultrasonic (UT) examination of the essentially 100 percent of the required volume. The component design configuration limits UT examination coverage of the welds to the percentages listed in Table 1, for N6A-NV, N1B-NV, N2A-NV, N2B-NV, N2C-NV, N2D-NV, N2G-NV, N2H-NV, N2K-NV, N3A-NV, N3B-NV, N3C-NV, N4B-NV, N4C-NV, N4E-NV, N5A-NV, N5B-NV, N7-NV, and N9-NV.

ALTERNATIVE EXAMINATION: None. In lieu of the Code required essentially 100 percent volume ultrasonic examination, TVA proposes an ultrasonic examination of accessible areas to the maximum extent practical given the component design configuration of the RPV nozzle-to-vessel welds.

JUSTIFICATION FOR THE GRANTING OF RELIEF: The design of the subject nozzle-to-vessel welds (N6A-NV, N1B-NV, N2A-NV, N2B-NV, N2C-NV, N2D-NV, N2G-NV, N2H-NV, N2K-NV, N3A-NV, N3B-NV, N3C-NV, N4B-NV, N4C-NV, N4E-NV, N4F-NV, N5A-NV, N5B-NV, N7-NV, and N9-NV, precludes a ultrasonic (UT) examination of the essentially 100 percent of the required examination volume. Access to the nozzle-to-vessel welds is by a series of doorways in the concrete biological shield wall. Insulation behind these doorways is designed for removal around the nozzle circumference.

In order to examine the welds in accordance with the Code requirements, the RPV would require extensive modifications. The physical arrangement of the nozzle-to-vessel weld precludes UT examination from the nozzle side. The limitations are inherent to the barrel-type nozzle-to-vessel weld design is compounded by the close proximity of the biological shield wall.

Scanning for the nozzle surface is ineffective due to the weld location and the asymmetrical inside surface where the nozzle and vessel converge. Coverage was increased by scanning from the outside blend radius of the weld when practical.

Experience from the automated UT examination performed from the inside surface has shown that the nozzle-to-vessel weld coverage will not be greatly improved even if performed form the inside surface utilizing the current state-of the-art techniques.

The configuration of the nozzle-to-vessel weld precludes UT examination from the nozzle side due to the weld location and the asymmetrical inside surface where the nozzle and vessel converge. The extent of examination coverage from the vessel side provides reasonable assurance that no flaws oriented parallel to the weld are present.

Areas receiving little or no examination coverage are located toward the outside surface of the reactor vessel in the general area of the nozzle inside blend radius (The blend radius

restricts the scanning movement and/or transducer contact). The reactor vessel inner-half of the thickness and inside surface are interrogated with the UT beam. Degradation located at the inside surface or inner-half of the vessel would be located. It should be noted that the nozzle inside radius section received essentially 100 percent examination coverage on these nozzles.

Radiographic examination as an alternate volumetric examination method was determined to be impractical due to radiological concerns. Gaining access to the inside surface of the RPV to place radiographic film would require extensive personnel protection due to high radiation and contamination levels. Also, due to the varying thickness at the outside blend radius of the weld, several radiographs may be required of one area to obtain the required coverage and/or film density. The additional Code coverage gained by radiography is impractical when weighed against the radiological concerns.

Therefore, TVA concludes that performing a UT examination of essentially 100 percent of the nozzle-to-vessel full penetration welds in the RPV would be impractical. Further, it would also be impractical to perform other volumetric examinations (i.e., radiography) which may increase examination coverage.

A maximum extent practical UT examination of the subject areas provides an acceptable level of quality and safety. TVA concludes that significant degradation, if present, would be detected during a UT examination performed to the maximum extent practical of the subject welds. As a result, reasonable assurance of operational readiness of the subject welds has been provided.

This request for relief is consistent with a previous Request For Relief 2-ISI-19, Revision 0, for the BFN Unit 2 RPV nozzle-to-vessel full penetration welds submitted and approved by the NRC in the First Period, of the Third Ten-Year ISI Inspection Interval. Reference NRC Safety Evaluation Report (SER) dated April 12, 2004, TAC NOS. MB9749 and MB9750.

Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), TVA requests that relief be granted for the referenced examinations for the BFN Unit 2 Third Ten-Year inspection interval.

### **IMPLEMENTATION SCHEDULE:**

This request for relief is applicable to the Third Ten-Year ISI Inspection Interval for BFN Unit 2 (May 25, 2001 to May 24, 2011).

The nozzle-to-vessel welds listed in Table 1 were examined in the first period (Cycle 12 operation) and second period (Cycle14 operation) of the Third Ten-Year inspection interval.

### **REFERENCES**:

N-GP-31 titled "Calculation of ASME Code Coverage for Section XI, Appendix VIII Ultrasonic Examinations"

# **Attachments:**

# Attachment A - 2 ISI Sketches

2-CHM-2046-C, Sheet 1, Reactor Vessel (RPV) Shell Course Weld/Nozzle Locations (Outside View)

2-ISI-0408-C, Sheet 1, Closure Head Assembly Weld Locations

# Attachment B - Weld Examination Data Reports

Weld No.	Report No.
N6A-NV	R110
N1B-NV	R137
N2A-NV	R138
N2B-NV	R142
N2C-NV	R139
N2D-NV	R173
N2G-NV	R136
N2H-NV	R143
N2K-NV	R174
N3A-ÑV	R151
N3B-NV	R175
N3C-NV	R152
N4B-NV	R176
N4C-NV	R177
N4E-NV	R178
N4F-NV	R179
N5A-NV	R156
N5B-NV	R157
N7-NV	R080
N9-NV	R117

# TABLE 1

WELD NUMBER	NPS	ISI DRAWING	PERCENT EXAMINED	REMARKS
N6A-NV	6"	2-ISI-0408-C	36.6%	Nozzle weld examined from the shell side with a 60° RL, 26°, 45°, and 55° Shear wave mode. No Transverse scans were performed from the nozzle side. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.
N1B-NV	28"	2-CHM-2046-C	31%	Nozzle to vessel weld. Examined using a 43°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.
N2A-NV	<sup>*</sup> 12"	2-CHM-2046-C	44%	Nozzle to vessel weld. Examined using a 40°, 50°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.
N2B-NV	12"	2-CHM-2046-C	44%	Nozzle to vessel weld. Examined using a 40°, 50°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.

WELD	NPS	ISI	PERCENT	REMARKS
NUMBER	·	DRAWING	EXAMINED	·
1100 111/	40"	0.01114.0040.0	4.40/	No. 100 500
N2C-NV	12"	2-CHM-2046-C	44%	Nozzle to vessel weld. Examined using a 40°, 50°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.
N2D-NV	12"	2-CHM-2046-C	44%	Nozzle to vessel weld. Examined using a 40°, 50°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.
N2G-NV	12"	2-CHM-2046-C	44%	Nozzle to vessel weld. Examined using a 40°, 50°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.
N2H-NV	12"	2-CHM-2046-C	50%	Nozzle to vessel weld. Examined using a 40°, 50°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.
N2K-NV	12"	2-CHM-2046-C	44%	Nozzle to vessel weld. Examined using a 40°, 50°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.

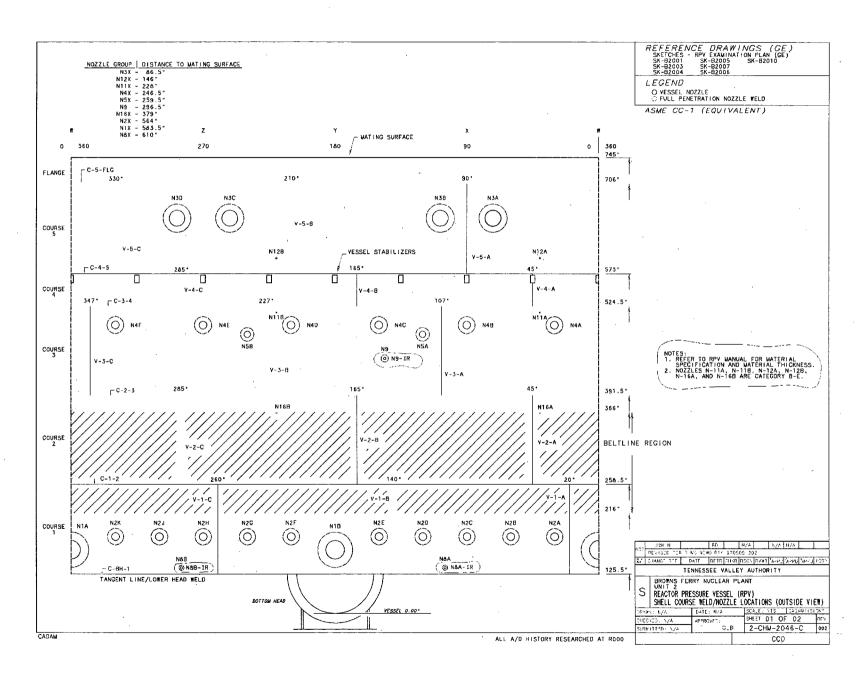
WELD NUMBER	NPS	ISI DRAWING	PERCENT EXAMINED	REMARKS
N3A-NV	26"	2-CHM-2046-C	41%	Nozzle to vessel weld. Examined using a 40°, 50°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.
N3B-NV	26"	2-CHM-2046-C	41%	Nozzle to vessel weld. Examined using a 40°, 50°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.
N3C-NV	26"	2-CHM-2046-C	41%	Nozzle to vessel weld. Examined using a 40°, 50°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.
N4B-NV	12"	2-CHM-2046-C	44%	Nozzle to vessel weld. Examined using a 40°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.

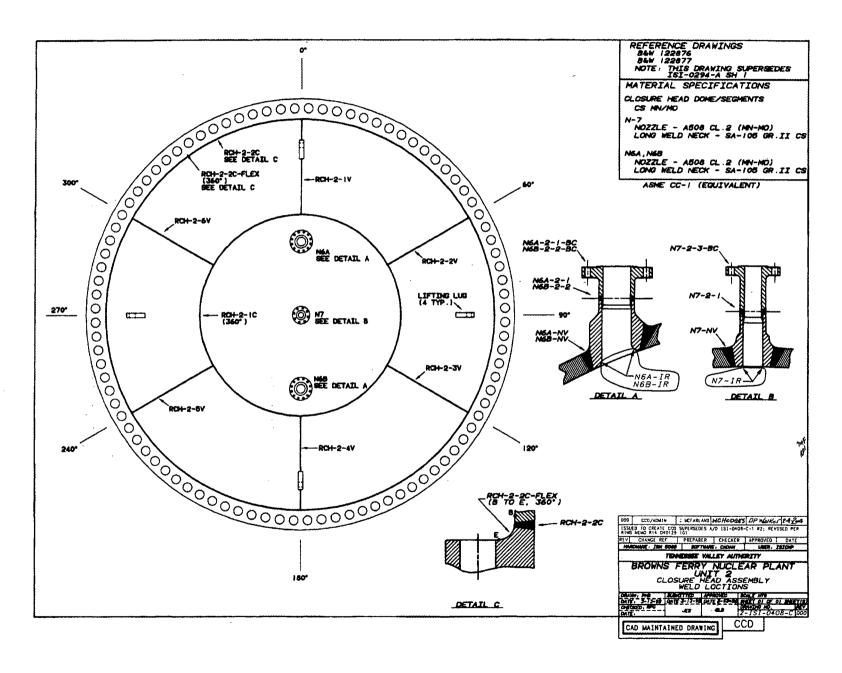
WELD NUMBER	NPS	ISI DRAWING	PERCENT EXAMINED	REMARKS
N4C-NC	12"	2-CHM-2046-C	44%	Nozzle to vessel weld. Examined using a 40°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.
N4E-NV	12"	2-CHM-2046-C	44%	Nozzle to vessel weld. Examined using a 40°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.
N4F-NV	12"	2-CHM-2046-C	44%	Nozzle to vessel weld. Examined using a 40°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.

WELD NUMBER	NPS	ISI DRAWING	PERCENT EXAMINED	REMARKS
N5A-NV	10"	2-CHM-2046-C	27%	Nozzle to vessel weld. Examined using a 35°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.
N5B-NV	10"	2-CHM-2046-C	27%	Nozzle to vessel weld. Examined using a 35°, and 60° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.
N7-NV	4"	ISI-0408-C	69%	Nozzle to vessel weld. Examined using a 45° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.
N9-NV	4"	2-CHM-2046-C	40%	Nozzle to vessel weld. Examined using a 35° shear wave mode and a 60° refracted longitudinal wave mode. Scanning was restricted due to the nozzle configuration. Exams were performed from the shell side and outer blend radius. This weld was examined using PDI qualified personnel, procedures and equipment.

Note: The base material and weld filler material for each weld is provided in the respective examination report provided in Attachment B.

# ATTACHMENT A ISI SKETCH 2-CHM-2046-C 2-ISI-0408-C





# **ATTACHMENT B**

# **Examination Reports**

Weld No.	Report No
N6A-NV	R110
N1B-NV	R137
N2A-NV	R138
N2B-NV	R142
N2C-NV	R139
N2D-NV	R173
N2G-NV	R136
N2H-NV	R143
N2K-NV	R174
N3A-NV	R151
N3B-NV	R175
N3C-NV	R152
N4B-NV	R176
N4C-NV	R177
N4E-NV	R178
N4F-NV	R179
N5A-NV	R156
N5B-NV	R157
N7-NV	R064
N9-NV	R117

# Examination Report, R-110 N6A-NV, RPV Nozzle-To-Head Weld

TENNESSEE VALLEY AUTHORITY			EXAMINATION SUMMARY AND RESOLUTION SHEET			REPORT NUMBER:		
PROJECT: BFN UNIT: 2		CYCI	LE: 12	COMPONENT ID:				
EXAMINATIO	ON METI	HOD		SYSTEM: RPV	ISI DWG	. NO. ISI-0408-C-01		
MT PT	UT 🛭	3	VT 🗌	CODE CLASS:		CATEGORY: B-D		
PROCEDURE: N-UT-78	REV:2	-	TC:N/A	COFIG.:	NOZZEL.	TO CLOSURE HEAD		
EXAMINER:	EXAMIN			EXAMINER:		EXAMINER:		
DOUGLAS GROWEWOLD	TIM	BRE	r2E					
LEVEL: I	LEVEL:	- [	٤_	LEVEL:		LEVEL:		
***								
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examination of the No						And the second s		
exquiriation of me 14	DA-IN A IIO	7.7.E1 (U)	KP v Closuic III	zau weiu.				
The weld was examin	ed with a	60deo 1	D) from the ho	and cide				
Also, due to the confi								
the inner radius was r	<del>-</del>				<u> </u>			
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for the circ scans.	TOTH THE HE	au side	and a zodeg.	In the Isamis olene				
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area. The same spot								
60deg, RL., This indi						· · · · · · · · · · · · · · · · · · ·		
exhibits no length and				ated by the	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
procedure N-UT-18T								
Coverage with the 60	247 1/23/	<u>04                                    </u>	BJR 1/23	/F4				
Coverage with the 60	OdegRIL ca	iculated	I to be approxu	nately 81%				
Coverage with the mo	deled shea	nwaves	was 100% of t	he lower 15% of the				
exam volume.								
Total coverage was a	Total coverage was approximately 90.5%							
D-UT-78 utilized For outer 8500								
151-PD1-2	151. PDI-210:MD LETILIZED FOR LANGE 1590							
	·			<u> </u>	Bu	- d		
RESOLUTION BY:	2	REVI	EWED BY:	447/23/04 Delay	ANII: J	J. F. Price		
TEVEL AL DATE: 7.26	A-07	1 10 1/10	WITE DATE		DATE:	5-24-03		

September 5, 2006

ISI Report Number: R-110

Unit/Cycle: U2/C12 Component: N6A-NV

Subject: Coverage Calculations

This memo is generated to address the achieved ASME Section XI Code Coverage for RPV Nozzle to Vessel welds, examination category B-D, Item B3.90, documented on this ISI Report.

The method of calculation previously used did not provide for a consistent and representative approach. Problem Evaluation Report, PER 99581, was generated to address this issue. As a result, a standard methodology, established in TVA ISO Procedure N-GP-31 (titled "Calculation of ASME Code Coverage for Section XI, Appendix VIII Ultrasonic Examinations"), has been developed, utilizing the Electric Power Research Institute (EPRI) Performance Demonstration Initiative (PDI) methodology, to calculate the achieved ASME Section XI Code Coverage.

In regard to this report, had the method established in ISO Procedure N-GP-31 been applied to this examination, the achieved coverage would have been reported as 36.6%.

This examination was performed in accordance with the criteria of 10CFR50.55a(b)(2)(xv)(G) for maximum achievable coverage requirements and 10CFR50.55a(b)(2)(xv)(K)(3) for RPV Nozzle to Vessel welds examined from the outside of the vessel. This examination utilized personnel, equipment and procedures qualified in accordance with the requirements of ASME Section XI, Appendix VIII in effect at that time.

This memo is for information only purposes and is not intended to change, nor alter, the originally reported coverage values.

Matt Welch TVA/ISO

NDE Level III

Mais Welch

### PER # 110164 (N6A-NV)

This PER (Problem Evaluation Report) # 110164 is being generated as a level "D" PER to document a change in the corrective action of PER# 99581 after the PER was closed and archived. PER# 99581 was generated on March 20, 2006 to document the inconsistancy with the methodology for calculating the ultrasonic examination volume coverage for ASME Section XI Code examination volumes obtained on the Unit 3 RPV Nozzle-to-Shell Welds during the Unit 3 Cycle 12 Refueling Outage versus UT examination volume coverages obtained, caculated, and reported in previous outages in Unit 2 and 3.

The methodology for calculating the the code coverage obtained for ASME Section XI code examination volume was discussed on March 20,2006 with TVA, EPRI, and AREVA. From this discussion, TVA, and AREVAgreed to a methodology based upon guidance from EPRI. The methodology has become standard for TVA and required for all future RPV examinations. TVA NDE Procedure N-GP-31, "CALCULATION OF ASME CODE COVERAGE FOR SECTION XI, APPENDIX VIII ULTRASONIC EXAMINATIONS" was developed.

PER 99581-004 Corrective Action Item description stated, "If calculations in Corrective Action Item # 99581-003 reveal that ASME Code coverage percentages are less than 90%, TVA will submit Request For Relief # 2-ISI-19, Revision 01 (N6A-NV) and Request For Relief # 3-ISI-7, Revision 03 (N4D-NV, N4E-NV, and N6B-NV) to BFN Licensing. This was completed on July 25, 2006. The PER was closed on July 25, 2006. A meeting was conducted on August 30, 2006 between BFN Licensing and Component Engineering to discuss the sumittal of the requests for relief to the NRC. Through further discussions it was determined that the RFR's were not necessary as the previously calculated coverage were calculated with the method accepted at that time .  $\Lambda$ letter would be written for each RPV Nozzle and attached to the existing UT examination reports explaining the new methodology and what the coverages would be under the new methodology so future reviewers would understand the reason for the coverage differences. This letter was attached to the affected UT examination reports; R-110 (N6A-NV), Unit 2 Cycle 12 Outage and Unit 3 Cycle 11 Outage; R-182 (N4D-NV), R-183 (N4E-NV), and R-186 (N6B-NV) and sent to Document Control Records Management lifetime storage. This was completed on September 06, 2006.

Trederick W. Frozeello Jr.

BFN ISO NDE Specialist, ISI

TENNESSEE VALLEY	DIGITAL UI.	REPURT NUMBER			
AUTHORITY	CALIBR		R.110		
	DATA				
PROJECT BFN UNIT/CYC	LE <u>2/12</u>		DATE: 2-28-03 BLOCK NO. 3F 19 TEMP: 77 °F		
PROCEDURE: <u>N-UT-78</u> REV:	2 TC: <u>N/4</u>		OCK: ROMPAS		
MANUFACTURER RTD			R S/N 558274 DUE DATE 12-6-03		
MODEL: TRL 2 S	N 01-887	COUPLANT: 44	TRAGEL BATCH: 02/25 ANGLE VERIFICATION		
SIZE: 2(24×42) FR	EQ: 2 MHz	BLOCK TYPE:	TEW SN: 5307		
SHAPE: REC # ELEMENTS: 2		NOMINAL AND	LE GO' ACTUAL ANGLE GI .		
CABLE TYPE RG-174 LEN	GTH: 6'	<del></del>	INSTRUMENT -		
MODE: □ SHEAR □ LONG	C RL		er <u>KB</u> due date 6-5-03 USN 52 SN: <u>E2C4</u> 09		
DAC			NSTRUMENT SETTINGS		
100 (21) 1/4/1	D NOTCH (22)	REFLECT			
	Jan A	SCAN DIRECT.	ITC SDH SENSITIVITY NUMBER		
80	M		□ 79 dB 10		
60 25	P	ZONE 1	BO dB 11		
60 SOR	L	FREQ: 3-4 ANGLE: 6/			
40 ZONE ZONE	T	DELAY -0.90			
	<del></del>	ZERO: 14.172 msec			
20	a	VELOCITY . 2283 msec PRRPRF: LOW			
·	E	RANGE: 4.22 10.9 inches TOF: NA			
0		DISP. MODE: FÜLL WAV POWER:			
DISPLAY WIDTH 4.23/10.					
REF. REFLECTOR: ROMAN SON AMPLITUDE: 80 % METAL P		CALIBRATION TIMES INITIAL TIME: 0930 FINAL TIME /730			
VERIFICATION TIMES 1) 1/40	2) 14/5 3) 1700	14) D/A 5 6 7 7 8 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
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GAIN SET	-6 dB -12dB		12 SET +6		
ATTENUATOR AMP 80% 3	2 TO 48 16 TO 24	<del></del>	O 96 40% 64 TO 96		
	40 20	පි	O 80		
COMMENT	\$		WELD/ITEMS EXAMINED.		
		NGA-N	111		
		KCH-X-	HE U/A 200 3.3.03		
EXAMINER: Down Anneu	LVL.TI		ANII: B. F. Trus		
	<u></u>		DATE: 2-24-03		
EXAMINER: O TOM Buch	LVL.I				
REVIEWER TO Que Du	Coy I.VL .: ]	U DATE: 3.3	63 PAGE OF LO		
ACCESS: FORMS DATABASE 10-27-01		·· <del></del>			
	. •				

Table 1. Browns Ferry Closure Head Instrumentation Nozzle (N6)
Geometry Inputs to Spreadsheet Model for Nozzle-to-Shell Weld Examination

Inside Surface		Outside Surface	· · · · · · · · · · · · · · · · · · ·
Dimensions	(inches)	Dimensions	(inches)
Weld Start R	4.94	Weld End R	9.08
Rbore	3.11	Rnozzle	5.72
Rbi	1.5	Rbo	2
Rvi	125.69	Rvo	129.69
Xoff	48	Yoff	0

Table 2. Spreadsheet Model Techniques for Instrumentation Nozzle-to-Shell Weld.

Probe Angle	Probe Skew	Scan Surface	Mode of Propagation		
45	±(25 to 80)	Vessel	Shear Wave		
55	±(20 to 60)	Vessel	Shear Wave		
26	上90	Blend	Shear Wave		

Table 3. Spreadsheet Model Techniques for Instrumentation Nozzle-to-Shell Weld.

Probe Angle	Probe Skew	Scan Surface	Min R	Max R	Min MP	Max MP	Max Misorientation
45	±(25 to 80)	Vessel	6.89	12.0	4.67	6.16	0
55	±(20 to 60)	Vessel	7.17	8.66	5.78	7.60	18
26	±90	Blend	5.94	7.10	4.89	7.44	20

EPRI- Modeling

TENNESSE	E VALLEY	DIGI	TAL UL	TRASO	NIC	RE	PORT NU	IMBER					
, <del></del>			CALIBR	ATION	1 *6.*1	***							
AUTH	ORITY		DATAS			-	Rice	<b>D</b>					
		rn -		CALIBRA'	TION D	ATE: 2	-28-03						
ROJECT BFN				CALIBRA'	TION B	LOCK NO	BF84TR T	EMP: 74 °F					
PROCEDURE: 7	TRANSDUCER	KL TO	C: <u>N/A</u>	SIMULAT	OR BLO	оск <u>: エ</u>	W 4" RA	2UMS					
MANUEL OTES	— Transducer Er <b>KB</b>			THERMOMETER S/N.558274 DUE DATE 12-6-03									
MODEL	AP S	N ^^	DOUY	COUPLANT: ULTRAGEL BATCH: 02125									
SIZE:5°			2.5 MHz	DI OCU T									
SIZE:	# ELEMENTS: 1												
CARLE TARE	RG 174 LEN	_ # CON СТИ: - 4	ا <del></del> -ار	NOMINAL ANGLE 26 ACTUAL ANGLE 26									
								DATE <u>6-5-03</u>					
MODE: SHE	EAR ULONG	IJ.R	L	MODEL N	[0, L]	SN KI	S/N•	E26409					
	DAC			NUDELIN	IN	STRUMEN	T SETTINGS						
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	REF	IDING	MCH V	SCAN DIRE			SENSITIVITY	NUMBER					
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VERTICAL		0 45	<del></del>	30 25	<del>                                     </del>	15 10							
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ATTENUATOR		2 TO 48	16 TO 24	20%	64 TO		% 64 TO	96					
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-morrow arry	UNIT/CYC		1	CALIBRATIO	ON DA	TE: 2-28	-03					
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MANUFACTURE	TRANSDUCER			THERMOMETER S/N.558274 DUE DATE 12-G-03								
MANORACIONA	MAS	N E 172		COUPLANT: ULTRAGEL BATCH: 02125								
SIZE: 5 X	NA FE	FO 9 3	5 MHz	BLOCK TYPE: TIW S/N: 5307								
	# ELEMENTS: 1	# COM	- C 111111	BLOCKTYPE: TIW SN: 5307								
SHAPE TYPE D	G58 LEN	CTEL G	"; <del>-</del> [	NOMINAL ANGLE 45 ACTUAL ANGLE 96 °								
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MANUFACTURER KBA				THERMOMETER S/N 558274 DUE DATE 12-6-63								
MODEL: GAMMA S	N E.25	215	] •	COUPLANT: ULTRAGEL BATCH: 02125  ANGLE VERIFICATION								
SIZE: 5 X1.0 FR	EO: 2.7	5 M	Hz	BLOCK TYPE: IIW S/N: 5307								
	SHAPE: REC. # ELEMENTS: 1 # CONS: 6							ī	۱۱۱۰ ــــــ ک ک ک	TIIAT A	NGLE 56°	
CABLE TYPE RG 58 LEN						STRU	MENT	——	Trong OC			
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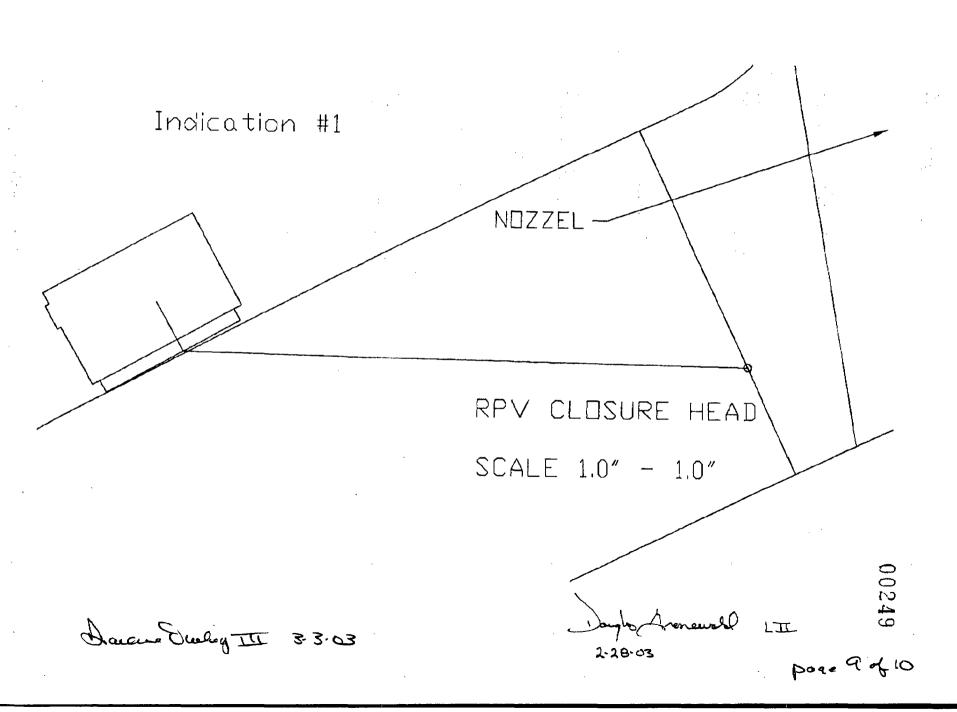
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SCAN SENS.:	<u>*1</u>	<b>★1</b> db EXAM START: 1140					EXAN	EXAM END: 1200 EXAM ANGLE: 60°RL													
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IND NO.				M	AX. 1	AMP.		20%			50%			100%							
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TVA

# MANUAL ULTRASONIC VESSEL EXAMINATION DATA SHEET

REPORT NO.

PROJECT: BFN UNIT: 2 WELD ID: NGA-NV CONFIG.: NOZZEL COMPONENT: HEAD																					
CAL. SHT. N	o.: _			_ P	ROCE	DUR	E: <u>IS</u>	I-PX	<b>L-210</b>	MD RI	E <b>V</b> .: _	1_]	PCR.:	_N/	<u>А</u> Т	EMP.:	<u>_63</u>	3*	PYRO	.: <u>558</u>	274
SCAN SENS.:	SCAN SENS.: 15% wordb Exam start: 1045 Exam end: 11:35 Exam angle: 26, 45° + 55° same																				
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IND 20% 50% 100% MAX. AMP. 20% NO.										50%			100%								
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**TVA** SYSTEM: RPV PROJECT: BFN REPORT NO.: RIIO Office of Nuclear Power WELD NO .: NGA -NV Unit: 60° Coverage Total Area 19.50° SQ.JN. Area Missed 4.55° SQ.IN. ASME Code Credit 77% 60° Coverage Total Area 11.55" SQ.IN. Area Missed 1.90" SQ.IN. ASME Code Coverage = 84% - LOWER 15% EXAM VOLUME Total Coverage Lower 15% = 100% Upper 85% = 81% Total Composit Coverage = 90.5% 00250

DATE: 2-28-03

PAGE 10

OF to

LEVEL:

TVA 19669 (ONP-6-88)

# Examination Report, R-137 N1B-NV, RPV Nozzle-To-Head Weld

# RPV Nozzle Ultrasonic Examination $000\underline{1}92$ **Summary Sheet**

Utility: TVA	Site: Browns Fo	erry Nuclear Plan	nt	Unit: 2	Outage: Cycle 14	ISI Report#: R137
Component Number:	N1B-NV	Component De	escription	n: N1 Nozzle t	o Vessel Weld	System: RPV
Code Category: B-D		Code Item: B3	.90		Code Class: 1	Material: CS
ISO / Drawing(s): 2-0	HM-2046-C-01 8	2-ISI-0270-C-0	2			
Procedure Numbe	r Proced	ure Revision		SDCN	Pr	ocedure Misc. Info
N-UT-78		4		NA	Revision 11 of the	PDI-UT-6 qualified equipment table
N-UT-79		1		NA	Revision 5 of the I	PDI-UT-7 qualified equipment table
54-ISI-850		06	30-9	044520-000		R-2003-19 Section 2 PRI Letter dated 3/13/07
Cal	ibration Sheets			xam Data Sheets	Indication Data Sheets	Exam Results  No Recordable Indications
N1BNV-CDS1			N11	BNV-EDS1	NA	Recordable Flaw Indications
N1BNV-CDS2						(acceptable flaw evaluation)
N1BNV-CDS3						Reportable Flaw Indications
N1BNV-CDS4						(unacceptable flaw evaluation)
Summary:						

In accordance with UT procedure N-UT-78 Revision 4, 60° refracted longitudinal wave examinations were performed from the vessel surface in both the axial (radial) and circumferential scan directions. These examinations resulted in no reportable indications.

In accordance with UT procedure 54-ISI-850-06 and the referenced TVA / EPRI modeling report the following additional examinations were performed. These examinations resulted in no reportable indications.

N2 Nozzie Modeling Parameters											
Probe Refracted Angle	Probe Skew	Scan Surface									
43°S	-106°	Blend Radius									
43°S	+106°	Blend Radius									

This ultrasonic examination was performed in accordance with the criteria of 10 CFR50.55a (b)(2)(xv)(G) and the minimum coverage requirements of 10 CFR50.55a (b)(2)(xv)(K) was achieved to the maximum extent possible. The examination procedure requires an additional circumferential scan of the outer 85%-t which is not addressed in 10CFR 50.55a. The 60°RL examinations were limited due to the nozzle configuration which reduced the examination volume obtained to 31%. Refer to coverage sketch(s) and worksheet for a description of the scanning volume, examination coverage, and scan limitations.

This examination satisfies the requirements of ASME Section XI (2001 thru 2003 Addenda) and was performed using ASME Section XI, Appendix VIII qualified personnel, procedures, and equipment.

Note: See TVA Request for Relief PDI-1 and PDI-2. Dockets No. 50-261/296, 50-327/328, and 50-0390. This relief request reduced the area to be examined per IWB-2500-7 (a) and (b) to the weld plus ½" on each side.

Prepared by: George Chapman Signature:	Date: 3/18/07	Reviewed by: Adam Conti	Date: 3/19/07
Customer: Matt Welch John Wilch	Date: 3/20/07	ANII: Signature: Ful Flund	Date: 5/18/07
	7 7		Page 1 of 10



# **Ultrasonic Examination Data Sheet**

Nozzle-to-Shell Weld Examination														
Utility: T\	/A		Si	te: Browns Fei	my Nuclear F	Plant			Ιu	Init: 2		Outage	: Cycle 14 RFO	
		Sheet Number: N					ISI Report N	lumber:	R137	•		<u> </u>		
Compone	ent ID: N	1B-NV					Component	Description:	N1 Nozz	le-to-V	essel We	ld		
					Exa	mination	Information							
		nber: 2-CHM-2046	C-01 & 2-ISI-02	70-C-02		W <sub>0</sub> Loc	ation: Nozzle Bo	ss (Rnozzle	)	Lo	Location	: Nozzle	TDC	
Examina	tion Limite	ed:⊠Yes □No					ge Sheet Numbe	er(s): N1BN\	/-CWS1					
Scan Information														
Examination Procedure: 54-ISI-850-06 Applicable SDCN's: 30-9044520-000										Scan St	rface: Ot	DD Blend Radius		
Angle/ Mode	Skew	Calibrat	ion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Li	mited	Recor Indical		Indication Data Sheet #	Examiner Initials
43°S	-106°	N1BN	IV-CDS1	03/09/07	1810	83°F	VH-9525	75.0 dB	∐Yes	⊠No	□Yes	⊠No	N/A	GC
43°S	+106°	N1BN	IV-CDS2	03/09/07	1830	83°F	VH-9525	75.0 dB	□Yes	⊠No	□Yes	⊠No	N/A	GC
N/A	N/A		N/A	N/A N/A N/A N/A N/A □Yes □N								□No	N/A	N/A
N/A	N/A		N/A	N/A	N/A	N/A	N/A	. N/A	□Yes	□No	□Yes	□No	N/A	N/A
Examinati	on Proced	ure: 54-ISI-850-06		Applicable SD	Applicable SDCN's: 30-9044520-000 Scan Surface: OD Vessel Shell									
Angle/ Mode	Skew	Calibrat	ion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	Scan Limited		dable ion(s)	Indication Data Sheet #	Examiner Initials
*60°S	N/A		N/A	N/A	N/A	N/A	N/A	N/A	☐Yes	□N∘	☐Yes	□N∘	N/A	N/A
N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A	N/A
Examinati	ion Proced	ure: N-UT-78 rev.4		Applicable SE	CN's: N/A						Scan St	ırface: Ol	D Vessel Shell	
Angle/ Mode	Zone	Beam Direction	Calibration Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	imited	Recor		Indication Data Sheet #	Examiner Initials
60°RL	1	⊠Radial □Circ	N1BNV-CDS3	03/09/07	1720	83°F	VH-9525	72.4 dB	⊠Yes	□No	□Yes	⊠No	N/A	GC
60°RL	2	⊠Radial □Circ	N1BNV-CDS4	03/09/07	1620	83°F	VH-9525	80.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	GC
60°RL	1	□Radial ⊠Circ	N1BNV-CDS3	03/09/07	1720	83°F	VH-9525	72.4 dB	⊠Yes	□No	□Yes	⊠No	N/A	GC
60°RL	2	□Radial ⊠Circ	N1BNV-CDS4	03/09/07	1620	83°F	VH-9525	80.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	GC
*The	Comments:  *The 60° shear modeled scan from the vessel shell could not be performed due to the as-found dimension of the blend radius. Table 2-1 of the modeling report lists the dimension as 5.75" however it actually measures ~7.0". Since the blend radius is larger than as listed on design drawings, and thus expected during the modeling process, scanning from the vessel shell could not be performed since the modeled scan area is in the blend region rather than on the vessel shell surface. TVA contacted the EPRI NDE Center for revised modeling to obtain the examination coverage missed by													

eliminating the 60°s scans. The revised modeling increased the scan area of the 43°, ±106° skew examinations to obtain 100% circumferential scan coverage of the inner 15%-t.

Examiner: George Chapman	Level: If	Date: 03/09/07	Examiner: N/A	Level: N/A	Date: N/A
Signature: Syn Is Car		L	Signature:		
Examiner: N/A	Level: N/A	Date: N/A	Examiner: N/A	Level: N/A	Date: N/A
Signature:			Signature:		
AREVA Review: Adam Conti	Level: III	Date: 03/19/07			
Signature Man (M)					
					Page 2 of 10



### RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet

Utility: TVA Plant: Browns Ferry Unit: 2 Weld ID: N1B-NV

Outer 85%-t

Axial scans are performed with a procedure for the examination of vessel shell welds. This procedure has been demonstrated for detection of flaws located throughout the entire weld thickness. Coverage obtained during axial scans is typically limited due to nozzle configuration.

Coverage Worksheet #: N1BNV-CWS1

iSI Report #: R137

In the circumferential scan direction the outer 85%-t is examined with the same vessel procedure as above and typically limited due to nozzle configuration. To achieve additional coverage in the circumferential scan direction a second examination is performed with a procedure demonstrated for nozzle inside-radius UT. This procedure has been demonstrated for detection of flaws in the inner 15%-t only. The nozzle inside-radius technique provides additional coverage since the component is modeled and scanning is performed with several search units from the nozzle blend.

Circumferential Scans								
inner 15%-t	Outer 85%-t							
Examination Procedure: 54-ISI-850-06	Examination Procedure: N-UT-78 Revision 4							
<sup>D</sup> Inner 15%-t Examination Volume: 9.9 <sup>2</sup> inchs	GOuter 85%-t Examination Volume: 85.72Inches.							
<sup>E</sup> Coverage Obtained by Modeling: 100%	60°RL Outer 85%-t Exam Limited:   ☐Yes ☐No							
Inner 15%-t Exam Limited: ☐Yes ☐No	Description of Limitation: Nozzle Blend Radius							
Description of Limitation: N/A	Outer 85-t% Volume Achieved: 16.72inches							
finner 15%-t Volume Achieved: 9.92inchs								
	al Examination Coverage: 28%  H)+A X 100 = J							
	Inner 15%-t  Examination Procedure: 54-ISI-850-06  Dinner 15%-t Examination Volume: 9.9²inchs  Coverage Obtained by Modeling: 100%  Inner 15%-t Exam Limited: Yes No  Description of Limitation: N/A  Finner 15%-t Volume Achieved: 9.9²inchs  Total Circumferenti							

Combined Axial and Circumferential Weld Coverage

'Total Examination Coverage: 31%

 $(C+J) + 2 \times 100 = L$ 

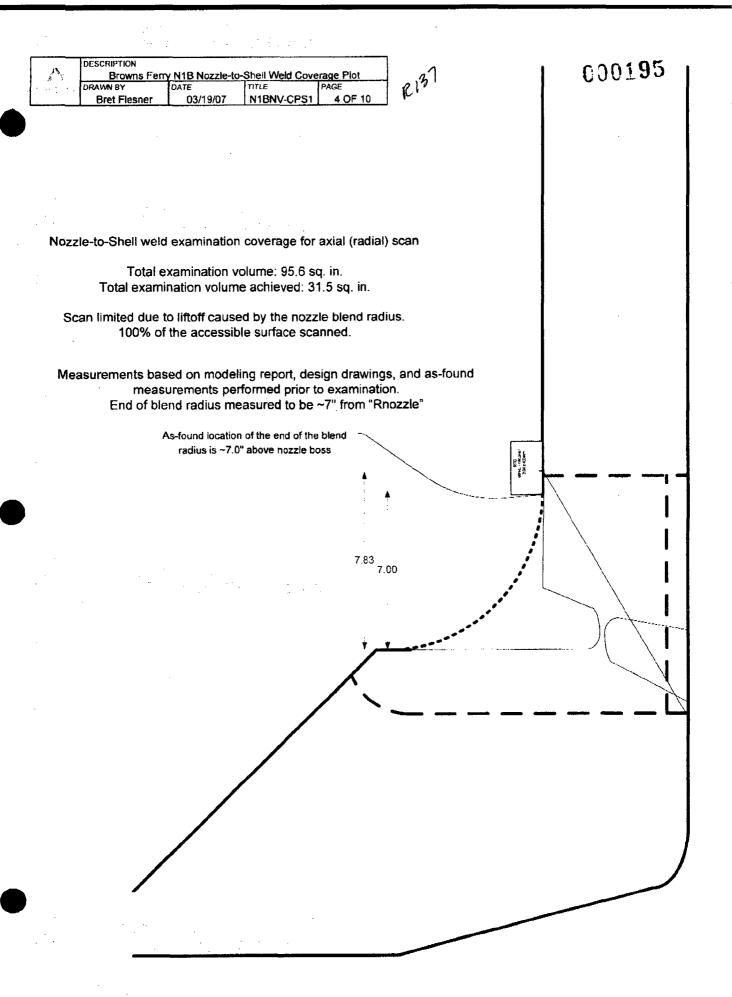
Prepared by: Bret Flesner Date: 03/19/

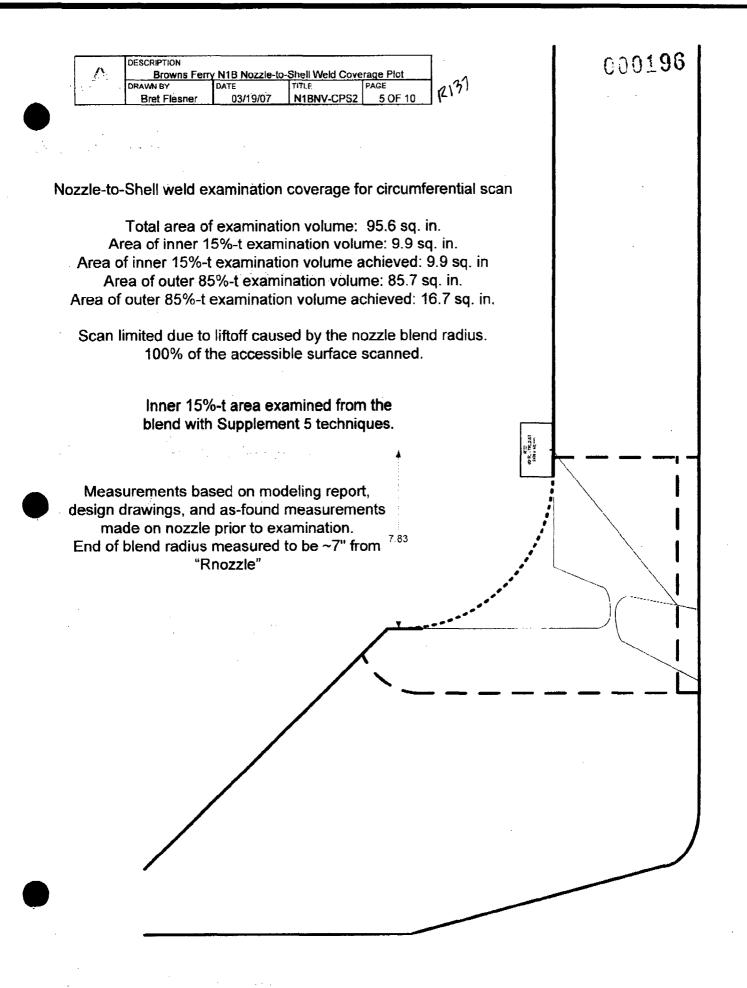
e: 03/19/07 Reviewed by

ewed by Adam Conti

Date:03/19/07

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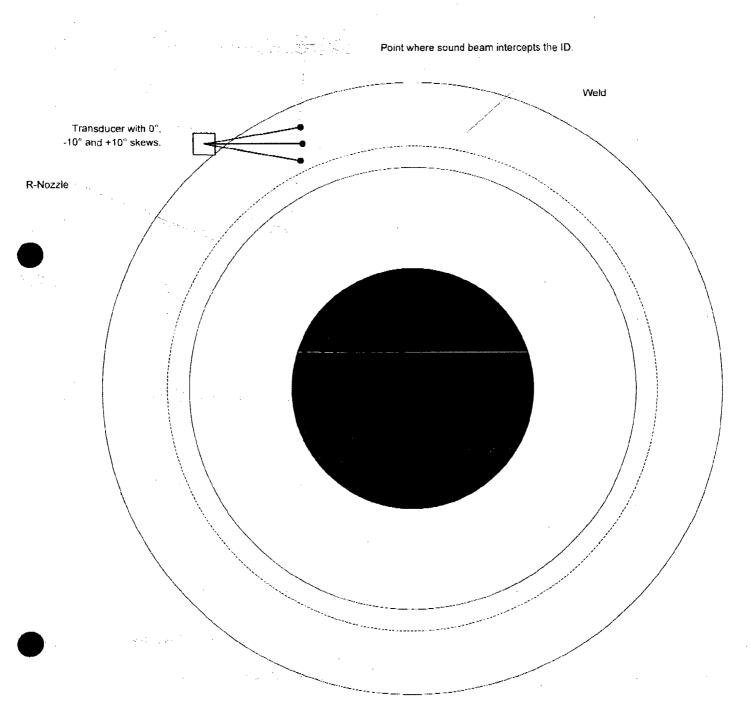


	DESCRIPTION			
J. 3	Browns Fe	rry N1B Nozzle-to-	Shell Weld Coverage	ge Plot
2.2	DRAWN BY	DATE	TITLE	PAGE
	Bret Flesner	03/19/07	N1BNV-CPS3	6 OF 10

R137 000197

Top View Measurements based on modeling report, design drawings, and as-found measurements.

End of blend radius measured to be ~7" from "Rnozzle"





### Reactor Pressure Vessel 600198 Manual Ultrasonic Calibration Data Sheet

Util	lity: TVA	Site: Bro	owns Ferry	Nuclear	Plant	Unit: 2		Outage: 0	Cycle 14 RFO		
Cal	libration Data Sheet Number:	N1BNV-CDS1		ISI Re	port Nu	mber: 🏻 🎗	137				
Co	mponent ID: N1B-NV			Compo	onent De	scription: N1	Nozzle-to	o-Vessel Weld			
Exa	amination Procedure: 54-ISI-	850-06		Applicable SDCN(s): 30-9044520-000							
	Ultrasonic Inst	trument		Transducer							
Ma	nufacture: Staveley		Man	ufacture:	KBA		Mod	Model: Benchmark 892-600			
Мо	del: Sonic 136		Seri	al Numbe	er: 0111P	rk 🕜	Fred	Frequency: 2.25 MHz			
Serial Number: 136P1200G081455				: 0.50" x	1.0"		Sha	pe: Rectangle			
Linearity Sheet No.: LDS1				Elements	s: 1		Con	figuration: Single			
Instrument Settings				acted An	gle: 43°		Mea	sured Angle: 47°			
Range: 20.0" Sound Path Depth				w Angle:	-106°		Mea	sured Skew Angl	e: * +106°		
RANGE	Delay: 0.658*	Mod	le: Shear			Rad	ius: 5.75"				
Velocity: 0.127 in / μS				le Type: l	RG-174	Length: 12'	Inter	mediate Connect	tors: 0		
Ī.,	Display: Filt2					Verific	cation B	lock			
Frequency: 2.25MHz				e: CS Ro	Rompas		S/N: 99-6251				
	Reject: Off	F	Reflector:	tor: 1" Reflector			2" Re	flector			
	Pulse Width: 222nS			Sweep:		0.6 div.		. 1.1	div.		
	Damping: 500Ω		Ar	nplitude:		70% FSH		80%	FSH		
	Mode: ⊠Pulse Echo ☐[	Dual		Gain:		28.2 dB		28.2	2 dB		
PULSER	Rep Rate: 2kHz					Basic Ca	libratio	n Block			
ž	Pulser: 150V 300V	(*Sonic 137 onty)	Bloc	k ID: BF-	18		Material: Clad CS				
	*Pulser voltage adjustable with th	e Sonic 137 instrument	only.	kness: 6.	0" with 0	.125" clad	Diameter: Flat				
	The Sonic 136 has a fix			perature	: 68 °F		Therm.	SN: VH-9525			
			Cou	plant: Ult	ragel II		Batch N	o.: <b>05325</b>			
		Ref	erence S	ensitivit	y Inform	nation					
Ref	flector: ID Notch	Sweep: 4.4 div		Amp	olitude: 8	0 %FSH	(	Gain: 53.4 dB			
Cal	In: Date 03/09/07 Time 1515	Check: Date 03/09/	/07 Time 18	308 Che	ck: Date I	N/A Time N/A		Out: Date 03/09/07	Time 1900		
We	dge skew incorrectly labeled on w	vedge, actual skew is		Commen	ts						
Exa Sig	aminer: George Chapman nature:	Level: II	Date: 03/09		aminer: N	N/A		Level: N/A	Date: N/A		
	EVA Review. Adam Centi nature	Level: III	Date: 03/19	9/07					Page 7 of 10		

### Reactor Pressure Vessel 000199 **Manual Ultrasonic Calibration Data Sheet**

] Util	ity: TVA	Site: Bro	owns Ferry	Nucle	ear Plant	Unit: 2		10	Outage: C	Cycle 14 RFO	
Cal	libration Data Sheet Number:	N1BNV-CDS2	•	IS	Report Nun	nber: RI	37				
Co	mponent ID: N1B-NV		•	Co	mponent Des	cription: N1	Nozzle-	to-Vessel	Weld		
Exa	amination Procedure: 54-ISI-	850-06		Applicable SDCN(s): 30-9044520-000							
	Ultrasonic Inst	trument		<del></del>							
Ma	nufacture: Staveley		Ма	Manufacture: KBA Model					Benchmark 892-600		
Mo	del: Sonic 136		Ser	ial Nu	mber: 00X1X	С	Fre	Frequency: 2.25 MHz			
Sei	ial Number: 136P1200G0814	155	Siz	e: 0.50	0" x 1.0"		Sha	ape: Rect	angle		
Linearity Sheet No.: LDS1				f Elem	nents: 1		Col	nfiguratio	n: Single		
	Instrument Se	Ref	racted	d Angle: 43°		Me	asured A	ngle: 43°			
ш	Range: 20.0" Sound Pa	Ske	w Ang	gle: +106°		Ме	asured SI	kew Angl	e; * -106°		
US Delay: 0.658*				de: Sh	iear		Rad	dius: 5.75	5"		
<b> </b> ~	Velocity: 0.127 in / μS	Cal	ole Typ	pe: RG-174	Length: 12'	Inte	ermediate	Connect	ors: 0		
	Display: Filt2					Verific	ation i	Block			
RCVR.	Frequency: 2.25MHz	Тур	e: CS	Rompas	ompas S/N		N: 99-6251				
Reject: Off				Reflec	ctor: 1" Reflector				2" Reflector		
	Pulse Width: 222nS				veep: 0.6 div.				1.1 div.		
	Damping: 500Ω		А	mplitu	ide:	70% FSH			80%	FSH	
	Mode: ⊠Pulse Echo ☐0	Dual		Ga	ain:	27.0 dB	27.0 dB			) dB	
PULSER	Rep Rate: 2kHz			Basic Calibration B					k		
ĭď	Pulser: ☐150V ☐300V	(*Sonic 137 only)	Blo	ck ID:	BF-18		Materia	Material: Clad CS			
	*Pulser voltage adjustable with th	ne Sonic 137 instrument	only. Thi	ckness	s: 6.0" with 0.	125" clad	Diameter: Flat				
	The Sonic 136 has a fir			nperat	ture: 68 °F		Therm. SN: VH-9525				
			Col	uplant:	: Ultragel II		Batch I	No.: 0532	25		
		Ref	erence S	Sensit	tivity Inform	nation					
Ref	flector: ID Notch	Sweep: 4.1 div		/	Amplitude: 80	%FSH		Gain: 53.	.0 dB		
Cal	In: Date 03/09/07 Time 1525	Check: Date 03/09/	07 Time 1	828	Check: Date N	I/A Time N/A		Out: Date	03/09/07	Time 1855	
				Comn	ments						
We	dge skew incorrectly labeled on w	vedge, actual skew is	-106°.								
	eminer: George Chapman nature:	Level: II	Date: 03/0	9/07	Examiner: N/A Signature			Le	vel: N/A	Date: N/A	
	EVA Review Adiam Continuature:	Level: III	Date: 03/1	9/07					Page 8 of 10		



# Reactor Pressure Vessel 600200 Manual Ultrasonic Calibration Data Sheet

Util	lity: TVA	Site: Brown	ns Ferry N	luclear f	Plant	Unit: 2		Outage:	Cycle 14 RFO		
Cal	libration Data Sheet Number: N1B	3NV-CDS3		ISI Re	port Nur	mber: R1	37		W		
Cor	mponent ID: N1B-NV			Compr	onent De	escription: N1	Nozzle-to-	Vessel Weld			
Exa	amination Procedure: N-UT-78 Re	evision 4		Applica	able SD(	CN(s): N/A					
	Ultrasonic Instrum	ient		Transducer							
Mai	nufacture: Staveley		Manu	ufacture:	RTD		Model	Model: TRL2-ST			
Mo	del: Sonic 136		Seria	I Numbe	er: 07-30	4 .	Frequ	Frequency: 2 MHz			
Ser	rial Number: 136P1200G081455		Angle	∌: 60°			Meas	ured Angle: 61	0		
Line	earity Sheet No.: LDS1		Mode	e: Refrac	ted Long	gitudinal	Size: 2	2(24x42)mm			
	Instrument Settin	Focu	s: FS~12	25mm		Squin	t Angle: 5°	4-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1			
ш	Range: 8.00" Sound Path	# of E	Elements	s: 2	Shape: Rect	. Config	guration: Dual	- SBS			
RANGE	Delay: 1.38*	Cable	e Type: F	RG-174	Length: 1	2' Interm	nediate Connec	ctors: 0			
Œ	Velocity: 0.230 in / µS				Verific	cation Blo	ock				
	Display: Filt 2		Туре	: CS Ror	mpas		S/N: 99-6	251			
RCVR	Frequency: 2.25 MHz	R€	eflector:		1" Reflector		2" Reflector				
	Reject: Off		Sweep: 1.3 div.				2.5 div.				
	Pulse Width: 222 nS		Am	Amplitude: 25% FSH				80%	% FSH		
	Damping: 500 Ω			Gain:		52.0 dB		52	2.0 dB		
œ	Mode: ☐Pulse Echo ☑Dual					Basic Ca	libration	Block			
PULSER	Rep Rate: 2kHz		Block	(ID: BF-	18		Material:	Clad CS			
ā.	Pulser: 150V 300V (*Sonic	ic 137 only)	Thick	ness: 6.	O" with C	0.125" Clad	Diameter:	Diameter: Flat			
	*Probe voltage is adjustable with the Sor		<sub>ie</sub> Temp	perature:	: 68 °F		Therm. S	Therm. SN: VH-9525			
	Sonic 136 has a fixed pulse	≥r voltage.	Coup	olant: Ultr	ragel II		Batch No.	Batch No.: 05325			
		Refer	rence Sei	nsitivit	y Infon	mation					
Ref	flector: 1/4-t SDH	Sweep: 3.8 div			Amplitur	de: 80 %FSH		Gain: 58.4 d	В		
Cal	In: Date 03/09/07 Time 1535	Check: Date 03/0	)9/07 Time	e 1717	Check: [	Date N/A Time	N/A	Out: Date 03/	/09/07 Time 1905		
		James de Paris de Carrer de La	Cr	ommen	its			,			
Zor	ne 1 - Near Surface calibration.										
	aminer: George Chapman	Level: II Date	te: 03/09/0		aminer: f jnature	N/A	<u> </u>	Level: N/A	Date: N/A		
	EVA Review. Adam Coffiti	Level: III Date	te: 03/19/0	)7					Page 9 of 10		



# Reactor Pressure Vessel 000201 Manual Ultrasonic Calibration Data Sheet

Util	lity: TVA	Site: E	Browns Ferry N	Nuclear I	Plant	Unit: 2		Outage:	Cycle 14 RFO		
Cal	libration Data Sheet Number: N1B	NV-CDS4		ISI Re	port Nun	nber: R13	7				
Co	mponent ID: N1B-NV			Compo	onent De	scription: N1	Nozzle-to-	Vessel Weld			
Exa	amination Procedure: N-UT-78 Re	vision 4		Applicable SDCN(s): N/A							
	Ultrasonic Instrum	ent			r						
Ма	nufacture: Staveley	-	Manu	ıfacture:	RTD		Mode	Model: TRL2-ST			
Мо	del: Sonic 136	The state of the s	Seria	l Numbe	er: 07-304	4	Frequ	iency: 2 MHz			
Ser	rial Number: 136P1200G081455	Angle	): 60°			Meas	ured Angle: 61	0			
Line	earity Sheet No.: LDS1	Mode	: Refrac	ted Long	jitudinal	Size:	2(24x42)mm				
	Instrument Settin	Focus	s: FS~12	25mm		Squin	t Angle: 5°				
й	Range: 18.0" Sound Path	# of E	lements	s: 2	Shape: Rect	t. Config	guration: Dual	- SBS			
RANGE	Delay: 1.38"	Cable	Type: F	RG-174	Length: 1	2' Intern	nediate Conne	ctors: 0			
	Velocity: 0.230 in / μS					Verific	cation Blo	ock			
~	Display: Filt 2		Туре:	CS Ror	npas		S/N: 99-6	251			
RCVR	Frequency: 2.25 MHz	Re	eflector:	1" Reflector			2" Reflector				
	Reject: Off	;	Sweep: 0.6 div.				1 div.				
	Pulse Width: 222 nS		Am	Amplitude: 25% FSH				80%	% FSH		
	Damping: 500.Ω			Gain: 52.0 dB				52	2.0 dB		
4	Mode: □Pulse Echo ☑Dual					Basic Ca	libration	Block			
PULSER	Rep Rate: 2kHz	<del>-</del>	Block	Block ID: BF-18			Material: Clad CS				
Ο.	Pulser: 150V 300V (*Sonic	: 137 only)	Thick	ness: 6.	0" with 0.	.125" Clad	Diameter	Diameter: Flat			
	*Probe voltage is adjustable with the Son		nt. The Temp	erature:	68 °F		Therm. S	Therm. SN: VH-9525			
	Sonic 136 has a fixed pulse	r Voltage.	Coup	lant: Ultr	ragel II		Batch No	Batch No.: 05325			
		Re	eference Se	nsitivit	y Inforn	nation					
Ref	lector: ID Notch	Sweep: 6.2	div		Amplitud	le: 80 %FSH		Gain: 73.2 d	8		
Cal	In: Date 03/09/07 Time 1545	Check: Date	03/09/07 Time	e 1618	Check: D	ate N/A Time	> N/A	Out: Date 03/	/09/07 Time 1910		
			Co	mmen	ts						
Zon	e 2 - Full Volume calibration.										
ı											
	miner: George Chapman nature:	Level: II	Date: 03/09/0		aminer: N nature	/A		Level: N/A	Date: N/A		
ADI	EVA Review Adam Conti	Level: III	Date: 03/19/0								

# Examination Report, R-138 N2A-NV, RPV Nozzle-To-Head Weld

ĮĄ.	Street.	9 c.		10					

### **RPV Nozzle Ultrasonic Examination**

				Summ	ary Sheet		000202	
Utility: TVA	Site: Browns	Ferry Nuclear Pla	ant	Unit: 2	Outage: Cycle 14	ISI Report	#: R138	
Component Numbe	r: N2A-NV	Component D	escription	: N2 Nozzie 1	to Vessel Weld	System: RPV		
Code Category: B-D	)	Code Item: B3	3.90		Code Class: 1	Material: C	S	
ISO / Drawing(s): 2-	CHM-2046-C-01	& 2-ISI-0270-C-0	02			<u> </u>		
Procedure Numb	rocedure Number Procedure Revision			SDCN	Pro	ocedure Misc. II	nfo	
N-UT-78	N-UT-78 4			NA	Revision 11 of the	PDI-UT-6 qualifi	ed equipment tabl	
N-UT-79		1		NA	Revision 5 of the F	PDI-UT-7 qualifie	ed equipment table	
54-ISI-850		06	30-90	<b>344520-000</b>		eport: IR-2003-1 I Letter dated 3/		
С	alibration Sheets			am Data Sheets	Indication Data Sheets	Exa	m Results	
N2ANV-CDS1			N2A	NV-EDS1			able Indications Flaw Indications	
N2ANV-CDS2						(acceptable	flaw evaluation)	
N2ANV-CDS3							Flaw Indications	
N2ANV-CDS4						(unacceptar	ole flaw evaluation)	
N2ANV-CDS5								
					IVA / EPRI modeling portable indications		lowing additiona	
		N2 N	ozzle Mo	deling Par	ameters			
	Probe Ref	racted Angle	Probe S		Scan Surface			
		0°S	-120	٥	Blend Radius			
		0°S	+120		Blend Radius			
	6	0°S	±(33°-6	66°)	Vessel			
minimum coverage examination process. The 60°F obtained to 44%. coverage, and sca	e requirements adure requires a RL examinations Refer to covera an limitations.	of 10 CFR50.5 an additional circ s were limited di age sketch(s) ar	5a (b)(2)( cumferentiue to the nd works)	(xv)(K) was itial scan of nozzle con heet for a d	iteria of 10 CFR50.5 achieved to the ma the outer 85%-t whi figuration which redu escription of the sca	ximum extent pich is not addressed the examining volume,	possible. The essed in 10CFR ination volume examination	
This examination ASME Section XI					11 thru 2003 Addeno 1 equipment	ia) and was pe	rformed using	
					-261/296, 50-327/32 to the weld plus ½			

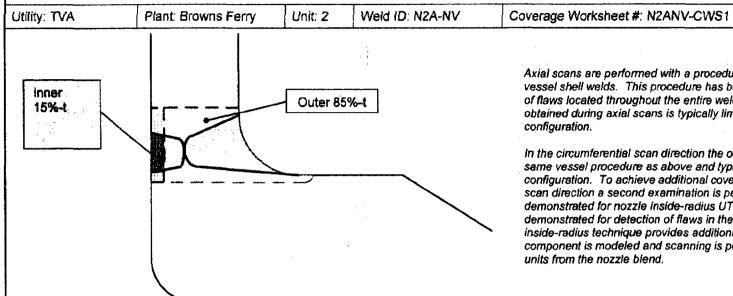
Prepared by: George Chapman Signature: Jay 19 Chapman Customer: Matt Welchy Reviewed by: Adam Conti-Date: 3/19/07 Date: 3/20/07 Date: 3/20/07 ANII: Signature: Signature: Page 1 of 11



#### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

Utility: T\			Si	te: Browns Ferr	y Nuclear P	lant				Init: 2	Outag	e: Cycle 14 RF	)
		Sheet Number: N	2ANV-EDS1			,	ISI Report N		138				
Compon	ent ID: N	IZA-NV					Component	Description:	N2 Nozz	ele-to-V	essel Weld		
1-2					Exar		n Information						
		nber: 2-CHM-2046		3-C-02			ocation: Nozzle Bo			<u>Lo</u>	Location: Nozzl	e TDC	
Examina	ition Limit	ed:⊠Yes □No					rage Sheet Number	er(s): NZAN	/-CWS1				
							formation				<del></del>		
	ion Proced	ure: 54-ISI-850-06		Applicable SDC	/N's: 30-9044	520-000			·		Scan Surface: C	D Blend Radius	
Angle/ Mode	Skew	Calibrat	tion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Lir	mited	Recordable Indication(s)	Indication Data Sheet #	Examiner Initials
*50°/s	+120°	N2AN	VV-CDS1	3/11/07	1321	84° F	VH-9525	72.0 dB	□Yes	⊠No	☐Yes ⊠No	N/A	GC
40°/s	-120°	N2AN	VV-CDS2	3/11/07	1301	84° F	VH-9525	72.0 dB	☐Yes	⊠No	☐Yes ⊠No	N/A	GC
NA	N/A		N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes □No	N/A	N/A
NA	N/A		N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	☐Yes ☐No	N/A	N/A
Examinati	on Proced	ure: 54-ISI-850-06		Applicable SDC	N's: 30-9044	520-000		L			Scan Surface: O	D Vessel Shell	
Angle/ Mode	Angle/ Syaw Calibration Sheet # Data Time Toma					Thermometer S/N:	Scan Gain	Scan L	imited	Recordable Indication(s)	Indication Data Sheet #	Examiner Initials	
60°/s	±33° to 6	6° N2A	VV-CD\$3	3/11/07	1241	84° F	VH-9525	75.0 dB	☐Yes	⊠No	☐Yes ⊠No	N/A	GC
N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	☐Yes	□No	□Yes □No	N/A	N/A
Examinati	ion Proced	ure: N-UT-78 revisio	n 4	Applicable SDC	N's: N/A				<del></del>		Scan Surface: C	D Vessel Shell	·
Angle/ Mode	Zone	Beam Direction	Calibration Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	imited	Recordable Indication(s)	Indication Data Sheet #	Examiner Initials
60°/RL	1	⊠Radial □Circ	N2ANV-CDS4	3/11/07	1211	84* F	VH-9525	72.4 dB	⊠Yes	□No	☐Yes ⊠No	N/A	GC
60°/RL	2	⊠Radial □Circ	N2ANV-CDS5	3/11/07	1136	84° F	VH-9525	82.0 dB	⊠Yes	□No	☐Yes ⊠No	N/A	GC
00 1112		Microsoft Colic	<u> </u>										
60°/RL	1	□Radial ⊠Circ	N2ANV-CDS4	3/11/07	1211	84° F	VH-9525	72.4 dB	⊠Yes	□No	□Yes ⊠No	N/A	GC
ļ	<del></del>		N2ANV-CDS4 N2ANV-CDS5	3/11/07 3/11/07	1211 1136	84° F 84° F	VH-9525 VH-9525	72.4 dB 82.0 dB	⊠Yes ⊠Yes	□No	□Yes ⊠No	N/A N/A	GC GC
60°/RL	1 2	□Radial ⊠Circ										<del> </del>	<u> </u>
60°/RL 60°/RL Commer	1 2 nts:	□Radial ⊠Circ	N2ANV-CDS5	3/11/07	1136							<del> </del>	<u> </u>
60°/RL 60°/RL Commer	1 2 nts:	□Radial ⊠Circ	N2ANV-CDS5	3/11/07	1136							<del> </del>	<u> </u>
60°/RL 60°/RL Commer	1 2 nts:	□Radial ⊠Circ	N2ANV-CDS5	3/11/07	1136							<del> </del>	<u> </u>
60°/RL 60°/RL Commer * See call	1 2 nts: baration da	□Radial ⊠Circ □Radial ⊠Circ uta sheet for addition	N2ANV-CDS5	3/11/07	1136							<del> </del>	<u> </u>
60°/RL 60°/RL Commer * See call	1 2 nts: baration da	□Radial ⊠Circ □Radial ⊠Circ uta sheet for addition	N2ANV-CDS5	3/11/07	1136	84° F						N/A	<u> </u>
60°/RL 60°/RL Commer * See calil Examiner: Signatur Examiner:	1 2 nts: baration da	□Radial ⊠Circ □Radial ⊠Circ uta sheet for addition	N2ANV-CDS5	3/11/07 * shear examinati	1136	84° F	VH-9525  Examiner: N/A  Signature:  Examiner: N/A				∐Yes ⊠No	N/A Date	GC
60°/RL 60°/RL Commer See calil Examiner: Signatur Examiner: Signatur AREVA R	1 2 hts: baration da George Cre: re: re: review: Ada	Radial Scirc Radial Scirc ta sheet for addition	N2ANV-CDS5	3/11/07 * shear examinati	1136 on.	84° F	VH-9525  Examiner: N/A  Signature:				∐Yes ⊠No	N/A Date	GC
60°/RL 60°/RL Commer See calil Examiner: Signatur Examiner: Signatur Signatur	1 2 hts: baration da George Cre: re: re: review: Ada	□Radial ⊠Circ □Radial ⊠Circ  ta sheet for addition  hapman	N2ANV-CDS5	3/11/07 * shear examinati  Level: II  Level: N/A	1136 on. Date: 03/11 Date: N/A	84° F	VH-9525  Examiner: N/A  Signature:  Examiner: N/A				∐Yes ⊠No	N/A Date	GC

#### **RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet**



Axial scans are performed with a procedure for the examination of vessel shell welds. This procedure has been demonstrated for detection of flaws located throughout the entire weld thickness. Coverage obtained during axial scans is typically limited due to nozzle configuration.

ISI Report #: R138

In the circumferential scan direction the outer 85%-t is examined with the same vessel procedure as above and typically limited due to nozzle configuration. To achieve additional coverage in the circumferential scan direction a second examination is performed with a procedure demonstrated for nozzle inside-radius UT. This procedure has been demonstrated for detection of flaws in the inner 15%-t only. The nozzle inside-radius technique provides additional coverage since the component is modeled and scanning is performed with several search units from the nozzle blend.

Axiai Scans	Circumferential Scans							
100%-t	Inner 15%-t	Outer 85%-t						
Examination Procedure: N-UT-78 Revision 4	Examination Procedure: 54-ISI-850-06	Examination Procedure: N-UT-78 Revision 4						
Required Examination Volume: 47.52inches	Inner 15%-t Examination Volume: 5.72inchs	GOuter 85%-t Examination Volume: 41.82 Inches.						
60°RL axial scan limited: ⊠Yes  □No	<sup>5</sup> Coverage Obtained by Modeling: 100%	60°RL Outer 85%-t Exam Limited:						
Description of Limitation: Nozzle Blend Radius	Inner 15%-t Exam Limited: ☐Yes ☒No	Description of Limitation: Nozzle Blend Radius						
Total Axial Volume Achieved: 24.32 inches	Description of Limitation: N/A	<sup>H</sup> Outer 85-t% Volume Achieved: 11.5 <sup>2</sup> inches						
	Finner 15%-t Volume Achieved: 5.72inchs							
C Borogatons of Avial Coverses: E10/	Total Circumforont	ial Evamination Coverage: 26%						

Percentage of Axial Coverage: 51% B + A X 100 = C

Total Circumferential Examination Coverage: 36%

 $(F + H) + A \times 100 = J$ 

Combined Axial and Circumferential Weld Coverage

'Total Examination Coverage: 44%

 $(C+J) + 2 \times 100 = L$ 

Prepared by: I	Bret Flesner	Da
Buer	TEROSA	20-

Date: 03/20/07

Reviewed by: Adam Contin

Date: 03/20/07

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DESCRIPTION
Browns Ferry N2A Nozzle-to-Shell Weld Coverage Plot
DRAWN BY
DATE
TITLE
PAGE
Bret Flesner
03/20/07 N2ANV-CPS1 4 OF 11

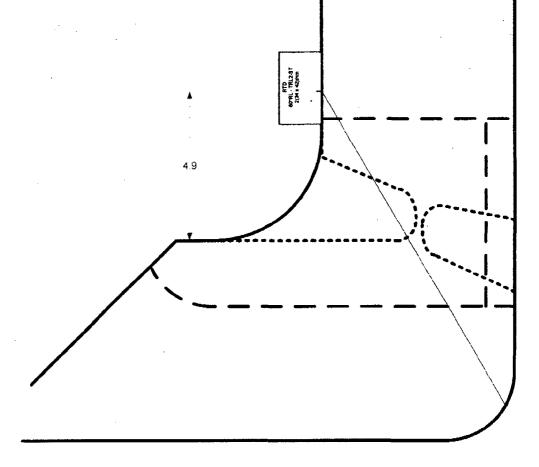
Nozzle-to-Shell weld examination coverage for axial (radial) scan

Total area of examination volume: 47.5 sq. in. Total area of examination volume achieved: 24.3 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius.

100% of the accessible surface scanned.

Measurements based on modeling report, design drawings, and as-found measurements.



R138

Nozzle-to-Shell weld examination coverage for circumferential scan

Total area of examination volume: 47.5 sq. in.

Total area of outer 85%-t exam volume achieved: 11.5 sq. in.

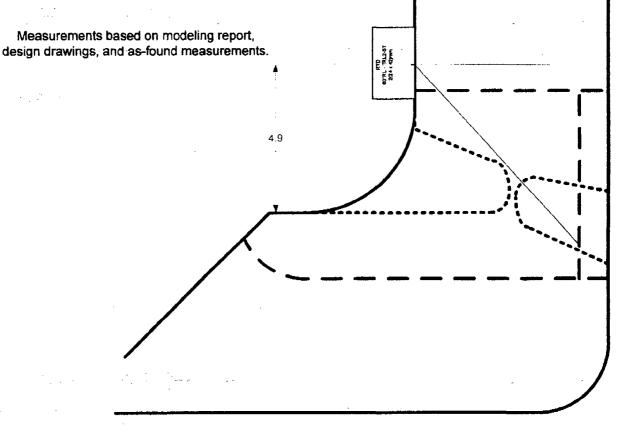
Total area of inner 15%-t volume: 5.7 sq. in.

Total area of inner 15%-t exam volume achieved: 5.7 sq. in.

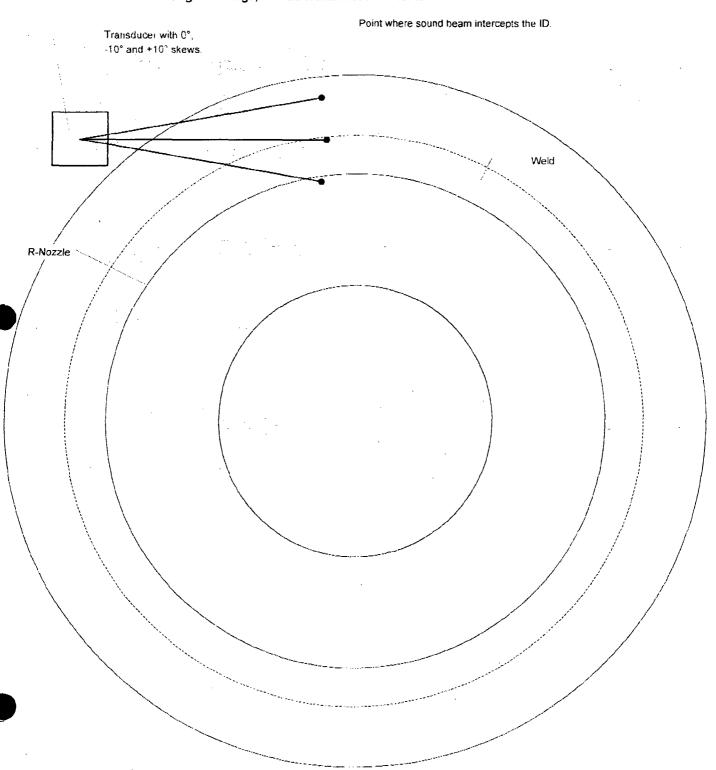
Scan limited due to liftoff caused by the nozzle blend radius.

100% of the accessible surface scanned.

Inner 15%-t area examined from the blend with Supplement 5 techniques.



Top View Measurements based on modeling report, design drawings, and as-found measurements.





## Reactor Pressure Vessel 000208 Manual Ultrasonic Calibration Data Sheet

Utili	ty: TVA	Site:	Browns	Ferry Nuclear Plant Unit: 2						Outage: 0	Cycle 14 RFO	
Cal	bration Data Sheet Number: N	2ANV-CDS1			ISI Report Number: £138							
Cor	mponent ID: N2A-NV			(	Compo	nent Des	cription: N2	Nozzle-	to-Ves	sel Weld		
Exa	mination Procedure: 54-ISI-85	0-06		1	Applica	ble SDCI	N(s): 30-904	- 1452 <b>0</b> -0	00			
	Ultrasonic Instru	ıment			Transducer							
Mai	nufacture: Staveley			Manufacture: KBA					Model: Benchmark 892-600			
Мо	del: Sonic 136			Serial N	Numbe	r: 0111PI	₹	Fre	equenc	y: 2.25 MHz		
Ser	ial Number: 136P1200G08145		Size: 0.	.5" x 1.	0"		Sh	ape: R	ectangle	·		
Linearity Sheet No.: LDS1					ements	: 1		Co	nfigura	tion: Single		
Instrument Settings					ed An	gle: 40°	·	Me	asured	Angle: * 50	٥	
Range: 15.0" Sound Path Depth					ngle:	120°	•	Me	asured	Skew Angl	e: *+120°	
RANGE	Delay: 0.587"		Mode:	Shear			Ra	dius: 3	.5"			
<u>«</u>	Velocity: 0.127 in / μS		Cable 1	Type: F	RG-174	Length: 12'	Inte	ermedi	ate Connect	tors: 0		
	Display: Filt2						Verific	ation	Block			
RCVR	Frequency: 2.25 MHz		Type: C	S Ror	Rompas S		S/N: 99-6251					
	Reject: Off		Refle	ector:	ctor: 1" Radius				2" Radius			
	Pulse Width: 222 nS			Sv	weep: 0.6 div.		0.6 div.			1.3 div.		
	Damping: 500 Ω			Ampl	itude:	de: 70 %FSH			80		F\$H	
	Mode: ⊠Pulse Echo □Du	al			Gain:		29.8 dB			29.8	3 dB	
PULSER	Rep Rate: 2kHz			Basic Calib					on Blo	ck		
PUL	Pulser: ☐150V ☐300V (*s	onic 137 only)		Block ID: BF-18 M				Materia	Material: Clad CS			
	*Pulser voltage adjustable with the	Sonic 137 instrum	nent only.	Thickne	ess: 6.0	0" with 0.	125" Clad	Diame	Diameter: Flat			
	The Sonic 136 has a fixed			Tempe	rature:	69° F		Therm	. SN: V	'H-9525		
				Coupla	nt: Ultr	agel II		Batch	No.: 0	5325		
			Referen	ce Sens	sitivit	y Inform	ation		1			
Ref	lector: ID Notch	Sweep: 6.1 div			Amp	litude: 80	%FSH		Gain:	58.2 dB	,	
Cal	In: Date 03/11/07 Time 1115 (	Check: Date 03/	/11/07 Ti	ime 1320	Chec	k: Date N	/A Time N/A		Out: D	ate 03/11/07	Time 1437	
				Cor	nmeni	<b>S</b>				٠	:	
wed conf	ring the calibration process a manu ge incident angle is cut such that a acted the EPRI NDE Center for add of skew but is actually +120°.	near wave	is genera	ited rati	ner than th	e specified 40	°. To as	sure ex	amination co	verage TVA		
	miner: George Chapman nature:	Level: II	Date:	03/11/07		miner: N	/A			Level: N/A	Date: N/A	
	EVA Review: Atlam Contil	Level: III	Date:	03/20/07	7						Page 7 of 11	



# Reactor Pressure Vessel 000209 Manual Ultrasonic Calibration Data Sheet

Othi	ty: IVA	Site: I	3rowns	Ferry Nu	ıdear	Plant	Unit: 2		Outage:	Cycle 14 KFU	
Cal	bration Data Sheet Number:	N2ANV-CDS2			ISI Report Number: R138  Component Description: N2 Nozzle-to-Vessel Weld						
Cor	nponent ID: N2A-NV			(	Compo	nent Des	cription: N2	Nozzle-t	o-Vessel Weld		
Exa	mination Procedure: 54-ISI-8	e: 54-ISI-850-06 Applicable SDCN(s): 30-9044520-000									
	Ultrasonic Inst	rument					er				
Mai	nufacture: Staveley			Manufa	cture:	KBA		Mod	del: Benchmark 8	92-600	
Mod	tel: Sonic 136			Serial N	łumbe	r: 01C4N	Х	Fre	quency: 2.25 MH	Z	
Ser	al Number: 136P1200G0814		Size: 0.	.5" x 1.	0"		Sha	pe: Rectangle			
Line	earity Sheet No.: LDS1		# of Ele	ments	: 1		Con	ifiguration: Single	)		
	Instrument Se	ttings		Refract	ed Ang	gle: 40°		Mea	sured Angle: 40	٠ ,	
ш	Range: 15.0" ⊠Sound Pat	h Depth		Skew A	ngle: -	⊦120°		Mea	asured Skew Ang	le: *-120°	
RANGE	Delay: 0.587"		Mode:	Shear			Rad	lius: 3.5"			
œ	Velocity: 0.127 in / µS			Cable 7	Гуре: F	RG-174	Length: 12'	Inte	rmediate Connec	ctors: 0	
	Display: Filt2						Verific	ation E	Block	:	
RCVR	Frequency: 2.25 MHz			Type: C	S Ron	npas		S/N: 99	-6251		
•	Reject: Off		Refl	ector:	or: 1" Radius			2" F	Radius		
	Pulse Width: 222 nS			S	veep:		0.6 div.		1.3	3 div.	
	Damping: 500 Ω			Ampl	itude:		70 %FSH		80 9	%FSH	
	Mode: ⊠Pulse Echo □Dual				Gain: 28.0 dB				28	.0 dB	
PULSER	Rep Rate: 2kHz						Basic Ca	libratio	n Block		
PUL	Pulser: 150V 300V (	*Sonic 137 only)		Block II	D: BF-	BF-18 M			Material: Clad CS		
	*Pulser voltage adjustable with the	e Sonic 137 instrume	nt only.	Thickness: 6.0" with 0.125" Clad			Diameter: Flat				
	The Sonic 136 has a fix	ed pulser voltage.	Í	Temperature: 69° F				Therm. SN: VH-9525			
				Coupla	nt: Ultr	agel II		Batch N	Batch No.: 05325		
		R	eferen	ce Sen	sitivit	y Inform	nation				
Ref	lector: ID Notch	Sweep: 5.2 div		.,,	Amp	litude: 80	) %FSH		Gain: 48.0 dB		
Cal	In: Date 03/11/07 Time 1110	Check: Date 03/1	1/07 Ti	me 1300	Ched	k: Date N	I/A Time N/A	.	Out: Date 03/11/0	7 Time 1432	
				Cor	nment	3					
*Tra	ensducer incorrectly labeled +	manuf	acturer: i	howev	er actual	skew is -120	)°.				
,,,	moduce mooneday labora .	aotai oi, i		o, aotaa,		•					
						٠				:	
	miner: George Chapman	Level: II	Date:	03/11/07		iminer: N nature	I/A		Level: N/A	Date: N/A	
	EVA Review Adam Contil	Level: III	Date:	03/20/07	7				·	Page 8 of 11	



#### 000210 **Reactor Pressure Vessel**

		Manu	al U	Itras	son	ic Ca	libratio	on D	ata Sheet	t		
	ity: TVA	Site: Br	owns F	erry Nu	clear	Plant	Unit: 2		Outage:	Cycle 14 RFO		
		N2ANV-CDS3	<del></del>	1	ISI Report Number: R138							
Cor	nponent ID: N2A-NV			С	ompo	nent Desc		•	o-Vessel Weld			
Exa	mination Procedure: 54-ISI-8	350-06		A	\pplica	ble SDCN	l(s): 30-904	14520-00	)0	A 111 - 2 - 124 W 1 - 17 - 17		
	Ultrasonic Inst	rument		Trans					er	<del></del>		
Mar	nufacture: Staveley		1	Manufac	cture:	KBA		Mod	del: Benchmark 8	92-600		
Mod	tel: Sonic 136			Serial N	lumbe	r: 00X1XE	3 🗸	Free	quency: 2.25 MH:	2		
Ser	ial Number: 136P1200G0814	55 .		Size: 0.5	5" x 1.	.0"		Sha	pe: Rectangle			
Line	earity Sheet No.: LDS1		# of Elei	ments	s: 1		Con	figuration: Single				
	Instrument Se		Refracte	ed Ang	gle: 60°		Mea	asured Angle: 59°				
Щ	Range: 20.0" Sound Pat		Skew A	ngle: :	±33° to 66	· · · · · · · · · · · · · · · · · · ·	Mea	asured Skew Ang	le: N/A			
RANGE	Delay: 0.813"		!	Mode: S	Shear			Rad	lius: Flat			
	Velocity: 0.127 in / μS			Cable T	ype: F	RG-174 L	ength: 12'	Inte	rmediate Connec	tors: 0		
œ	Display: Filt2	114.114.114.114.114.114.114.114.114.114		Verificatio								
RCVR	Frequency: 2.25 MHz	VA Site: Bit ion Data Sheet Number: N2ANV-CDS3  Itent ID: N2A-NV ation Procedure: 54-ISI-850-06  Ultrasonic Instrument sture: Staveley  Sonic 136  umber: 136P1200G081455  Sheet No.: LDS1  Instrument Settings  Instrumen		Type: CS Rompas S/				S/N: 99	S/N: 99-6251			
	Reject: Off			Refle	ector:		1" Radius		2" Radius 1.1 div.			
	Pulse Width: 222 nS			Sweep: 0.6			0.6 div.		1.1	div.		
	Damping: 500 Ω			Amplit	tude:		70 %FSH		80 %	6FSH		
	Mode: ⊠Pulse Echo □□	Jual		Gain:			27.6 dB		27.	6 dB		
PULSER	Rep Rate: 2kHz	turn en skriver og skriver og skriver					Basic Ca	libratio	ibration Block			
<u> </u>	Pulser: ☐150V ☐300V (	*Sonic 137 only)	lr	Block ID	): BF-	18		Material: Clad CS				
	*Pulser voltage adjustable with the	e Sonic 137 instrument		Thickne	ss: 6.0	0" with 0.1	25" Clad	Diameter: Flat				
	• ,		- 1	Tempera	ature:	69° F		Therm.	SN: VH-9525 🗸			
			1	Couplan	nt: Ultr	agel II		Batch N	No.: 05325			
		Ref	erenc	e Sens	itivit	y Inform	ation					
Ref	lector: ID Notch	Sweep: 5.8 div			Amp	litude: 80	%FSH		Gain: 60.8 dB			
Cal	In: Date 03/11/07 Time 1105	Check: Date 03/11/	/07 Tim	ne 1240	Chec	ck: Date N/	'A Time N/A		Out: Date 03/11/07	7 Time 1440		
				Com	nment	is .						
	miner: George Chapman nature:	Level: II	Date: 0	03/11/07		aminer: N/. nature	A		Level: N/A	Date: N/A		
	EVA Review: Adam Contil	Level: III	Date: 0	3/20/07						Page 9 of 11		

	<b>A</b>	

## Reactor Pressure Vessel 600211 Manual Ultrasonic Calibration Data Sheet

200	A Company of the Comp										
Util	ty: TVA	Site: E	Browns Ferry	Nuclear	Plant	Unit: 2		Outage: 0	Cycle 14 RFO		
Calibration Data Sheet Number: N2ANV-CDS4  ISI Report Number: R138											
Cor	mponent ID: N2A-NV										
Exa	mination Procedure: N-UT-78 Revi	ion Procedure: N-UT-78 Revision 4 Applicable SDCN(s): N/A									
	Ultrasonic Instrume	nt	*			Tra	ansducer				
Mai	nufacture: Staveley		Mani	ufacture	RTD		Model	TRL2-ST			
Мо	del: Sonic 136		Seria	il Numb	er: 07-304	4	Freque	ency: 2 MHz	`		
Ser	ial Number: 136P1200G081455	Angl	e: 60°			Measu	ired Angle: 61°				
Line	earity Sheet No.: LDS1	Mode	e: Refra	cted Long	itudinal	Size: 2	2(24x42)mm				
	Instrument Settings	Focu	s: FS~1	25mm		Squint	Angle: 5°				
ų	Range: 8.00" ⊠Sound Path □	# of I	Element	s: 2	Shape: Red	. Config	uration: Dual -	SBS			
ZANGE	Delay: 1.38"		Cabl	e Type:	RG-174	Length: 1	2' Interm	ediate Connec	tors: 0		
	Velocity: 0.230 in / μS					Verific	cation Blo	ck			
~	Display: Filt 2		Туре	: CS Ro	mpas		S/N: 99-62	251			
RCVR	Frequency: 2.25 MHz	-	R	eflector:	1" Radius		2" Radius				
	Reject: Off			Sweep:		1.2 div.		2.5	div.		
	Pulse Width: 222 nS	Am	plitude:	tude: 25 %FSH			80 %	6FSH			
	Damping: 500 Ω			Gain: 52.0 dB				52.	0 dB		
œ	Mode: □Pulse Echo ☑Dual		•		Basic Ca	libration	Block				
PULSER	Rep Rate: 2kHz		Block	Block ID: BF-18				Clad CS			
Ē.	Pulser: 150V 300V (*Sonic 1	37 only)	Thick	Thickness: 6.0" with 0.125" Clad				Diameter: Flat			
	*Probe voltage is adjustable with the Sonic	137 instrument	t. The Tem	perature	: 69 °F		Therm, SN: VH-9525				
	Sonic 136 has a fixed pulser v	roltage.	Cour	ılant: Ulf	ragel II		Batch No.: 05325				
		Re	eference Se	nsitivi	y Inform	nation					
Ref	lector: 1/4-t SDH	weep: 3.8 c	div		Amplitud	le: 80 %FSH		Gain: 58.4 dE	3		
Cal	In: Date 3/11/07 Time 1100	heck: Date	3/11/07 Time	1210	Check: D	ate N/A Time	N/A	Out: Date 3/1	1/07 Time 1430		
			C	ommer	its						
Zor	e 1 - Near Surface calibration.										
	miner: George Chapman	Level: II	Date: 03/11		Examiner: N/A Signature			Level: N/A	Date: N/A		
ARI	EVA Review Adam Conti	Date: 03/20.	07					Page 10 of 11			



### Reactor Pressure Vessel 000212 Manual Ultrasonic Calibration Data Sheet

Util	lity: IVA	Site: B	rowns Ferry	Ferry Nuclear Plant Unit: 2					Cycle 14 RFO	
Ca	libration Data Sheet Number: N2A	NV-CDS5	-	ISI Re	port Nur					
Co	mponent ID: N2A-NV			Comp	onent De	scription: N2	Nozzle-to-V	essel Weld	· · · · · · · · · · · · · · · · · · ·	
Exa	amination Procedure: N-UT-78 Re	vision 4		Applic	able SDC	CN(s): N/A				
Γ	Ultrasonic Instrum	ent		Transducer						
Ма	nufacture: Staveley		Mani	ufacture	: RTD		Model:	TRL2-ST		
Мо	del: Sonic 136		Seria	I Numb	er: 07-30	4 🗸	Freque	ency: 2 MHz	-	
Sei	rial Number: 136P1200G081455		Angl	e: 60°			Measu	red Angle: 61°		
Lin	earity Sheet No.: LDS1	Mode	e: Refra	cted Long	gitudinal	Size: 2	(24x42)mm			
	Instrument Settin	Focu	s: FS~1	25mm		Squint	Angle: 5°			
	Range: 18.0" Sound Path	□Depth	# of	Element	s: 2	Shape: Rect	. Config	uration: Dual	- SBS	
RANGE	Defay: 1.38"	Cabi	е Туре:	RG-174	Length: 1	2' Interm	ediate Connec	tors: 0		
E	Velocity: 0.230 in / μS			,		Verific	ation Blo	ck		
	Display: Filt 2		Туре	: CS Ro	mpas		S/N: 99-62	251	•	
Š	Frequency: 2.25 MHz		R	eflector:		1" Radius		2" R	adius	
	Reject: Off							1.1	div.	
	Pulse Width: 222 nS	Ап	Amplitude: 25 %FSH				80 %	6FSH		
ļ	Damping: 500 Ω		Gain:		52.0 dB		52.	0 dB		
gg.	Mode: □Pulse Echo ☑Dual		Basic Calib			libration l	Block			
PULSER	Rep Rate: 2kHz		Block	Block ID: BF-18			Material: C	Clad CS		
1	Pulser: 150V 300V (*Sonic	c 137 only)	Thick	Thickness: 6.0" with 0.125" Clad			Diameter:	Flat		
	*Probe voltage is adjustable with the Son Sonic 136 has a fixed pulse	nic 137 instrument.	The Tem	perature	e: 69 °F		Therm. SN: VH-9525			
	Sonic 135 has a fixed pulse	or vollage.	Cour	Couplant: Ultragel II			Batch No.: 05325			
<u> </u>		Re	ference Se	ensitivi	ty Infor	nation				
Ref	flector: ID Notch	Sweep: 6.3 d	liv		Amplitud	de: 80 %FSH		Gain: 73.2 dl	3	
Cal	In: Date 3/11/07 Time 1055	Check: Date 3	3/11/07 Time	1135	Check: [	Date N/A Time	N/A	Out: Date 3/1	1/07 Time 1435	
			C	ommer	nts					
Zor	ne 2 - Full Volume calibration.							:		
									1	
	aminer: George Chapman Inature:	Level: II	Date: 03/11		aminer: 1 gnature	N/A		Level: N/A	Date: N/A	
	EVA Review: Adam Contil	Level: III	Date: 03/20	<i>(</i> 07					Page 11 of 11	

### Examination Report, R-142 N2B-NV, RPV Nozzle-To-Head Weld



### RPV Nozzle Ultrasonic Examination

AREN.	? .*		17.	V 1402	Summa	ary Sheet	iation	000213	
Utility: TVA	s	ite: Browns	Ferry Nuclear Pl	ant	Unit: 2	Outage: Cycle 14	ISI Rep	ort#: R142	
Component Num	ber: N2	B-NV	Component I	Description	n: N2 Nozzle t	o Vessel Weld	System	; RPV	
Code Category: I	B-D		Code Item. B	3.90		Code Class: 1	Materia	i: CS	
ISO / Drawing(s)	2-CHM	1-2046-C-01	& 2-ISI-0270-C-	02			4.		
Procedure Nu	mber	Proce	edure Revision		SDCN	Pro	ocedure Misc	: Info	
N-UT-78			4		NA	Revision 11 of the	PDI-UT-6 qu	alified equipment table	
N-UT-79			1		NA	Revision 5 of the F	PDI-UT-7 qua	lified equipment table	
54-ISI-850		06	30-9	044520-000		eport: IR-200 I Letter date	3-19 Section 3 d 3/5/07		
	Calibra	ation Sheets		E	xam Data Sheets	Indication Data Sheets	Exam Results		
N2BNV-CDS1		Tation, a		N2	BNV-EDS1			ordable Indications able Flaw Indications	
N2BNV-CDS2								able flaw evaluation)	
N2BNV-CDS3			r estados				□Reporta	ble Flaw Indications	
N2BNV-CDS4		· · · · · · · · · · · · · · · · · · ·					(unacce	ptable flaw evaluation)	
N2BNV-CDS5	· · · ·				*		7		
from the vessel reportable indice. In accordance v	surfactions.	e in both th	e axial (radial) 54-ISI-850-06	and circ	umferential s		ese examina g report the	were performed ations resulted in no following additional	
	ag Sani		N2 N	lozzie M	odeling Par	ameters			
	ŀ	Probe Ref	racted Angle	Probe		Scan Surface			
	-		0°S	-120		Blend Radius			
	-		0°S	+12		Blend Radius			
	<u> </u>		o°s	±(33°-		Vessel			
minimum cover examination pro 50.55a. The 60	age re ocedur o'RL ex 6. Ref	quirements e requires a kaminations er to covera	of 10 CFR50.5 an additional ci s were limited c	55a (b)(2 rcumfere fue to the	)(xv)(K) was intial scan of a nozzle conf	iteria of 10 CFR50.5 achieved to the ma the outer 85%-t wh figuration which red escription of the sca	ximum exte ich is not ac uced the ex	nt possible. The Idressed in 10CFR amination volume	

This examination satisfies the requirements of ASME Section XI (2001 thru 2003 Addenda) and was performed using ASME Section XI, Appendix VIII qualified personnel, procedures, and equipment.

Note: See TVA Request for Relief PDI-1 and PDI-2. Dockets No. 50-261/296, 50-327/328, and 50-0390. This relief request reduced the area to be examined per IWB-2500-7 (a) and (b) to the weld plus ½" on each side.

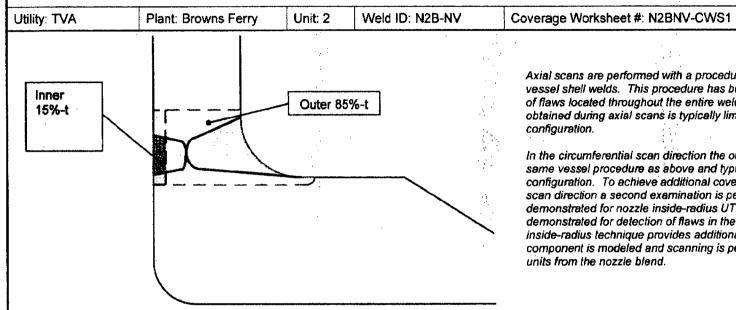
Prepared by: Thomas Brown	Date: 3/19/07	Reviewed by: Adam Coati	Date: 3/20/07
Signature Do	Date. 3/19/01	Signature: Signature:	Date. SIZOIOI
Customer: Matt Welch	Date: 3/22/01	ANII:	Data: 4 . 4 .
Signature: Wall Willel	Date: 7/24/01	Signature: Sand hard	Date: 5 (18/57
			Page 1 of 11



#### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

Utility: T\	/A		Si	te: Browns Fei	rv Nuclear	Plant	<del> </del>		Tu	nit: 2		Outage	e: Cycle 14	RFO
	Examination Data Sheet Number: N2BNV-EDS1 ISI Report Number: R142													
Compon	ent ID: N	2B-NV			ig tyre i e e		Component	Description:	N2 Nozz	de-to-V	essel Wek	ď		
							n Information	. 37				Y'		
		nber: 2-CHM-2046		70-C	4.		cation: Nozzle Bo			<u>L</u> c	Location:	Nozzie	TDC	
Examina	tion Limit	ed.⊠Yes □No	·-···	·	<u> </u>		age Sheet Numb	er(s): N2BN	V-CWS1					
						Scan Inf	ormation	<u>:</u>						
·Examinati	on Proced	ure: 54-ISI-850-06		Applicable SD	CN's: 30-904	4520-000		1			Scan Sur	face: Of	D Blend Rad	us
Angle/ Mode	Skew	Calibrat	tion Sheet #	Date	Time	Temp	Thermometer . S/N:	Scan Gain	Scan Lir	nited	Record Indicati		Indication Data Shee	
*50°S -120° N2BNV-CDS1				03/19/07	1410	88°F	VH-9520	61.0 dB	□Yes	⊠No	□Yes	⊠No	N/A	ТВ
40°S	+120°	N2BI	V-CDS2	03/19/07	1418	88°F	VH-9520	61.0 dB	□Yes	⊠No	□Yes	⊠No	N/A	ТВ
NA NA	N/A		N/A	N/A	: N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A	N/A
NA	N/A		N/A	N/A	N/A	N/A	N/A	N/A		□No	<del> </del>	□No	N/A	N/A
Examination Procedure: 54-ISI-850-06 Applicable SDCN's: 30-9044520-000 Scan Surface: OD Vessel Shell														
Angle/ Mode	Skew		tion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	<del></del>		Record	lable	Indication Data Shee	n Examiner
60°S	±33° to €	6° N2BI	VV-CDS3	03/19/07	1440	88°F	VH-9520	67.0 dB	□Yes	⊠No	<del></del>	⊠No	N/A	TB
N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	Yes	□No	<del></del>	□No	N/A	N/A
Examinat	on Proced	ure: N-UT-78 revisio	n 4	Applicable SD	CN's: N/A	4	<u> </u>	1	1. — : : : .		+		D Vessel Shi	
Angle/		<del></del>	Calibration	<del> </del>		T	Thermometer	T 8 6	T		Recordable Indicat		Indicatio	
Mode	Zone	Beam Direction	Sheet #	Date	Time	Temp	S/N:	Scan Gain	Scan Li	miteo	Indicati	on(s)	Data Shee	t# Initials
60°/RL	1	⊠Radial □Circ	N2BNV-CDS4	03/19/07	1345	88°F	VH-9520	76.0 dB	⊠Yes	□No	☐Yes	⊠No	N/A	ТВ
60°/RL	2	⊠Radial □Circ	N2BNV-CDS5	03/19/07	1357	88°F	VH-9520	78.0 dB	⊠Yes	□No	☐Yes	⊠No	N/A	ТВ
60°/RL	1	□Radial ⊠Circ	N2BNV-CDS4	03/19/07	1345	88°F	VH-9520	76.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	тв
60°/RL	2	☐Radial ⊠Circ	N2BNV-CDS5	03/19/07	1357	88°F	VH-9520	78.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	ТВ
Comments:  * See note on calibration data sheet for details relating to the 50° measured angle.														
Signatu	Examiner: Thomas Brown  Level: II  Date: 03/19/07  Examiner: N/A  Signature:  Signature:													
Examiner Signatu	re:		1	Level: N/A	Date: N/A	_	xaminer: N/A Signature:					Level:	N/A	Date: N/A
AREVA R Signatu	leview: Adı re	im Conti	7.4	Level: III	Date: 03/2	20/07					· · · · · · · · · · · · · · · · · · ·			
i		,	_ /											Page 2 of 11

#### **RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet**



Axial scans are performed with a procedure for the examination of vessel shell welds. This procedure has been demonstrated for detection of flaws located throughout the entire weld thickness. Coverage obtained during axial scans is typically limited due to nozzle configuration.

ISI Report#: アノイン

In the circumferential scan direction the outer 85%-t is examined with the same vessel procedure as above and typically limited due to nozzle configuration. To achieve additional coverage in the circumferential scan direction a second examination is performed with a procedure demonstrated for nozzle inside-radius UT. This procedure has been demonstrated for detection of flaws in the inner 15%-t only. The nozzle inside-radius technique provides additional coverage since the component is modeled and scanning is performed with several search units from the nozzle blend.

Axial Scans	Circumferential Scans								
100%-t	Inner 15%-t	Outer 85%-t							
Examination Procedure: N-UT-78 Revision 4	Examination Procedure: 54-ISI-850-06	Examination Procedure: N-UT-78 Revision 4							
ARequired Examination Volume: 47.52inches	<sup>D</sup> Inner 15%-t Examination Volume: 5.7 <sup>2</sup> inchs	GOuter 85%-t Examination Volume: 41.82Inches.							
60°RL axial scan limited: ⊠Yes ☐No	<sup>E</sup> Coverage Obtained by Modeling: 100%	60°RL Outer 85%-t Exam Limited: ⊠Yes ☐No							
Description of Limitation: Nozzle Blend Radius	Inner 15%-t Exam Limited: ☐Yes ☑No	Description of Limitation: Nozzle Blend Radius							
<sup>B</sup> Total Axial Volume Achieved: 24.3 <sup>2</sup> inches	Description of Limitation: N/A	*Outer 85-t% Volume Achieved: 11.5 <sup>2</sup> inches							
	Finner 15%-t Volume Achieved: 5.72inchs								
<sup>C</sup> Percentage of Axial Coverage: 51%	Total Circumferent	ial Examination Coverage: 36%							
B + A X 100 = C	(F+	+ H) + A X 100 = J							

Combined Axial and Circumferential Weld Coverage

'Total Examination Coverage: 44%

 $(C+J) + 2 \times 100 = L$ 

Prepared r	by: Bret Flesher	L
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1)10	Tolome	~

Date: 03/20/07

Reviewed by Adam Cont

Date: 03/20/07

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	DESCRIPTION				
$\Delta$	Browns Ferry N2	B Nozzie-to-Shell	Weld Coverage P	lot	21
1 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	DRAWN BY	DATE	TITLE	PAGE	L
	Bret Flesner	03/20/07	N2BNV-CPS1	4 OF 11	

Nozzle-to-Shell weld examination coverage for axial (radial) scan

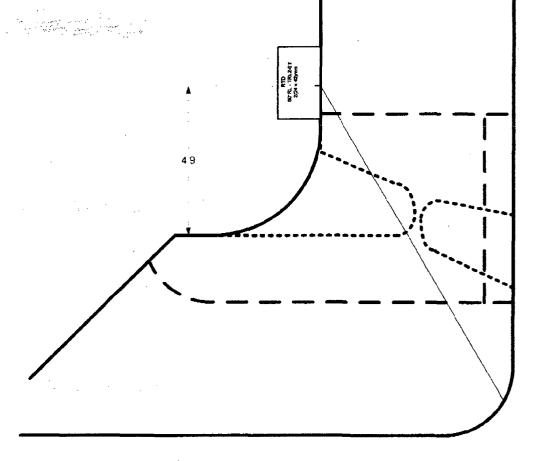
Total area of examination volume: 47.5 sq. in.

Total area of examination volume achieved: 24.3 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius.

100% of the accessible surface scanned.

Measurements based on modeling report, design drawings, and as-found measurements.



DESCRIPTION
Browns Ferry N2B Nozzle-to-Shell Weld Coverage Plot

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DATE
TITLE
PAGE
Bret Flesner
03/20/07
N2BNV-CPS2
5 OF 11

RIYN

Nozzle-to-Shell weld examination coverage for circumferential scan

Total area of examination volume: 47.5 sq. in.

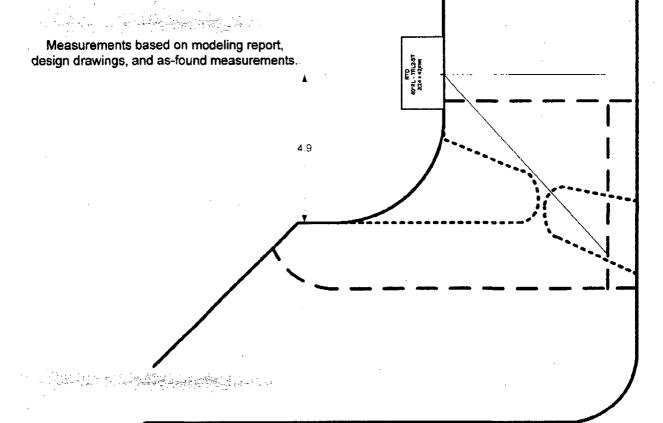
Total area of outer 85%-t exam volume achieved: 11.5 sq. in.

Total area of inner 15%-t volume: 5.7 sq. in.

Total area of inner 15%-t exam volume achieved: 5.7 sq. in.

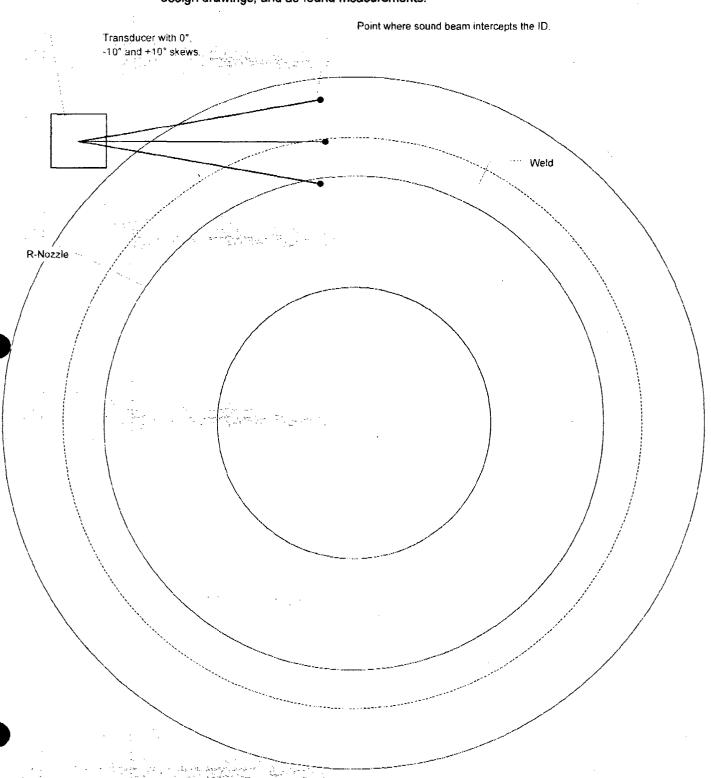
Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned.

Inner 15%-t area examined from the blend with Supplement 5 techniques.



RIGN

### Top View Measurements based on modeling report, design drawings, and as-found measurements.





## Reactor Pressure Vessel 600219 Manual Ultrasonic Calibration Data Sheet

Uti	lity: TVA	s	ite: Browns	<b>Ferry Nu</b>	clear F	Plant	Unit: 2			Outage: 0	Cycle 14 RFO
Calibration Data Sheet Number: N2BNV-CDS1 ISI Report Number: R142											
Co	mponent ID: N2B-NV	C	Compo	nent Des	scription: N2	Nozzle-t	o-Vess	el weld			
Exa	Applicable SDCN(s): 30-9044520-000										
	Ultrasonic Inst	trument					Tr	ansduc	er		,
Ма	nufacture: Staveley			Manufa	cture:	КВА		Mod	del: Bei	nchmark 89	92-600
Мо	del: Sonic 136		18	Serial N	Numbe	r: 0111P	R	Fre	quency	: 2.25 MHz	
Sei	rial Number: 7031			Size: 0.	.5" x 1.	0"		Sha	ape: Re	ctangle	
Lin	earity Sheet No.: LDS4		# of Ele	ments	: 1		Cor	nfigurat	ion: Single		
	instrument S		Refract	ed Ang	jle: 40°		Mea	asured	Angle: * 50	0	
ш	Range: 15.0" Sound Pa	h	Skew A	ingle: -	120°		Mea	asured	Skew Angl	e: *+120°	
RANGE	Delay: 0.517"		Mode: 8	Shear			Rad	dius: 3.	5"		
<u>«</u>	Velocity: 0.127 in / μS			Cable T	Гуре: Б	G-174	Length: 12'	Inte	rmedia	te Connect	ors: 0
	Display: Filt2						Verifi	cation E	Block		
RCVR	Frequency: 2.25 MHz	·		Type: C	S Ron	npas		S/N: 791413			
	Reject: Off			Refle	ector:		1" Reflector			2" Re	flector
	Pulse Width: 222 nS			Sv	veep:		0.6 div.			1.3	div.
	Damping: 500 Ω	ping: 500 Ω			itude:		70 %FSH			80 %	FSH
	Mode: ⊠Pulse Echo □[	Dual		Gain: 36.4			36.4 dB			36.4	4 dB
PULSER	Rep Rate: 2kHz			Basic Ca				alibration Block			
됩	Pulser: ☐150V ☐300V	(*Sonic 137 only)	) 1 1 1	Block II	D: BF-1	F-18 Mate			l: Clad	cs	
	*Pulser voltage adjustable with th	e Sonic 137 ins	strument only.	Thickne	ess: 6.0	)" with 0.	.125" Clad	Diameter: Flat			
	The Sonic 136 has a fix	ked pulser volta	ge.	Tempe	rature:	72 °F		Therm.	SN: VI	H-9520	
				Coupla	nt: Ultr	agel (I		Batch N	Vo.: 05	325	
			Referen	ice Sens	Bitivity	/ Inform	nation				
Re	flector: ID Notch	Sweep: 6.1	div		Amp	litude: 80	0%FSH		Gain: 5	8.2 dB	
Cal	In: Date 03/19/07 Time 1150	Check: Date	03/19/07 T	ime 1409	Chec	k: Date N	N/A Time N/A	\	Out: Da	ite 03/19/07	Time 1512
				Con	nment	<b>s</b> .					
043 exa	uring the calibration process a 3-122). The wedge incident a amination coverage TVA control ditionally the wedge is also income.	ich that a 50 RI NDE Cer	)° refractenter for ad	ed shea Iditiona	ar wave i Il modeli	is generated ing using the	rather th	an the	specified 4	0°. To assure	
	aminer: Thomas Brown	Level:	II Date:	03/19/07		miner: N nature	I/A		L	evel: N/A	Date: N/A
	EVA Review: Adam Continature:	Level:	III Date:	03/20/07	7						Page 7 of 11



# Reactor Pressure Vessel 000220 Manual Ultrasonic Calibration Data Sheet

Util	ity: IVA	owns Fe	erry Nu	iclear i	riant	Unit: 2			Outage: C	ycle 14 RFO		
Cal	ibration Data Sheet Number: N2BN\	V-CDS2			ISI Re	port Nur	mber: Ri	42				
Cor	nponent ID: N2B-NV			Component Description: N2 Nozzle-to-Vessel weld								
Examination Procedure: 54-ISI-850-06				Applicable SDCN(s): 30-9044520-000								
Ultrasonic Instrument				Transducer								
Manufacture: Staveley				Manufa	acture:	KBA		Mo	del: Be	nchmark 89	92-600	
Mod	del: Sonic 136			Serial I	Numbe	r: 01C4N	1X	Fre	equency	r: 2.25 MHz		
Ser	ial Number: 703 l		:	Size: 0	.5" x 1	.0"		Sha	ape: Re	ectangle		
Line	earity Sheet No.: LDS4		#	# of Ele	ements	: 1		Co	nfigurat	ion: Single		
Instrument Settings			Ī	Refrac	ted An	gle: 40°		Me	asured	Angle: 40°		
ul	Range: 15.0" ⊠Sound Path □	Depth		Skew A	Angle:	+120°		Ме	asured	Skew Angl	e: *-120°	
RANGE	Delay: 0.519"		ı	Mode:	Shear			Ra	dius: 3.	5"		
ac i	Velocity: 0.127 in / μS	(	Cable	Type: f	RG-174	Length: 12'	Inte	ermedia	ite Connect	ors: 0		
Display: Filt2							Verific	ation	Block			
RCVR	Frequency: 2.25 MHz			Type: CS Rompas S/I			S/N: 79	N: 791413				
	Reject: Off		Ref	lector:	ctor: 1" Reflector			2" Reflector				
	Pulse Width: 222 nS			Swei			0.6 div.		1.3 div.			
٠	Damping: 500 Ω				litude:	ude: 70 %FSH				80 %FSH		
	Mode: ⊠Pulse Echo □Dual				Gain: 36.0 dB				36.0	) dB		
PULSER	Rep Rate: 2kHz						Basic Ca	ilbratio	on Blo	ck		
PUL	Pulser: 150V 300V (*Sonic 13	E	Block ID: BF-18 Ms			Materia	laterial: Clad CS					
	*Pulser voltage adjustable with the Sonic 1	137 instrument	t only.	Thickness: 6.0" with 0.125" Clad Di			Diame	Diameter: Flat				
	The Sonic 136 has a fixed pulse			Tempe	rature:	72 °F		Therm. SN: VH-9520				
			[c	Coupla	int: Ulti	ragel II		Batch	Batch No.: 05325			
		Ref	ference	e Sen	sitivit	y Inform	nation					
Ref	lector: ID Notch Sweep	p: 5.2 div			Amp	litude: 8	0 %FSH		Gain: 5	8.0 dB		
Cal	In: Date 03/19/07 Time 1145 Check	:: Date 03/19/	/07 Tim	ne 1417	Che	ck: Date I	N/A Time N/A		Out: Date 03/19/07 Time 1517			
Comments  *Transducer incorrectly labeled +120° skew by the manufacturer; however actual skew is -120°.												
Exa Sig	miner: Thomas Brown  ature: Vortice B	.evel: II	Date: 0			Examiner: N/A Signature		ı	_evel: N/A	Date: N/A		
ARI		evel: III	Date: 0	3/20/0	7					,	Page 8 of 11	



## Reactor Pressure Vessel 000221 Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	Ferry Nu	uclear F	'lant	Unit: 2			Outage: 0	Cycle 14 RFO			
Cal	ibration Data Sheet Number: N	12BNV-CDS3			ISI Re	port Nun	nber: R/	42				
Cor	mponent ID: N2B-NV		1		Component Description: N2 Nozzle-to-Vessel weld							
Exa	mination Procedure: 54-ISI-85	0-06		1	Applicable SDCN(s): 30-9044520-000							
	Ultrasonic Instru	ıment			Transducer							
Mar	nufacture: Staveley			Manufa	acture:	KBA		Мо	Model: Benchmark 892-600			
Model: Sonic 136				Serial	Numbe	r: 00X1X	.B	Fre	quency:	2.25 MHz		
Ser	ial Number: 703I			Size: 0	).5" x 1.	0"		Sha	ape: Rec	tangle	,	
Line	earity Sheet No.; LDS4			# of Ele	ements	: 1		Col	nfiguratio	n: Single		
Instrument Settings			Refract	ted Anç	jle: 60°	·····	Me	asured A	ingle: 59°			
щ	Range: 20.0" Sound Path Depth			Skew /	Angle: :	£33° to 6	6°	Ме	asured S	kew Angl	e: N/A	
RANGE	Delay: 0.842"			Mode:	Shear			Rad	dius: Flat			
<u></u>	Velocity: 0.127 in / μS				Type: F	₹G-174	Length: 12'	Inte	ermediate	Connect	tors: 0	
~	Display: Filt2						Verific	ation	Block			
RCVR	Frequency: 2.25 MHz			Type: CS Rompas S/		S/N: 79	/N: 791413					
	Reject: Off			Refl	lector:	ector: 1" Reflector				2" Reflector		
	Pulse Width: 222 nS			S	weep:		0.6 div.			1.1	dív.	
	Damping: 500 Ω			Amp	litude:		70 %FSH			80 %	FSH	
	Mode: ⊠Pulse Echo □Dual				Gain:	Sain: 33.8 dB				33.8	3 dB	
PULSER	Rep Rate: 2kHz						Basic Ca	libratio	on Bloc	k		
PUL	Pulser: ☐150V ☐300V (*s	ionic 137 only)		Block ID: BF-18 Ma			Materia	laterial: Clad CS				
	*Pulser voltage adjustable with the S	Sonic 137 instrume	ent only.	Thickness: 6.0" with 0.125" Clad Dia			Diamet	ameter: Flat				
	The Sonic 136 has a fixed			Tempe	erature:	72 °F		Therm.	Therm. SN: VH-9520			
				Coupla	ant: Ultr	agel II		Batch I	Batch No.: 05325			
		R	eferen	ce Sen	sitivit	y Inform	nation					
Ref	lector: ID Notch S	Sweep: 5.8 div			Amp	litude: 80	0 %FSH		Gain: 60.8 dB			
Cal	In: Date 03/19/07 Time 1200 C	Check: Date 03/1	1 <b>9/07</b> Tir	me 1439	Chec	k: Date N	N/A Time N/A		Out: Date 03/19/07 Time 1519			
				Cor	mment	S						
									,			
	nature: Thomas Brown	Level: II	Date:	03/19/0		miner: N	I/A		Le	evel; N/A	Date: N/A	
	EVA Review Aden/Continature:	Level: III	Date:	03/20/0	7				l		Page 9 of 11	

				•	
A	-	F-12.	W	2.	

#### Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	wns Ferry N	Ferry Nuclear Plant Unit: 2 O				Outage: 0	Cycle 14 RFO		
Cal	ibration Data Sheet Number: N2BI		ISI Report Number: RI42							
Col	mponent ID: N2B-NV		Component Description: N2 Nozzle-to-Vessel Weld.							
Examination Procedure: N-UT-78 Revision 4				Applicable SDCN(s): N/A						
	Ultrasonic Instrum	ent		Transducer						
Ма	nufacture: Staveley		Manu	facture:	RTD		Mode	I: TRL2-ST		
Мо	del: Sonic 136		Serial	Numbe	er: 07-304	4	Frequ	iency: 2 MHz		
Ser	ial Number: 703l		Angle	: 60°	* , ,		Meas	ured Angle: 61°		
Line	earity Sheet No.: LDS4		Mode	Refrac	ted Long	itudinal	Size:	2(24x42)mm	-	
Instrument Settings				s: FS~1	25mm		Squir	it Angle: 5°		
111	Range: 8.00° ⊠Sound Path □Depth			lement	s: 2	Shape: Rec	. Confi	guration: Dual -	SBS	
RANGE	Delay: 1.38"			Туре:	RG-174	Length: 1	2' Interr	nediate Connec	tors: 0	
~	Velocity: 0.230 in / μS		Verification Block							
	Display: Filt 2	Type:	CS Ro	mpas		S/N: 791	413			
RCVR	Frequency: 2.25 MHz	Re	flector:	: 1" Reflector			2" Reflector			
	Reject: Off		Sweep:	1.2 div.			2.5 div.			
	Pulse Width: 222 nS			plitude:		25 %FSH		80 %	FSH	
	Damping: 500 Ω			Gain:		52.0 dB		52.0	) dB	
nz.	Mode: □Pulse Echo □Dual	the Control of the Co	200			Basic Ca	libration	Block		
PULSER	Rep Rate: 2kHz		Block	Block ID: BF-18 Ma			Material:	Clad CS		
ā.	Pulser: 150V 300V (*Sonic	: 137 only)	Thicks	Thickness: 6.0" with 0.125" Clad Di			Diameter	Diameter: Flat		
	*Probe voltage is adjustable with the Son		The Temp	Temperature: 72 °F TI			Therm. S	Therm. SN: VH-9520		
	Sonic 136 has a fixed pulse	er voltage.	Coupl	ant: Ult	ragel II		Batch No	Batch No.: 05325		
		Refe	erence Sei	nsitivi	ty Inform	nation				
Ref	lector: 1/4-t SDH	Sweep: 3.8 div	,		Amplitud	le: 80 %FSH		Gain: 58.4 dE	3	
Cal	In: Date 03/19/07 Time 1233	Check: Date 03	/19/07 Time	1344	Check: D	Date N/A Time	N/A	/A Out: Date 03/19/07 Time 1520		
Zor	ne 1 - Near Surface calibration.		Co	ommer	nts					
	miner: Thomas Brown	Level: II D	Pate: 03/19/0		aminer: N jnature	√A		Level: N/A	Date: N/A	
	EVA Review Adam Continature:	Level: III D	oate: 03/20/0	07					Page 10 of 11	



# Reactor Pressure Vessel 000223 Manual Ultrasonic Calibration Data Sheet

Utility: TVA Site: Browns Fe		owns Ferry I	<b>luclear</b>	Plant	Unit: 2		Outage: 0	Cycle 14 RFO		
Cal	ibration Data Sheet Number: N2B	NV-CDS5		ISI Report Number: RI4V						
Co	mponent ID: N2B-NV			Component Description: N2 Nozzle-to-Vessel Weld.						
Exa	amination Procedure: N-UT-78 Re	vision 4		Applicable SDCN(s): N/A						
	Ultrasonic Instrum	ent		Transducer						
Manufacture: Staveley			. Manu	ıfacture:	RTD		Mode	I: TRL2-ST		
Model: Sonic 136			Seria	l Numbe	er: 07-30	4 .	Frequ	ency: 2 MHz		
Ser	ial Number: 703l		Angle	e: 60°	.,,		Meas	ured Angle: 61°		
Linearity Sheet No.: LDS4			Mode	: Refrac	ted Long	gitudinal	Size:	2(24x42)mm		
Instrument Settings			Focu	s: FS~1	25mm		Squin	t Angle: 5°		
Range: 18.0" Sound Path Depth			# of E	Element	s: 2	Shape: Rec	. Config	guration: Dual -	SBS	
RANGE	Delay: 1.38"		Cable	туре:	RG-174	Length: 1	2' Intern	nediate Connect	tors: 0	
	Velocity: 0.230 in / µS					Verifi	cation Blo	ock		
Display: Filt 2				CS Ro	mpas		S/N: 7914	<b>413</b>		
Frequency: 2.25 MHz			Re	eflector:		1" Reflector		2" Reflector		
	Reject: Off			Sweep:	veep: 0.5 div.			1.1 div.		
	Pulse Width: 222 nS			plitude:		25 %FSH		80 %FSH		
	Damping: 500 Ω			Gain:		52.0 dB		52.0	O dB	
œ	Mode: ☐Pulse Echo   ☑Dual					Basic Ca	Ilbration	Block		
PULSER	Rep Rate: 2kHz		Block	Block ID: BF-18 M			Material:	laterial: Clad CS		
ă.	Pulser: 150V 300V (*Sonic	: 137 only)	Thick	Thickness: 6.0" with 0.125" Clad D			Diameter	Diameter: Flat		
	*Probe voltage is adjustable with the Soni		The Temp	Temperature: 72 °F Ti			Therm. S	herm. SN: VH-9520		
	Sonic 136 has a fixed pulse	r voltage.	Coup	Couplant: Ultragel II			Batch No	Batch No.: 05320		
		Ref	erence Se	nsitivi	y Infon	mation	•			
Ref	flector: ID Notch	Sweep: 6.3 di	v		Amplitu	olitude: 80 %FSH		Gain: 73.2 dB		
Cal	In: Date 03/19/07 Time 1230	Check: Date 0	3/19/07 Time	e 1356	Check: [	Date N/A Time	N/A	A Out: Date 03/19/07 Time 1520		
Comments										
Zor	ne 2 - Full Volume calibration.									
	miner: Thomas Brown hature	Level: II	Date: 03/19/		aminer: I inature	N/A		Level: N/A	Date: N/A	
	EVA Review Agam Conti nature:	Level: III	Date: 03/20/	07				***************************************	Page 11 of 11	

# Examination Report, R-139 N2C-NV, RPV Nozzle-To-Head Weld

AREVA	÷	RF			asonic Examir ary Sheet	nation 000224				
Utility: TVA	Site: Browns	Ferry Nuclear Pi	lant U	nit: 2	Outage: Cycle 14	ISI Report #: R139				
Component Number	: N2C-NV	Component	Description: N	2 Nozzle 1	to Vessel Weld	System: RPV				
Code Category: B-D Code Item: B3.9			33.90		Code Class: 1	Material: CS				
ISO / Drawing(s): 2-0	CHM-2046-C-01	& 2-ISI-0270-C	-02							
Procedure Number	er Proc	edure Revision	SD	CN	Pro	Procedure Misc. Info				
N-UT-78		4	N	IA .	Revision 11 of the F	PDI-UT-6 qualified equipment table				
N-UT-79		, , <b>1</b>	NA		Revision 5 of the PDI-UT-7 qualified equipment tab					
<b>54-ISI-850</b>		06	30-9044	520-000		eport: IR-2003-19 Section 3 Letter dated 3/5/07				
Ce	libration Sheets	3	1	Data eets	Indication Data Sheets	Exam Results  ⊠No Recordable Indications				
N2CNV-CDS1			N2CNV-ED			Recordable Flaw Indications				
N2CNV-CDS2						(acceptable flaw evaluation)				
N2CNV-CDS3						Reportable Flaw Indications				
N2CNV-CDS4						(unacceptable flaw evaluation)				
N2CNV-CDS5										
Summary:										
	rface in both tl					aminations were performed se examinations resulted in no				
					TVA / EPRI modeling portable indications.	report the following additional				
	***	N2 N	Nozzle Mode	ling Par	ameters					
	Probe Re	fracted Angle	Probe Ske		Scan Surface					
	4	10°S	-120°		Blend Radius					
		50°S	+120°		Blend Radius					
	<u> </u>	50°S	±(33°-66°	<u> </u>	Vessel					

This ultrasonic examination was performed in accordance with the criteria of 10 CFR50.55a (b)(2)(xv)(G) and the minimum coverage requirements of 10 CFR50.55a (b)(2)(xv)(K) was achieved to the maximum extent possible. The examination procedure requires an additional circumferential scan of the outer 85%-t which is not addressed in 10CFR 50.55a. The 60°RL examinations were limited due to the nozzle configuration which reduced the examination volume obtained to 44%. Refer to coverage sketch(s) and worksheet for a description of the scanning volume, examination coverage, and scan limitations.

This examination satisfies the requirements of ASME Section XI (2001 thru 2003 Addenda) and was performed using ASME Section XI, Appendix VIII qualified personnel, procedures, and equipment.

Note: See TVA Request for Relief PDI-1 and PDI-2. Dockets No. 50-261/296, 50-327/328, and 50-0390. This relief request reduced the area to be examined per IWB-2500-7 (a) and (b) to the weld plus 1/2" on each side.

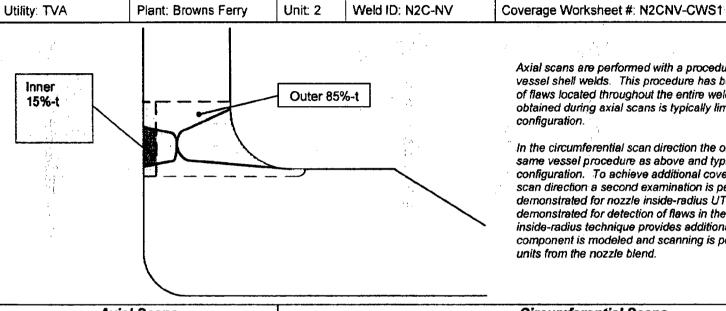
			# 1 1	
Prepared by: George Chapman Signature:	Date: 3/19/07	Reviewed by: Ad Signature:	an Conti	Date: 3/20/07
Customer: Matt Welch Signature: Wan Wilch	Date: 3/20/07	ANII: Signature:	u Flor	Date:5/18/37
	<b>y</b>			Page 1 of 11



#### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

Utility: TV	⁄Α		Si	te: Browns Fer	ry Nuclear P	lant				Jnit: 2		Outage	: Cyde 14 RF	0
		Sheet Number: N2	CNV-EDS1				ISI Report N		2139		-1187-1-1			
Compone	ent ID: N	2C-NV		<u> </u>	Eva		Component on Information	Description:	Nozzie-i	o-vess	ei vveid		<u>:</u>	
ISO / Dro	wing Nun	nber: 2-CHM-2046	C.01 2 ISL027	7 C-02	EXa		ocation: Nozzle Bo	se (Rnozzie)	<del></del>	110	Location	· Nozzle	TDC	
		d: ⊠Yes □No		J-U-02			erage Sheet Number			1 -0	LUGGGG	. 11022		
<u> </u>		<u></u>					nformation	/					₹,	
Examination	on Procedu	re: 54-ISI-850-06		Applicable SD	CN's: 30-9044	520-00	0 (				Scan Su	ırface: Ol	D Blend Radius	
Angle/ Mode				Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Li	mited			Indication Data Sheet #	Examiner Initials
*50°S	-120°	N2CN	IV-CDS1	03/11/07	1321	84°F	VH-9525	72.0 dB	□Yes	⊠No	□Yes	⊠No	N/A	GC
40°S	+120*	N2CN	IV-CDS2	03/11/07	1356	84°F	VH-9525	: 72.0 dB	□Yes	⊠No	☐Yes	⊠No	N/A	GC
NA	N/A		N/A	N/A	N/A	N/A	i, <b>N/A</b>	N/A	□Yes	□No	□Yes	□No	N/A	N/A
NA	N/A		N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	☐Yes	□No	N/A	N/A
Examination	on Procedu	ire: 54-ISI-850-06		Applicable SD	CN's: 30-9044	1520-00	0				Scan St	urface: Ol	D Vessel Shell	
Angle/ Mode	Skew	Calibrat	ion Sheet#	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	imited	Recor		Indication Data Sheet #	Examiner Initials
60°S	±33° to 6	6" N2Ch	IV-CDS3	03/11/07	1405	84°F	VH-9525	72.0 dB	☐Yes	⊠No	∐Yes	⊠No	N/A	GC
N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	☐Yes	□No	☐Yes ☐No N/		N/A	N/A
Examination Procedure: N-UT-78 revision 4			Applicable SDCN's: N/A						Scan St	urface: Ol	D Vessel Shell			
Angle/ Mode	Zone	Beam Direction	Calibration Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	imited	Recor		Indication Data Sheet #	Examiner Initials
60°/RL	1	⊠Radial ⊟Circ	N2CNV-CDS4	03/11/07	1525	82°F	VH-9520	78.4 dB	⊠Yes	□No	□Yes	⊠No	N/A	BF
60°/RL	2	⊠Radial □Circ	N2CNV-CDS5	03/11/07	1605	82°F	VH-9520	76.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	BF
60°/RL	1	☐Radial ⊠Circ	N2CNV-CDS4	03/11/07	1525	82°F	VH-9520	78.4 dB	⊠Yes	□No	□Yes	⊠No	N/A	BF
60°/RL	2	□Radial ⊠Circ	N2CNV-CDS5	03/11/07	1605	82°F	VH-9520	76.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	BF
Commen	its:													
* See Moto	a 1 on atta	ched calibration data	sheet for details re	elating to the 50°	measured an	nle								
O66 1400	O F OIL O'ILO	onga ganistation date	. S. JOGE TOT GOLDHO TO	James to the ou	PROGRAMME BIT	3.V.							•	
Evaminar	George	hanman		Level: II	Date: 03/1	1/07	Examiner: N/A	<del></del>				Level:	N/A Date	e: N/A
	re:		/	LCTOI. II	Date: 00/1	,,,,	Signature:						Jan	e: N/A
	Bret Fles		Them	Level: II	Date: 03/1	1/07	Examiner: N/A Signature:	····				Level:	N/A Date	B: N/A
AREVA R	eview: Ad		7	Level: III	Date: 03/2	0/07		······································				<del></del>	<del></del>	
Signatu	re	Jacom Ja (	<del>~~</del>		1 .					<del></del>		·		Page 2 of 11

#### **RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet**



Axial scans are performed with a procedure for the examination of vessel shell welds. This procedure has been demonstrated for detection of flaws located throughout the entire weld thickness. Coverage obtained during axial scans is typically limited due to nozzle configuration.

ISI Report #: R139

In the circumferential scan direction the outer 85%-t is examined with the same vessel procedure as above and typically limited due to nozzle configuration. To achieve additional coverage in the circumferential scan direction a second examination is performed with a procedure demonstrated for nozzle inside-radius UT. This procedure has been demonstrated for detection of flaws in the inner 15%-t only. The nozzle inside-radius technique provides additional coverage since the component is modeled and scanning is performed with several search units from the nozzle blend.

Axial Scans	Circumferential Scans							
100%-t	Inner 15%-t	Outer 85%-t						
Examination Procedure: N-UT-78 Revision 4	Examination Procedure: 54-ISI-850-06	Examination Procedure: N-UT-78 Revision 4						
ARequired Examination Volume: 47.5 <sup>2</sup> inches	<sup>D</sup> Inner 15%-t Examination Volume: 5.7 <sup>2</sup> inchs	<sup>G</sup> Outer 85%-t Examination Volume: 41.8 <sup>2</sup> Inches.						
60°RL axial scan limited: ⊠Yes  □No	ECoverage Obtained by Modeling: 100%	60°RL Outer 85%-t Exam Limited: ⊠Yes ☐No						
Description of Limitation: Nozzle Blend Radius	Inner 15%-t Exam Limited: Yes No	Description of Limitation: Nozzle Blend Radius						
<sup>B</sup> Total Axial Volume Achieved: 24.3 <sup>2</sup> inches	Description of Limitation: N/A	HOuter 85-t% Volume Achieved: 11.52inches						
	Finner 15%-t Volume Achieved: 5.7 <sup>2</sup> inchs							
<sup>C</sup> Percentage of Axial Coverage: 51%	Total Circumferential Examination Coverage: 36%							
B + A X 100 = C	$(F + H) + A \times 100 = J$							

Combined Axial and Circumferential Weld Coverage

'Total Examination Coverage: 44%

 $(C+J) + 2 \times 100 = L$ 

Prepared by: Bret Flesner	Date: 03/20/07	Reviewed by:/Ada
Brot Flore	101	M

Date: 03/20/07

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DESCRIPTION Browns Ferry N2C Nozzle-to-Shell Weld Coverage Plot

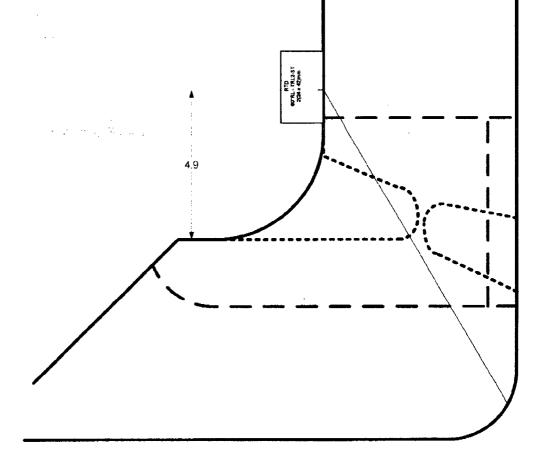
R139

Nozzle-to-Shell weld examination coverage for axial (radial) scan

Total area of examination volume: 47.5 sq. in. Total area of examination volume achieved: 24.3 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned.

Measurements based on modeling report, design drawings, and as-found measurements.



DESCRIPTION
Browns Ferry N2C Nozzle-to-Shell Weld Coverage Plot
DRAWN BY
DATE
TITLE
PAGE
Bret Flesner
03/20/07
N2CNV-CPS2
5 OF 11

R139

Nozzle-to-Shell weld examination coverage for circumferential scan

Total area of examination volume: 47.5 sq. in.

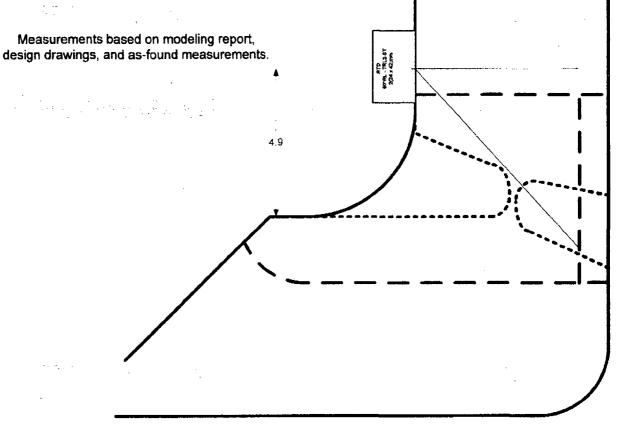
Total area of outer 85%-t exam volume achieved: 11.5 sq. in.

Total area of inner 15%-t volume: 5.7 sq. in.

Total area of inner 15%-t exam volume achieved: 5.7 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned.

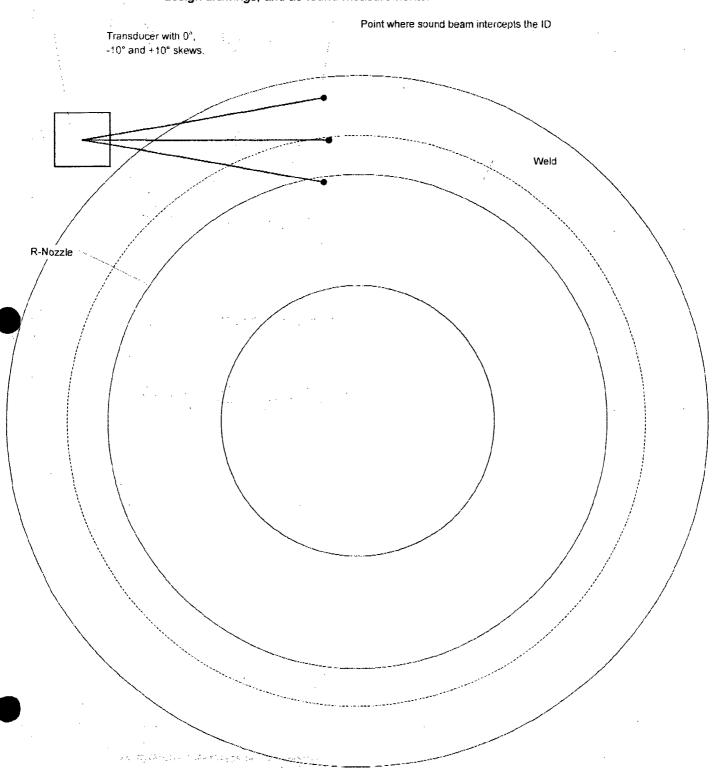
Inner 15%-t area examined from the blend with Supplement 5 techniques.



DESCRIPTION B

RIZA

#### Top View Measurements based on modeling report, design drawings, and as-found measurements.





# Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet

Util	ty: TVA	Site: B	rowns	Ferry Nu	ıclear	Plant	Unit: 2	,		Outage: 0	ycle 14 RFO
Cal	bration Data Sheet Number:	N2CNV-CDS1			ISI Re	port Nu	mber: $RI$	39	···		
Component ID: N2C-NV Component Description: N2 Nozzle-to-Vessel weld											
Exa	mination Procedure: 54-ISI-8	350-06		F	Applica	ible SDC	N(s): 30-90-	14520-0	000		
42.0	Ultrasonic Inst	rument					Tra	ansdu	cer		
Mai	nufacture: Staveley			Manufa	cture:	KBA	_ A _4(a + , _ == -, _ == -, == -, == -, == -, == -, == -, == -, == -, == -, == -, == -, == -, == -, == -, == -, == -, == -, = = -, = -, == -, == -, == -, == -, == -, == -, == -, == -, == -, == -, = -, ==	Mo	Model: Benchmark 892-600		
	del: Sonic 136			Serial N	lumbe	r: 0111P	R /	Fre	equency	: 2.25 MHz	
Ser	ial Number: 136P1200G0814	55		Size: 0.	.5" x 1.	0"		Sh	ape: Re	ctangle	
Line	earity Sheet No.: LDS1		# of Ele	ements	: 1		Co	nfigurati	ion: Single		
	Instrument Se	ttings		Refract	ed Ang	gle: 40°		Мє	asured	Angle: * 50	o
111	Range: 15.0" Sound Pat	th Depth		Skew A	ingle: -	-120°		Me	asured	Skew Angle	e: *+120°
RANGE	Delay: 0.587"	**************************************		Mode: 9	Shear		**************************************	Ra	dius: 3.	5"	The second se
oc.	Velocity: 0.127 in / μS		Cable 7	Type: F	RG-174	Length: 12'	Int	ermedia	te Connect	ors: 0	
	Display: Filt2				•		Verific	ation	Block		,
Frequency: 2.25 MHz Type: CS Rompas S/N: 99-						9-6251					
	Reject: Off		Reflector:			1" Radius			2" R	adius	
	Pulse Width: 222 nS			Sweep:			0.6 div.			1.3	div.
	Damping: 500 Ω	* *	7 -	Amplitude: 70 %FSH				80 %	FSH		
	Mode: ⊠Pulse Echo □D	lual .		Gain: 29.8 dB					29.8	3 dB	
PULSER	Rèp Rate: 2kHz			Basic Calib			librati	ibration Block			
1Nd	Pulser: ☐150V ☐300V (	*Sonic 137 only)		Block ID: BF-18			Material: Clad CS			m	
	*Pulser voltage adjustable with the	e Sonic 137 instrumer	nt only.	Thickne	ess: 6.	0" with 0	.125" Clad	Diameter: Flat			
	The Sonic 136 has a fix	ed pulser voltage.	-	Tempe	rature:	69° F		Them	. SN: VI	H-9525	
				Coupla	nt: Ultr	agel II		Batch	No.: 05	325	
		Re	feren	ce Sens	sitivit	y infor	nation				
Ref	lector: ID Notch	Sweep: 6.1 div			Amp	litude: 8	0 %FSH		Gain: 5	8.2 dB	
Cal	In: Date 03/11/07 Time 1115	1/07 Ti	me 1320	Chec	k: Date I	N/A Time N/A		Out: Da	ite 03/11/07	Time 1437	
043 exa Add	ring the calibration process a -122). The wedge incident ar mination coverage TVA conta litionally the wedge is also inc	ngle is cut such that acted the EPRI ND	at a 50° E Cent	discove refracte	ed she Idition	th the TV ar wave al modeli	is generated ing using the	rather t	han the manufac	specified 4 stured 50° a	0°. To assure
	miner: George Chapman nature:	Level: II	Date:	03/11/07	707 Examiner: N/A Signature Level: N/A Date				Date: N/A		
	EVA Review Adam Conti	Level: III	Date:	03/20/07	7						Page 7 of 11



#### **Reactor Pressure Vessel** Manual Ultrasonic Calibration Data Sheet

	iity: TVA	31	te: Browns	гепу и	uclear	Plant	Unit: 2			Outage. C	ycle 14 RFU
Ca	libration Data Sheet Number:	N2CNV-CDS	52		ISI Re	port Num	nber: $RI$	39			
Co	mponent ID: N2C-NV				Compo	nent Des	cription: N2	Nozzle-	to-Vesse	l weld	
Exa	amination Procedure: 54-ISI-8	350-06			Applicable SDCN(s): 30-9044520-000						
	Ultrasonic Inst	rument					Tra	ansduc	er		
Ма	nufacture: Staveley			Manuf	acture:	KBA		Мо	Model: Benchmark 892-600		
Мо	del: Sonic 136			Serial Number: 01C4NX			Fre	quency:	2.25 MHz	•	
Se	rial Number: 136P1200G0814	* ** **	A CARE TO THE	Size: 0.5" x 1.0"			Sha	ape: Rect	tangle`		
Lin	earity Sheet No.: LDS1			# of El	ements	: 1		Cor	nfiguratio	n: Single	
	Instrument Se	ettings		Refrac	ted Ang	gle: 40°		Me	asured A	ngle: 40°	
	Range: 15.0" Sound Pa	th □Depth	1	Skew Angle: +120°				Ме	asured S	kew Angl	e: *-120°
RANGE	Delay: 0.587"			Mode: Shear Radi					dius: 3.5"	•	
~	Velocity: 0.127 in / μS			Cable Type: RG-174 Length: 12' Int					ermediate	Connect	tors: 0
	Display: Filt2			Verificati			cation I	Block		<del></del>	
RCVR	Frequency: 2.25 MHz			Type: CS Rompas S		S/N: 99	S/N: 99-6251				
	Reject: Off			Ref	lector:	r: 1" Radius		2" Radius		adius	
	Pulse Width: 222 nS				Sweep:		0.6 div.			1.3	div.
	Damping: 500 Ω			Amp	litude:		70 %FSH			80 %	FSH
	Mode: ⊠Pulse Echo □□	)ual			Gain:		28.0 dB			28.0	) dB
PULSER	Rep Rate: 2kHz						Basic Ca	libratio	on Bloci	k	
뒬	Pulser: 150V 300V	*Sonic 137 only)		Block	D: BF-	18		Materia	al: Clad C	s	
	*Pulser voltage adjustable with th	e Sonic 137 insl	rument only.	Thickn	ess: 6.0	0" with 0.	125" Clad	Diame	ter: Flat		· · · · · · · · · · · · · · · · · · ·
	The Sonic 136 has a fix			Tempe	erature:	69° F		Therm.	. SN: VH-	-9525	
				Coupla	ant: Ultr	agel II		Batch I	No.: 053	25	
			Referen	ce Sen	sitivit	y Inform	nation				
Re	flector: ID Notch	Sweep: 5.2	div		Amp	litude: 80	%FSH		Gain: 48	3.0 dB	
Cal	In: Date 03/11/07 Time 1110	Check: Date	03/11/07 T	ime 1355	Chec	k: Date N	I/A Time N/A		Out: Date	∋ 03/11/07	Time 1432
					mment	13					
+Tr	ansducer incorrectly labeled +	the manuf	facturer:	bowevo	er actual	skew is -120	)°				
'''	unsauce mooneery labeled .	idolai ci ,	nonci	ci actaai	0.000	, .					
	aminer: George Chapman,	Level:	II Date:	03/11/0		7 Examiner: N/A Signature			Le	vel: N/A	Date: N/A
	EVA Review: Adam Conti nature:	Level:	III Date:	03/20/0	7						Page 8 of 11



# Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet 000232

Util	ny: IVA	Site:	prowns	гепту м	uclear Pi	ant	Unit: 2			Outage: 0	Sycie 14 KFO
Ca	libration Data Sheet Number: N	N2CNV-CDS3	1.1		ISI Repo	ort Nun	nber: J	3139			
Co	mponent ID: N2C-NV			(	Compone	ent Des	scription: N2	Nozzle	to-Ves	sel weld	
Exa	amination Procedure: 54-ISI-85	50-06		,	Applicabl	e SDC	N(s): 30-90	44520-0	000		
	Ultrasonic Instru	ument			Transducer						
Ма	nufacture: Staveley			Manufa	acture: K	ВА		Mo	Model: Benchmark 892-600		
Мо	del: Sonic 136			Serial I	Number:	00X1X	В	Fre	quenc	y: 2.25 MHz	<u> </u>
Se	ial Number: 136P1200G08145	5 .		Size: 0.5" x 1.0"					ape: Re	ectangle	
Lin	earity Sheet No.: LDS1	10 - 04- 11 - 1		# of Ele	ements:	1		Со	nfigura	tion: Single	
	Instrument Set	tings		Refract	ted Angle	e: 60°		Me	asured	Angle: 59°	
ш	Range: 20.0" Sound Path	Depth		Skew A	Angle: ±3	3° to 66	6°	Me	asured	Skew Angl	e: N/A
RANGE	Delay: 0.813"			Mode: Shear Radius						at	
"	Velocity: 0.127 in / µS			Cable 1	Type: RC	G-174	Length: 12	Int	ermedia	ate Connec	tors: 0
	Display: Filt2					Verifi	cation	Block			
RCVR	Frequency: 2.25 MHz		Type: 0	CS Romp	as		S/N: 9	6/N: 99-6251			
	Reject: Off		Refl	lector:	1" Radius			2" Radius			
	Pulse Width: 222 nS		S	weep:		0.6 div.			4.1	div.	
	Damping: 500 Ω			Ampl	litude:		70 %FSH			80 %	6FSH
	Mode: ⊠Pulse Echo □Du	ıal			Gain:		27.6 dB			27.0	6 dB
PULSER	Rep Rate: 2kHz			Basic Calibration B					on Blo	ck	
둞	Pulser: □150V □300V (*8	Sonic 137 only)		Block I	D: BF-18	3		Materi	al: Clac	CS	
	*Pulser voltage adjustable with the	Sonic 137 instrum	nent only.	Thickne	ess: 6.0"	with 0.	125" Clad	Diame	ter: Fla	t	
	The Sonic 136 has a fixe			Tempe	rature: 6	9° F		Therm	. SN: V	H-9525	
				Coupla	ınt: Ultraç	gel II		Batch	No.: 0	5325	
		F	Referen	ce Sen	sitivity	Inform	nation				
Re	flector: ID Notch	Sweep: 5.8 div			Amplit	ude: 80	)%FSH		Gain: (	60.8 dB	
Cal	In: Date 03/11/07 Time 1105	Check: Date 03/	/11/07 Ti	ime 1404	Check:	Date N	I/A Time N/A	١	Out: D	ate 03/11/07	7 Time 1440
		<del></del>	Co	mments					,		
·											
				•							
	aminer: George Chapman nature:	Level: II	Date:	03/11/0	7 Examiner: N/A Level: N/A Signature			Level: N/A	Date: N/A		
AR	EVA Review/Adam conti /	Level: III	Date:	03/20/0							Page 9 of 11



#### Reactor Pressure Vessel 000233 **Manual Ultrasonic Calibration Data Sheet**

Util	ity: TVA	Site: Browns	s Ferry N	luclear	Plant	Unit: 2		Outage: 0	Cycle 14 RFO	
Cal	libration Data Sheet Number: N2C	NV-CDS4		ISI Re	oort Nun	nber:	R139			
Co	mponent ID: N2C-NV			Compo	nent De	scription: N2	Nozzle-to-	Vessel Weld		
Exa	amination Procedure: N-UT-78 Re	vision 4		Applicable SDCN(s): N/A						
	Ultrasonic Instrum	ent				•				
Ma	nufacture: Staveley		Manuf	acture:	RTD		Mode	Model: TRL2-ST		
Мо	del: Sonic 136		Serial	Numbe	r: 07-30	5	Frequ	iency: 2 MHz		
Ser	ial Number: 136P1200G081456		Angle:	60°			Meas	ured Angle: 61°		
Lin	earity Sheet No.: LDS2		Mode:	Refrac	ted Long	gitudinal	Size:	2(24x42)mm		
	Instrument Setting	gs	Focus:	: FS~12	25mm		Squin	nt Angle: 5°		
Ш	Range: 8.00" Sound Path	☐Depth	# of El	ements	s: 2	Shape: Rect	. Confi	guration: Dual	- SBS	
RANGE	Delay: 1.34"		Cable	Type: I	RG-174	Length: 1	2' Intern	nediate Connec	tors: 0	
	Velocity: 0.227 in / μS					Verific	ation Bl	ock		
	Display: Filt 2		Type:	N/A			S/N:	N/A		
₹CVR	Frequency: 2.25 MHz		Ref	Reflector:		N/A		N	I/A	
	Reject: Off		Sweep:			N/A		N	I/A	
	Pulse Width: 222 nS	Amp	Amplitude: N/A				N	I/A		
	Damping: 500 Ω		Gain:		N/A		V	I/A		
æ	Mode: □Pulse Echo  ⊠Dual					Basic Ca	libration	Block		
PULSER	Rep Rate: 2kHz		Block 1	ID: BF-	18	_	Material:	Clad CS		
1	Pulser: 150V 300V (*Sonic	: 137 only)	Thickn	ess: 6.	0" with 0	.125" Clad	Diameter	: Flat		
	*Probe voltage is adjustable with the Son Sonic 136 has a fixed pulse		Tempe	erature:	68 °F		Therm. S	N: VH-9520		
	Sonic 130 has a fixed pulse		Coupla	ant: Ulti	agel II		Batch No	.: 05325		
		Referer	ice Sen	sitivit	y Infor	nation				
Ref	flector: 1/4-t SDH	Sweep: 3.7 div			Amplitud	de: 80 %FSH	· ····	Gain: 58.4 dl	3	
Cal	In: Date 03/11/07 Time 1220	Check: Date N/A	Time N/A	<b>\</b>	Check: E	Date N/A Time	N/A	Out: Date 03/	11/07 Time 1720	
			Co	mmen	ts					
Zor	ne 1 - Near Surface calibration.									
							•			
	aminer: Bret Flesner nature: Sur Files	I I	: 03/11/0	03/11/07 Examiner: N/A Signature				Level: N/A	Date: N/A	
AR	EVA Review Adam Couti		: 03/20/0	<del></del>	•			,l	Page 10 of 11	
		<u> </u>		<u> </u>		·				



## Reactor Pressure Vessel One of the control of the

Uti	ility: TVA	Site: B	rowns l	<b>Ferry N</b>	uclear	Plant	Unit: 2		Outage	e: Cycle 14 RFO
Ca	libration Data Sheet Number: N2C	NV-CDS5			ISI Re	port Nur	nber:	R139	•	
Со	mponent ID: N2C-NV				Comp	onent De	scription: N2	Nozzle-to-	-Shell Weld.	
Ex	amination Procedure: N-UT-78 Re	vision 4			Applic	able SDC	N(s): N/A			
	Ultrasonic Instrum	ent					Tn	ansduce	r	
Ma	inufacture: Staveley			Manufa	acture	RTD		Mode	l: TRL2-ST	
Мо	del: Sonic 136			Serial I	Numbe	er: 07-30	5	Frequ	Jency: 2 MHz	
Se	rial Number: 136P1200G081456			Angle:	60°			Meas	ured Angle: 6	61°
Lin	earity Sheet No.: LDS2		Mode:	Refra	ted Long	jitudinal	Size:	2(24x42)mm		
	Instrument Setting	gs		Focus:	FS~1	25mm		Squir	nt Angle: 5°	
w	Range: 18.0" Sound Path	□Depth		# of Ele	ement	s: 2	Shape: Red	t. Confi	guration: Du	al - SBS
RANGE	Delay: 1.34"			Cable	Гуре:	RG-174	Length: 1	2' Interr	nediate Conn	ectors: 0
	Velocity: 0.227 in / µS		. 1441 . 1441				Verific	cation BI	ock _	-
_	Display: Filt 2			Type: N	N/A			S/N: N/A		
Š	Frequency: 2.25 MHz			Refl	ector:		N/A			N/A
	Reject: Off			Sı	weep:		N/A			N/A
	Pulse Width: 222 nS			Ampl	itude:		N/A			N/A
	Damping: 500 Ω				Gain:		N/A			N/A
Œ.	Mode: ☐Pulse Echo ☑Dual						Basic Ca	libration	Block	
PULSER	Rep Rate: 2kHz			Block II	D: BF-	18		Material:	Clad CS	
	Pulser: 150V 300V (*Sonic	: 137 only)		Thickne	ess: 6	0" with 0.	.125" Clad	Diameter	: Flat	
	*Probe voltage is adjustable with the Soni		The	Tempe	rature	68 °F		Therm. S	N: VH-9520	
	Sonic 136 has a fixed pulse	r vonage.		Coupla	nt: Ult	ragel II		Batch No	.: 05325	
_		Ref	ferenc	e Sen	sitivi	y inform	nation	_		
Re	flector: ID Notch	Sweep: 6.3 di	iv			Amplitud	le: 80 %FSH		Gain: 73.2	dB
Cal	In: Date 03/11/07 Time 1224	Check: Date 1	N/A Tin	ne N/A		Check: D	ate N/A Time	N/A	Out: Date 0	3/11/07 Time 1722
				Con	nmen	its				
Zoi	ne 2 - Full Volume calibration.									
										;
	aminer: Bret-Flesner Inature: Surt Tillesne		Date: 0	03/11/07		aminer: N	I/A	_	Level: N/	A Date: N/A
	EVA Review: Adam Conti nature:		Date: 0	03/20/07	7					Page 11 of 11

# Examination Report, R-173 N2D-NV, RPV Nozzle-To-Head Weld

 $H^{-\frac{1}{2}}(x,y) = H^{-\frac{1}{2}}(x,y) + \frac{1}{2} \int_{\mathbb{R}^n} dx \, dx \, dx \, dx$ 



### RPV Nozzle Ultrasonic Examination Summary Sheet

000235

Utility: TVA	Sita: Browns F	erry Nuclear Plar	<b>1</b>	Unit: 2	Outage: Cycle 14	ISI Report #: 12/73
		T .				
Component Number:	N2U-NV 	Component De	escription:	NZ NOZZIE t		System: RPV
Code Category: B-D		Code Item: B3.	.90		Code Class: 1	Material: CS
ISO / Drawing(s): 2-C	HM-2046-C-01 8	. 2-ISI-0270-C-02	2			
Procedure Number	Proced	ure Revision	s	DCN	Pro	ocedure Misc. Info
N-UT-78		-4		NA	Revision 11 of the	PDI-UT-6 qualified equipment table
N-UT-79	_	1		NA	Revision 5 of the F	PDI-UT-7 qualified equipment table
54-ISI-850		06	30-904	4520-000		eport: IR-2003-19 Section 3 I Letter dated 3/5/07
Cali	bration Sheets			m Data neets	Indication Data Sheets	Exam Results
N2DNV-CDS1				iv-EDS1	Sileets	No Recordable Indications
N2DNV-CDS2			1			Recordable Flaw Indications (acceptable flaw evaluation)
N2DNV-CDS3				· · · · · · · · · · · · · · · · · · ·		☐Reportable Flaw Indications
N2DNV-CDS4			Ţ · —			(unacceptable flaw evaluation)
N2DNV-CDS5						1
Summary:						
						caminations were performed
		axial (radial) a	nd circun	iferential s	can directions. The	ese examinations resulted in no
reportable indication	ns.					
In pagardanas with	UT procedure 6	: A 101 0E0 06 a	nd tha ra	foranced T	NA / EDDI modeline	g report the following additional
examinations were						
examinations word	po//o////od: 11//	oo examinatio	no resum	Ja	portable indications.	•
	N2 Nozzle M	Modeling Parar	neters			
Probe Refracted A		Skew		Surface		
40°S	-12		_	d Radius		
50°S	+12			d R <u>adius</u>		
60°S	±(33°	-66°)	_ <u>.</u> V	essel		,
						55a (b)(2)(xv)(G) and the
						ximum extent possible. The
						ch is not addressed in 10CFR
						uced the examination volume nning volume, examination
coverage, and scan		c sketch(s) and	A WOLKSIN	or ioi a de	sscription of the sca	ming volume, examination
This examination sa	itisfies the requ	irements of AS	ME Secti	on XI (200	1 thru 2003 Addeno	la) and was performed using
ASME Section XI, A	ppendix VIII qu	ialified personn	el, proce	dures, and	equipment.	
Note: See TVA Rec						28, and 50-0390. This relief on each side.
· · · · · · · · · · · · · · · · · · ·				· · · · · ·		
Prepared by: Thoma Signature:	s Brown	Date: 3	/22/07	Reviewe Signatu	ed by Addin Conti	Date: 4/11/07
Customer: M-H18-la	low little	Date:	4/15/07	ANII:	7/	Date: 5/21(07
Signature.		<u> </u>	<i>I</i> '. —	Signatu	Jan V un	Page 1 of 11
			_			

•			•	
Δ	R	E	V	Δ

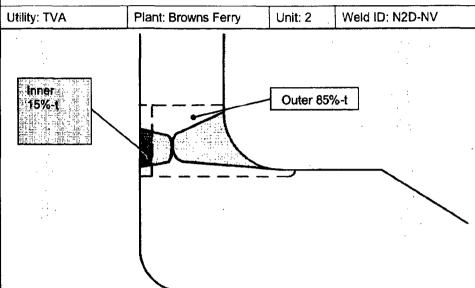
#### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

Utility: T\				te: Browns Fer	ry Nuclear Pl	lant			Unit: 2	Outage	e: Cycle 14 RF	0
		Sheet Number: N	2DNV-EDS1				ISI Report N		K173			
Compone	ent ID: N	12D-NV						Description:	Nozzle-to-Vess	el Weld		
					Exan		Information		· · · · · · · · · · · · · · · · · · ·			
		mber: 2-CHM-2046		0-C-01			cation: Nozzle Bo			c Location: Nozzle	e TDC	
Examina	tion Limiti	ed:⊠Yes □No					age Sheet Number	er(s): NZDN	V-CWS1			
<u> </u>							ormation					
Examinati	on Proced	ure: 54-ISI-850-06		Applicable SD	CN's: 30-9044	520-000			· ·	Scan Surface: Of	D Blend Radius	
Angle/ Mode	Skew	Calibrat	ion Sheet#	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Limited	Recordable Indication(s)	Indication Data Sheet #	Examiner Initials
*50°/s	-120°	N2DN	IV-CDS1	03/22/07	1230	78°F	VH-9525	70.4 dB	□Yes ⊠No	☐Yes ⊠No	N/A	TB
40°/s	+120°	N2DN	IV-CDS2	03/22/07	1250	78°F	VH-9525	70.8 dB	□Yes ⊠No	□Yes ⊠No	N/A	ТВ
NA /	N/A		N/A	N/A	N/A	N/A	N/A	N/A	□Yes □No	□Yes □No	N/A	N/A
NA /	N/A		N/A	N/A	N/A	N/A	N/A	N/A	□Yes □No	□Yes □No	N/A	N/A
Examinati	on Proced	ure: 54-ISI-850-06		Applicable SD	CN's: 30-9044	520-000			<del></del>	Scan Surface: O	D Vessel Shell	
Angle/ Mode	Skew	Calibrat	ion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Limited	Recordable Indication(s)	Indication Data Sheet #	Examiner Initials
60°/s	±33° to 6	66° N2Di	IV-CDS3	03/22/07	1310	78°F	VH-9525	67.0 dB	☐Yes ⊠No	☐Yes ⊠No	N/A	ТВ
N/A /	N/A		N/A	N/A	N/A	N/A	N/A	N/A	☐Yes ☐No	☐Yes ☐No	N/A	N/A
Examinati	ion Proced	ure: N-UT-78 revisio	n 4	Applicable SD	CN's: N/A			<del></del> .		Scan Surface: O	D Vessel Shell	
Angle/ Mode	Zone	Beam Direction	Calibration Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Limited	Recordable Indication(s)	Indication Data Sheet #	Examiner Initials
60°/RL	11	⊠Radial □Circ	N2DNV-CDS4	03/22/07	1332	78°F	VH-9525	79.0 dB	' ⊠Yes □No	□Yes ⊠No	! N/A	ТВ
60°/RL	2	⊠Radial □Circ	N2DNV-CDS5	03/22/07	1403	78°F	VH-9525	78.0 dB	⊠Yes □No	□Yes ⊠No	N/A	ТВ
60°/RL	1	□Radial ⊠Circ	N2DNV-CDS4	03/22/07	1332	78°F	VH-9525	79.0 dB	⊠Yes □No	□Yes ⊠No	N/A	TB
60°/RL	2	□Radial ⊠Circ	N2DNV-CDS5	03/22/07	1403	78°F	VH-9525	78.0 dB	⊠Yes □No	□Yes ⊠No	N/A	TB
Commen	nts:	•										
* See cali	bration dat	a sheet for additiona	I details on the 50°	shear examination	on.							
F					I m	/A ] =				·····		
Signatu	Thomas E	3rown Brown		Level: II	Date: 03/22	-	xaminer: N/A Signature:			Level:	N/A Da	te: N/A
Examiner		10000		Level: N/A	Date: N/A		Examiner: N/A		·	Level:	N/A Da	te: N/A
Signatu	re:	111 0		20701. 14/74	500.1071		Signature:			Level.		10. 11/1
AREVA R	eview: Ada	de Conti		Level: III	Date: 4/11/0		-3			· · · · · · · · · · · · · · · · · · ·		
Signatu	r <sub>2</sub>	14 - 1 - 1 - 1		1	i							

Page 2 of 11



### RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet



Axial scans are performed with a procedure for the examination of vessel shell welds. This procedure has been demonstrated for detection of flaws located throughout the entire weld thickness. Coverage obtained during axial scans is typically limited due to nozzle configuration.

Coverage Worksheet #: N2DNV-CWS1

ISI Report#: パパクろ

In the circumferential scan direction the outer 85%-t is examined with the same vessel procedure as above and typically limited due to nozzle configuration. To achieve additional coverage in the circumferential scan direction a second examination is performed with a procedure demonstrated for nozzle inside-radius UT. This procedure has been demonstrated for detection of flaws in the inner 15%-t only. The nozzle inside-radius technique provides additional coverage since the component is modeled and scanning is performed with several search units from the nozzle blend.

Required Examination Volume: 47.5² inches       b³ Inner 15%-t Examination Volume: 5.7² inches       Gouter 85%-t Examination Volume: 41.8² Inches         b°RL axial scan limited: ☑Yes ☐No       ECoverage Obtained by Modeling: 100%       60°RL Outer 85%-t Exam Limited: ☑Yes ☐No         escription of Limitation: Nozzle Blend Radius       Inner 15%-t Exam Limited: ☐Yes ☐No       Description of Limitation: Nozzle Blend Radius         otal Axial Volume Achieved: 24.3² inches       Description of Limitation: N/A       HOuter 85-4% Volume Achieved: 11.5² inches         FInner 15%-t Volume Achieved: 5.7² inchs       Fourth Radius								
100%-t	Inner 15%-t	Outer 85%-t						
Examination Procedure: N-UT-78 Revision 4	Examination Procedure: 54-ISI-850-06	Examination Procedure: N-UT-78 Revision 4						
ARequired Examination Volume: 47.52inches	Inner 15%-t Examination Volume: 5,72inchs							
60°RL axial scan limited: ⊠Yes □No		60°RL Outer 85%-t Exam Limited: ☑Yes ☐No						
Description of Limitation: Nozzle Blend Radius	Inner 15%-t Exam Limited: ☐Yes ☑No							
<sup>B</sup> Total Axial Volume Achieved: 24.3 <sup>2</sup> inches	Description of Limitation: N/A	HOuter 85-t% Volume Achieved: 11.5 <sup>2</sup> inches						
	Finner 15%-t Volume Achieved: 5.72inchs							
<sup>C</sup> Percentage of Axial Coverage: 51%		Examination Coverage: 36%						
B ÷ A X 100 = C		Y) + A X 100 = J						
	Combined Axial and Circumferential Weld C	Coverage						

'Total Examination Coverage: 44%

 $(C+J) \div 2 \times 100 = L$ 

Prepared by: Bret Flesner Date: 03/22/07 Reviewed by: Adam Conti Date: 04/11/07 Page 3 of 11					
	Prepared by: Bret Flesner	Date: 03/22/07	-fil' -f	Date:04/11/07	Page 3 of 11

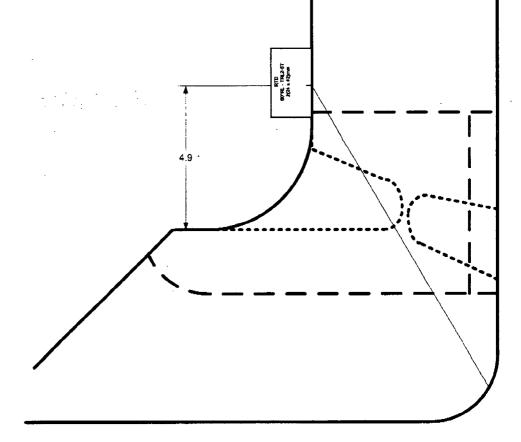
DESCRIPTION
Browns Ferry N2D Nozzle-to-Shell Weld Coverage Plot
DRAWN BY
DRAWN BY
DATE
DATE
TITLE
PAGE
N2DNV-CPS1 4 OF 11

Nozzle-to-Shell weld examination coverage for axial (radial) scan

Total area of examination volume: 47.5 sq. in. Total area of examination volume achieved: 24.3 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned.

Measurements based on modeling report, design drawings, and as-found measurements.



A	DESCRIPTION Browns Ferry N2D No	ozzle-to-Shell	Weld Coverage f	Plot
AREVA	DRAWN BY	DATE	TITLE	PAGE
1	Bret Flesner	03/22/07	N2DNV-CPS2	5 OF 11

Nozzle-to-Shell weld examination coverage for circumferential scan

Total area of examination volume: 47.5 sq. in.

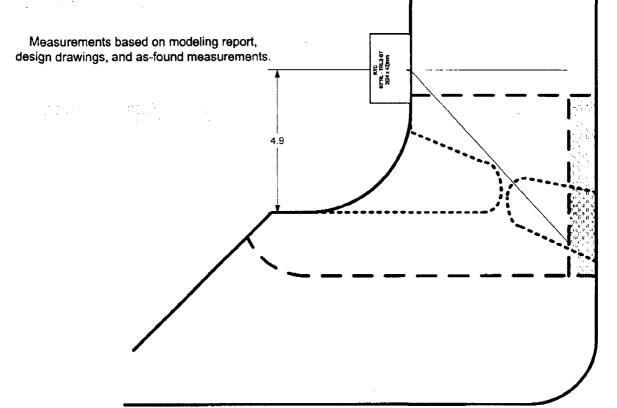
Total area of outer 85%-t exam volume achieved: 11.5 sq. in.

Total area of inner 15%-t volume: 5.7 sq. in.

Total area of inner 15%-t exam volume achieved: 5.7 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned.

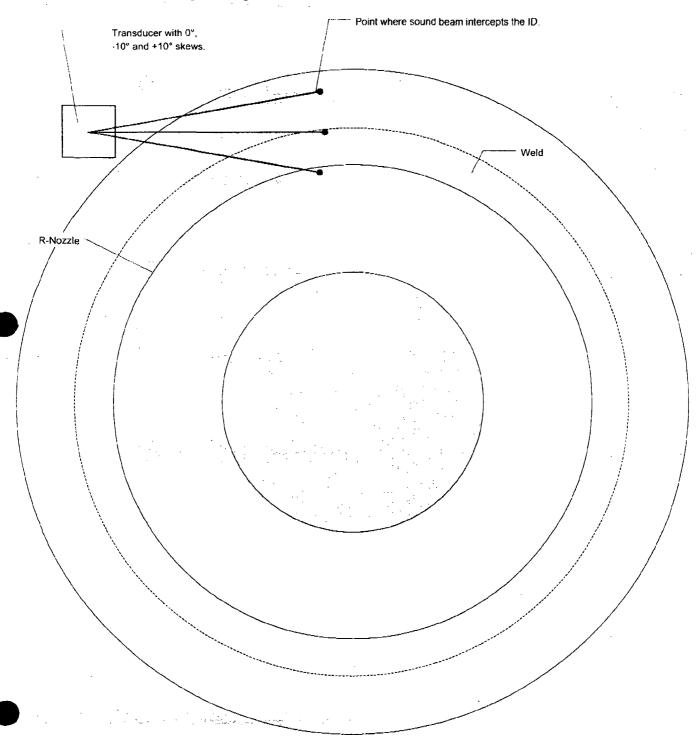
Inner 15%-t area examined from the bland with Supplement 5 techniques.



K173

	DESCRIPTION	······		
	Browns Ferry N2D N	Nozzle-to-Shell Wel	d Coverage Plot	
AREVA	DRAWN BY	DATE	TITLE	PAGE
	Bret Flesner	03/22/07	N2DNV-CPS3	6 OF 11

Top View
Measurements based on modeling report,
design drawings, and as-found measurements.





## Reactor Pressure Vessel 600241 Manual Ultrasonic Calibration Data Sheet

Ju	my: TVA	Site: Br	owns Ferry	Nuclear	Plant	Unit: 2		Outage: 0	Cycle 14 RFO
,Ca	ibration Data Sheet Number:	N2DNV-CDS1		ISI Re	eport Nun	nber:	RIT	3	
Co	mponent ID: N2D-NV	····		Compo	onent Des	cription: N2	Nozzle-to-Ve	essel Weld	
Exa	mination Procedure: 54-ISI-8	350-06		Applica	able SDCI	N(s): 30-90	44520-000		
	Ultrasonic Inst	rument				Tr	ansducer	<u> </u>	
Ма	nufacture: Staveley		Mar	nufacture:	KBA		Model: I	Benchmark 8	92-600
Мо	del: Sonic 136	-	Seri	ial Numbe	er: 0111PF	₹ .:	Frequer	ncy; 2.25 MHz	 !
Sei	ial Number: 7031		Size	e: 0.5" x 1	.0"		Shape:	Rectangle	· · · · · · · · · · · · · · · · · · ·
Lin	earity Sheet No.: LDS4	·	# of	Element	s: 1		Configu	ration: Single	,
	Instrument Se	ttings	Ref	racted An	gle: 40°	<del>-</del>	Measure	ed Angle: * 50	 )°
	Range: 15.0" Sound Pat	h Depth	Ske	w Angle:	-120°	<del></del> .	Measure	ed Skew Ang	le: * +120°
RANGE	Delay: 0.519"		Mod	de: Shear			Radius:	3.5"	
2≥	Velocity: 0.127 in / µS		Cat	ole Type:	RG-174	- Length: 12'	Interme	diate Connec	tors: 0
	Display: Filt2				***************************************	Verific	cation Bloc	:k	
RCVR	Frequency: 2.25 MHz		Тур	e: CS Ro	mpas	-	S/N: 79141	3	
	Reject: Off	<u> </u>	F	Reflector:		1" Radius		2" R	adius
	Pulse Width: 222 nS			Sweep:		0.6 div.		1.3	div.
•	Damping: 500 Ω		Aı	mplitude:		70 %FSH		80 %	6FSH
	Mode: ⊠Pulse Echo □D	ual		Gain:		36.4 dB		36.	4 dB
PULSER	Rep Rate: 2kHz					Basic Ca	libration B	lock	
집	Pulser: ☐150V ☐300V (	*Sonic 137 only)	Bloc	ck ID: BF-	18		Material: CI	ad CS	
	*Pulser voltage adjustable with the	Sonic 137 instrumen	Thic	kness: 6.	0" with 0.	125" Clad	Diameter: F	lat	·
	The Sonic 136 has a fix		-	nperature	74 °F	Page 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Therm, SN:	VH-9525	
			Cou	ıplant: Ult	ragel II		Batch No.:	05325	
		Re	ference S	ensitivit	y Inform	ation			
Ref	lector: ID Notch	Sweep: 6.1 div		Amp	olitude: 80	%FSH	Gain	: 62.6 dB	
Cal	In: Date 03/22/07 Time 1100	Check: Date 03/22	/07 Time 1	229 Che	ck: Date N	/A Time N/A	Out:	Date 03/22/07	Time 1625
				Commen	ts				
inci TV/	uring the calibration process a dent angle is cut such that a 5 A contacted the EPRI NDE Ce prrectly labeled -120° skew bu	0° refracted shear nter for additional	wave is ge modeling u	nerated r	ather than	the specifie	ed 40°. To as	ssure examina	ation coverage
Exa	miner: Thomas Brown	<del></del>	Date: 3/22/	- 1	aminer: Na nature	/A	<u></u>	Level: N/A	Date: N/A
	VA Review Adam Conjunature.	Level: III	Date: 4/11/	/07					
									Page 7 of 11



## Reactor Pressure Vessel 000242 Manual Ultrasonic Calibration Data Sheet

OU	ity: IVA	Site: Brown	is reity ivi	uclear Plan	t Unit: 2		Outage:	Cycle 14 RFO
Ca	ibration Data Sheet Number:	N2DNV-CD\$2		ISI Report	Number:	RIT	3	
Co	mponent ID: N2D-NV		`	Componer	t Description:	N2 Nozzle	-to-Vessel Weld	<del></del>
Exa	amination Procedure: 54-ISI-	850-06		Applicable	SDCN(s): 30	-9044520-	000	
	Ultrasonic Ins	trument				Transdu	сег	
Ma	nufacture: Staveley		Manuf	acture: KB	4	М	odel: Benchmark 8	92-600
Мо	del: Sonic 136		Serial	Number: 0	1C4NX	Fr	equency: 2.25 MH:	<u> </u>
Sei	ial Number: 703 I		Size: 0	).5" x 1.0"		SI	nape: Rectangle	
Lin	earity Sheet No.: LDS4		# of El	ements: 1		C	onfiguration: Single	
	Instrument S	ettings	Refrac	ted Angle:	40°	M	easured Angle: 40°	
ш	Range: 15.0" Sound Pa	th □Depth	Skew	Angle: +12	)°	M	easured Skew Ang	le: * -120°
RANGE	Delay: 0.519"		Mode:	Shear		R	adius: 3.5"	
0 <u>C</u>	Velocity: 0.127 in / μS		Cable	Type: RG-	174 Length:	12' In	termediate Connec	tors: 0
	Display: Filt2				Ve	rification	Block	
RCVR	Frequency: 2.25 MHz		Type:	CS Rompa	s	\$/N: 7	91413	
	Reject: Off		Ref	lector:	1" Refle	ctor	2" Re	eflector
	Pulse Width: 222 nS	e de serve de la company	s	weep:	0.6 di	V.	1.3	div.
	Damping: 500 Ω		Amp	litude:	70 %F	\$H	80 %	%FSH
	Mode: ⊠Pulse Echo □[	Dual		Gain:	36.0 c	IB	36.	0 dB
PULSER	Rep Rate: 2kHz				Basic	Calibrat	on Block	
PU	Pulser: ☐150V ☐300V	(*Sonic 137 only)	Block I	D: BF-18		Mater	ial: Clad CS	
	*Pulser voltage adjustable with th	e Sonic 137 instrument only	Thickn	ess: 6.0" w	ith 0.125" Cla	d Diame	eter: Flat	, .
	The Sonic 136 has a fix		_	rature: 74°	F	Thern	n. SN: VH-9525	
			Couple	nt: Ultrage	l II	Batch	No.: 05325	
		Refere	nce Sen	sitivity In	formation			······································
Ref	lector: ID Notch	Sweep: 5.2 div		Amplitud	le: 80 %FSH		Gain: 58.0 dB	
Cal	In: Date 03/22/07 Time 1104	Check: Date 03/22/07	Time 1249	Check: E	ate N/A Time	N/A	Out: Date 03/22/07	7 Time 1627
			Co	mments	***************************************		·	
* 11	e transducer wedge is incorr	ectly labeled -120° ske	w by the n	nanufacture	er; however a	ctual skew	is +120°.	
			•					
Exa	miner: Thomas Brown	Level: II Date	e: 03/22/0	7 Examin			Level: N/A	Date: N/A
ARI	EVA Review: Agam Copy nature:	Level: III Date	e: 4/11/07		·			Page 8 of 11



# Reactor Pressure Vessel 000243 Manual Ultrasonic Calibration Data Sheet

Jtil	ity: TVA	Site: Browns	Ferry Nuc	clear Plant	Unit: 2	-	Outage: 0	Cycle 14 RFO
Cal	ibration Data Sheet Number:	N2DNV-CD\$3	ı	SI Report N	Number:	R173		
Co	mponent ID: N2D-NV		C	Component I	Description: N2	Nozzle-to-Ve	ssel Weld	
Exa	amination Procedure: 54-ISI-8	350-06	A	pplicable Sl	DCN(s): 30-90	44520-000	٠,	_
	Ultrasonic Inst	rument			. Tr	ansducer		
Ma	nufacture: Staveley		Manufa	cture: KBA		Model: E	Benchmark 89	92-600
Мо	del: Sonic 136		Serial N	lumber: 011	11PL	Frequen	cy: 2,25 MHz	
Sei	rial Number: 703I		Size: 0.	5" x 1.0"		Shape: I	Rectangle	
Lin	earity Sheet No.: LDS4		# of Ele	ments: 1		Configur	ration: Single	
	Instrument Se	ettings	Refracte	ed Angle: 60	)°	Measure	ed Angle: 59°	
ш	Range: 20.0" Sound Par	th □Depth	Skew A	ngle: ±33° to	o 66° -	Measure	ed Skew Angl	e: N/A
SANGE	Delay: 0.842"		Mode: S	Shear		Radius:	Flat	
) ex	Velocity: 0.127 in / μS		Cable T	ype: RG-17	'4 Length: 12'	Intermed	diate Connect	iors: 0
	Display: Filt2				Verifi	cation Bloc	k	
RCVR	Frequency: 2.25 MHz		Type: C	\$ Rompas		S/N: 791413	3	
_ 	Reject: Off		Refle	ector:	1" Radius		2" R	adius
	Pulse Width: 222 nS		Sv	veep:	0.6 div.		1.1	div.
Ì	Damping: 500 Ω		Ampli	tude:	70 %FSH		80 %	FSH
	Mode: ⊠Pulse Echo □C	Dual	٠. (	Gain:	33.8 dB		33.8	3 dB
PULSER	Rep Rate: 2kHz				Basic Ca	alibration B	lock	
됩	Pulser: 150V 300V	*Sonic 137 only)	Block I	D: BF-18		Material: Cla	ad CS	
	*Pulser voltage adjustable with the	e Sonic 137 instrument only.	Thickne	ss: 6.0" with	h 0.125" Clad	Diameter: F	lat	
	The Sonic 136 has a fix	•		ature: 74 °F		Therm. SN:	VH-9525	,
			Couplar	nt: Ultragel I	II	Batch No.:	05325	
		Refere	nce Sens	sitivity Info	ormation			
Re	flector: ID Notch	Sweep: 5.8 div		Amplitude	: 80 %FSH	Gain	: 65.8 dB	
Cal	In: Date 03/22/07 Time 1107	Check: Date 03/22/07	Fime 1309	Check: Da	te N/A Time N/A	A Out:	Date 03/22/07	Time 1629
			Con	nments				
					,			
	aminer: Thomas Brown	Level: II Date	: 03/19/07	Examine Signature			Level: N/A	Date: N/A
	EVA Review Cam Canti inature: Warm (n)	Level: III Date	: 4/11/07					Page 9 of 11



## Reactor Pressure Vessel 600244 Manual Ultrasonic Calibration Data Sheet

Util				duclear	Plant	Unit: 2		Outage: 0	Cycle 14 RFO	
Cal	ibration Data Sheet Number: N2DI	NV-CDS4		ISI Re	port Nur	mber:	R17	3		
Co	mponent ID: N2D-NV			Comp	onent De	escription: N2	Nozzle-to-	Vessel Weld.		
Exa	amination Procedure: N-UT-78 Re	vision 4	- /	Applic	able SD0	CN(s): N/A				
	Ultrasonic Instrum	ent				Tr	ansducer	r		
Ма	nufacture: Staveley		Manu	ıfacture	RTD		Model	: TRL2-ST		
Мо	del: Sonic 136		Seria	l Numb	er: 07-30	5	Frequ	ency: 2 MHz	,	
Sei	rial Number: 7031		Angle	e: 60°		-	Meası	ured Angle: 61°		
Lin	earity Sheet No.: LDS4		Mode	: Refra	cted Long	gitudinal	Size: 2	2(24x42)mm		
	Instrument Setting	gs	Focu	s: FS~1	25mm		Squin	t Angle: 5°		
ш	Range: 8.00" Sound Path	□Depth	# of E	Element	s: 2	Shape: Rec	t. Config	guration: Dual -	SBS	
RANGE	Delay: 1.38"		Cable	e Type:	RG-174	Length: 1	2' Interm	nediate Connect	ors: 0	
<u>"</u>	Velocity: 0.230 in / µS			Verific				ock		
	Display: Filt 2		Туре	: CS Ro	mpas	1,0	S/N: 7914	113		
RCVR	Frequency: 2.25 MHz		Re	eflector:		1" Radius		2" R	adius	
	Reject: Off			Sweep:		1.2 div.		2.5	div.	
	Pulse Width: 222 nS		Am	plitude:		25 %FSH		80 %	FSH	
	Damping: 500 Ω			Gain:		52.0 dB		52.0	) dB	
œ	Mode: ☐Pulse Echo  ☑Dual					Basic Ca	libration	Block		
PULSER	Rep Rate: 2kHz		Block	ID: BF	-18		Material:	Clad CS		
٩	Pulser: 150V 300V (*Sonic	137 only)	Thick	ness: 6	.0" with (	0.125" Clad	Diameter:	Flat		
	*Probe voltage is adjustable with the Son		Temp	oerature	: <b>74</b> °F		Therm. S	N: VH-9525		
	Sonic 136 has a fixed pulse	er voltage.	Coup	lant: Ul	tragel II		Batch No.	.: 05325		
		Ref	erence Se	nsitivi	ty Infor	mation				
Re	flector: 1/4-t SDH	Sweep: 3.8 di	v		Amplitu	de: 80 %FSH		Gain: 62.8 dE	3 	
Cal	In: Date 03/22/07 Time 1115	Check: Date 03	3/22/07 Tim	e 1331	Check: I	Date N/A Time	e N/A	Out: Date 03/2	2/07 Time 1620	
			C	ommei	ıts					
Zoi	ne 1 - Near Surface calibration									
		٠								
Exa	aminer: Thomas Brown	Level: II	Date: 03/22		aminer: I	N/A		Level: N/A	Date: N/A	
	EVA Review Adem Contilinature:	Level: III	Date: 4/11/0	)7					Page 10 of 11	



## Reactor Pressure Vessel 600245 Manual Ultrasonic Calibration Data Sheet

Utili	ty: TVA	Site: Browi	ns Ferry N	iuclear F	riant	Unit: 2		Outage: 0	Cycle 14 RFO
Cali	bration Data Sheet Number: N2	DNV-CDS5		ISI Rep	oort Nur	nber:	R173		
Con	nponent ID: N2D-NV			Compo	nent De	scription: N2	Nozzle-to-\	Vessel Weld.	
Exa	mination Procedure: N-UT-78 R	evision 4		Applica	able SDC	CN(s): N/A			
	Ultrasonic Instru	nent				Tr	ansducer		
Mar	nufacture: Staveley		Manu	facture:	RTD		Model	: TRL2-ST	
Mod	lel: Sonic 136		Serial	Numbe	r: 07-30	5	Freque	ency: 2 MHz	
Seri	al Number: 703l		Angle	: 60°			Measu	ıred Angle: 61°	
Line	earity Sheet No.: LDS4		Mode	: Refrac	ted Long	gitudinal	Size: 2	2(24x42)mm	· · · · · · · · · · · · · · · · · · ·
	Instrument Settii	ngs	Focus	: FS~12	25mm		Squint	Angle: 5°	
ا س	Range: 18.0" Sound Path	□Depth	# of E	lements	s: 2	Shape: Rec	t. Config	juration: Dual -	SBS
RANGE	Delay: 1.38"		Cable	Type: F	RG-174	Length: 1	2' Interm	ediate Connec	tors: 0
<u> </u>	Velocity: 0.230 in / μS					Verifi	cation Blo	ock	
-	Display: Filt 2		Type:	CS Ror	npas		S/N: 7914	13 .	
RCVR	Frequency: 2.25 MHz		Re	flector:		1" Radius		2" R	adius
	Reject: Off	,		Sweep:		0.5 div.	· .	1.1	div.
	Pulse Width: 222 nS		Amı	olitude:		25 %FSH		80 %	6FSH
	Damping: 500 Ω			Gain:		52.0 dB		52.	0 dB
er.	Mode: □Pulse Echo □Dua					Basic Ca	libration	Block	
PULSER	Rep Rate: 2kHz		Block	ID: BF-	18		Material:	Clad CS	. 410 11 110 110 110 110 110 110 110 110
α.	Pulser:150V300V (*Sor	nic 137 only)	Thick	ness: 6.	0" with 0	).125" Clad	Diameter:	Flat	
	*Probe voltage is adjustable with the So		ne Temp	erature:	74 °F		Therm. SI	N: VH-9525	
	Sonic 136 has a fixed pul	sei voitage.	Coupl	lant: Ulti	ragel II		Batch No.	: 05320	
		Refer	ence Se	nsitivit	y Infor	mation			
Ref	lector: ID Notch	Sweep: 6.3 div			Amplitu	de: 80 %FSH	· · · · · · · · · · · · · · · · · · ·	Gain: 77.2 de	3
Cal	In: Date 03/22/07 Time 1117	Check: Date 03/2	22/07 Time	1402	Check: [	Date N/A Time	e N/A	Out: Date 03/2	22/07 Time 1622
Zon	e 2 - Full Volume calibration.		Co	ommen	ts				
	miner: Thomas Brown	Level: II Da	ite: 03/22/		aminer: I	N/A		Level: N/A	Date: N/A
	EVA Review Agam Contil	Level: III Da	ate: 4/11/0	7					Page 11 of 11

#### Examination Report, R-136 N2G-NV, RPV Nozzle-To-Head Weld

		K	
A	R		A

### RPV Nozzle Ultrasonic Examination Summary Sheet

000246

AREV	4			Oun	ııııa			
Utility: TVA	Site: E	Browns F	erry Nuclear Plant	t Unit: 2	!	Outage: Cycle 14	ISI Repo	ort#: <i>R136</i>
Component Num	ber: N2G-N\	/	Component Des	scription: N2 No	zzle to	Vessel Weld	System:	RPV
Code Category: I	3-D		Code Item: B3.9	90		Code Class: 1	Material	CS
ISO / Drawing(s)	2-CHM-204	6-C-01	& 2-ISI-0270-C-01					,, ,, ,,
Procedure Nu	mber	Proce	dure Revision	SDCN		Pro	cedure Misc	Info
N-UT-78			4	NA		Revision 11 of the F	PDI-UT-6 qua	lified equipment table
N-UT-79			1	NA				ified equipment table
54-ISI-850	)		06	30-9044520-0	000	Modeling Re	port: IR-200 Letter dated	3-19 Section 3 3/5/07
	Calibration	Sheets		Exam Data Sheets	а	Indication Data Sheets	E	xam Results
N2GNV-CDS1	N2GNV-C	DS6	N2GNV-CDS11	N2GNV-ED	S1	N2GNV-IDS1		rdable Indications ble Flaw Indications
N2GNV-CDS2	N2GNV-C	DS7	N2GNV-CD\$12	N2GNV-ED	S2	N2GNV-IDS2		ble flaw evaluation)
N2GNV-CDS3	N2GNV-C	DS8						ole Flaw Indications
N2GNV-CDS4	N2GNV-C					<del></del>	(unaccep	table flaw evaluation)
N2GNV-CDS5	N2GNV-C					<del></del>		
Summary:			The second transfer	<u> </u>		, , , , , , , , , , , , , , , , , , ,	<u> </u>	
In accordance v	vith UT prod	cedure	54-ISI-850-06 ar nese examination	nd the reference	ced T\ no rep	ortable indications.	report the	t. following additional
	Prol	oe Refr	acted Angle P	robe Skew		Scan Surface		
		40	)°S	-120°		Blend Radius		
1			)°S	+120°		Blend Radius		
j		60	)°S	±(33°-66°)		Vessel		
minimum covers examination pro 50.55a. The 60	age require ocedure req o'RL examin o. Refer to	ments uires a nations covera	of 10 CFR50.55a n additional circu were limited due	a (b)(2)(xv)(K) inferential sca to the nozzle	was a an of the config	eria of 10 CFR50.5 chieved to the max ne outer 85%-t which guration which redu scription of the scar	timum exter th is not add ced the exa	t possible. The dressed in 10CFR imination volume
			uirements of ASM ualified personne			thru 2003 Addend equipment.	a) and was	performed using
Note: See TVA request reduced	Request fo the area to	r Reliet o be ex	PDI-1 and PDI-2 amined per IWB-	2. Dockets No -2500-7 (a) an	o. 50-2 d (b) t	61/296, 50-327/32 o the weld plus ½"	8, and 50-0 on each sid	390. This relief e.
Prepared by: Bri Signature: Signature: Customer: Matt	co Fil	lesn	Date: 3/	18/07 Sig	viewe		<del></del>	Date: 3/18/07
Signature:	Way I	While	Date: 7	120/07 AN Sig	inature	Lat Hul	<del>.</del> .	Date: 5/2//91 Page 1 of 25



### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

Utility: T\					te: Browns Fer	ry Nuclear I	Plant	<u> </u>			Unit: 2		Outage	e: Cycle 14 RF	0
			Number: N2	2GNV-EDS1				ISI Report N							
Compone	ent (D: N	[2G-N	<u>v</u>		<u></u>			Component	Description:	N2 Noz	zle-to-Ve	essel We	eld		12.00
					<u> </u>	Exa		on Information	<u>-</u>		- 1:-		-		, dist
				I-C-01 & 2-ISI-02	70-C-01			ocation: Nozzle Bo			L <sub>S</sub>	Location	n: Nozzie	TDC	
Examina	tion Limiti	ed: 🖂	Yes No					rage Sheet Number	er(s): N2G-C	WS1	<u>;</u>				
·					·	···		formation							
Examinati	on Proced	ure: 54	-ISI-850-06		Applicable SD0	CN's: 30-904	4520-000	) <u>,                                   </u>				Scan Su	urface: Ol	D Blend Radius	
Angle/ Mode	Skew		Calibrati	ion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	imited	Recor		Indication Data Sheet #	Examiner Initials
*50°S	+120°		N2GN	V-CDS1	03/13/07	1400	83°F	VH-9520	70.2 dB	□Yes	⊠No	□Yes	⊠No	N/A	∱ BF
40°S :	-120°		N2GN	IV-CDS2	03/13/07	1415	83°F	VH-9520	65.0 dB.	□Yes	⊠No	□Yes	⊠No	N/A	(a.t.BF
N/A	N/A			N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A	N/A
N/A	N/A		1	N/A	N/A	N/A	N/A	N/Å	N/A	□Yes	□No	□Yes	□No	N/A	N/A
Examinati	on Proced	ure: 54	-ISI-850-06		Applicable SD0	CN's: 30-904	4520-000	)	·			Scan St	urface: Ol	D Vessel Shell	
Angle/ Mode	Skew		Calibrati	ion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan I	imited		rdable tion(s)	Indication Data Sheet #	Examiner Initials
60°S	±33° to 6	6°	N2GN	IV-CDS3	03/13/07	1425	83°F	VH-9520	70.0 dB	□Yes	⊠No	□Yes	⊠No	N/A	8F
N/A	N/A			N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A	N/A
Examinati	on Proced	ure: N-	UT-78 rev.4		Applicable SD	CN's: N/A						Scan St	urface: O	D Vessel Shell	
Angle/ Mode	Zone	Bea	m Direction	Calibration Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan I	_imited		rdable tion(s)	Indication Data Sheet #	Examiner Initials
60°RL	1	⊠Ra	adial □Circ	N2GNV-CDS4	03/13/07	1435	83°F	VH-9520	72.4 dB	⊠Yes	□No	⊠Yes	□No	N2GNV-IDS1	BF
60°RL	2	⊠Ra	adial	N2GNV-CDS5	03/13/07	1500	83°F	VH-9520	78.0 dB	⊠Yes	□No	⊠Yes	□No	N2GNV-IDS1	BF
60°RL	11	□Ra	adial ⊠Circ	N2GNV-CDS4	03/13/07	1435	83°F	VH-9520	72.4 dB	⊠Yes	□No	. □Yes	⊠No	N/A	BF
60°RL	2	□Ra	adial 🖾 Circ	N2GNV-CDS5	03/13/07	1500	83°F	VH-9520	78.0 dB	⊠Yes	□No	☐Yes	⊠No	N/A	BF
Commen	ts: Initial d	etectio	n examination	n. A non-surface co	nnected fabricat	ion flaw was	recorded	during the 60°RL ex	amination. Se	e sizing a	and flaw e	valuation	workshee	ets for additiona	details.
								-		•					į
*See note	on calibra	tion da	ta sheet relatir	ng to 50°, +120° ski	ew measured an	gle.									
Examiner:	Bret Flesr	ner 🔏	1	10	Level: II	Date: 03/1	3/07	Examiner: N/A					Level:	N/A Da	te: N/A
Signatur			S100 9	Flesnar				Signature:					1		
Examiner:			a second		Level: N/A	Date: N/A		Examiner: N/A					j Level:	N/A Da	te: N/A
Signatur		1			1 .			Signature:					1		É
AREVA R		n Cor	ti /		Level: III	Date: 03/1		<del>-</del>							
Signatur	re 💯	ami	(76)			<u></u>	<u>. j</u>								
<u> </u>															Page 2 of 25



#### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

Utility: T\					te: Browns Fer	ry Nuclear F	Plant				Jnit: 2		Outage	e: Cycle 14	RFO
			et Number: N	2GNV-EDS2				ISI Report N					-		111
Compone	ent_ID: N	12G-N	<u> </u>					Component	Description:	N2 Noz	zle-to-V	essel We	ld		1.1.
						Exa		n Information			<u> </u>				<u>,1 , , , , , , , , , , , , , , , , , , </u>
ISO / Dra	wing Nur	nber:	2-CHM-2046	S-C-01 & 2-ISI-02	70-C-01			cation: Nozzle Bo		)	L <sub>0</sub>	Location	: Nozzle		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Examina	tion Limite	ed:	JYes ⊠No					age Sheet Number	er(s): N/A						- , :
							Scan Int	formation			. 1				\$ 45g
Examinati	on Procedi	ure:	: <u>.</u>		Applicable SD	CN's:					Ber .	Scan Su	ırface: Ol	O Vessel She	ell
Angle/ Mode	Skew		Calibrat	ion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Li	mited	Recor Indicat		Indicatio Data Shee	
45°S	N/A		N2GNV-CDS	6, N2GNV-CDS7	03/14/07	1122	81°F	VH-9520	N/A	□Yes	⊠No	⊠Yes	□No	N2GNV-ID	S2 BF
60°S	N/A	ļ	N2GNV-CDS	8, N2GNV-CDS9	03/14/07	1140	81°F	VH-9520	N/A	∐Yes	⊠No	⊠Yes	□No	N2GNV-ID	S2 BF
0°1	N/A		N2GN	V-CDS10	03/14/07	1120	81°F	VH-9520	N/A	□Yes	⊠No	□Yes	⊠No	N/A	BF
N/A	N/A			N/A	N/A	N/A	N/A	N/A	N/A	∐Yes	□No	□Yes	□No	N/A	. N/A
Examinati	on Procedi	ure: N	<i>V</i> A		Applicable SD	CN's: N/A				,		Scan Su	rface: N/	Α .	
Angle/ Mode	Skew		Calibrat	ion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	.imited	Recor Indicat		Indicatio Data Shee	
N/A	N/A			N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	,N/A	N/A
N/A	N/A			N/A	N/A	N/A	N/A	N/A	N/A	∏Yes	□No	□Yes	□N∘	N/A	N/A
Examinati	on Procedi	ure: N	I-UT-78 rev.4		Applicable SD	CN's: N/A						Scan Su	urface: Ol	O Vessel She	ell
Examinati Angle/ Mode	on Procedi Zone	I	I-UT-78 rev.4 am Direction	Calibration Sheet #	Applicable SD Date	CN's: N/A Time	Temp	Thermometer S/N:	Scan Gain	Scan L	imited	Scan Su Recor Indicat	dable	O Vessel She Indicatio Data Shee	n Examiner
Angle/		Bea			<del>                                     </del>		Temp 81°F		Scan Gain 72.4 dB	Scan L ⊠Yes		Recor	dable tion(s)	Indicatio	n Examiner et # Initials
Angle/ Mode	Zone	Bea ⊠R	am Direction	Sheet #	Date	Time	· '	S/N:		ļ		Recor Indicat	dable tion(s)	Indicatio Data Shee	en Examiner et # Initials DS1 BF
Angle/ Mode 60°/RL	Zone 1	Bea ⊠R ⊠R	am Direction	Sheet # N2GNV-CDS11	Date 03/14/07	Time	81°F	S/N: VH-9520	72.4 dB	⊠Yes	□No	Recor Indicat	dable tion(s) ☐No ☐No	Indicatio Data Shee N2GNV-ID	et # Initials  DS1 BF
Angle/ Mode 60°/RL 60°/RL	Zone 1 2	Bea ⊠R ⊠R	am Direction  Radial □Circ	Sheet # N2GNV-CDS11 N2GNV-CDS12	Date 03/14/07 03/14/07	Time 1100 1110	81°F	S/N: VH-9520 VH-9520	72.4 dB 78.0 dB	⊠Yes ⊠Yes	□No □No	Recor	dable tion(s)  No No	Indicatio Data Shee N2GNV-ID N2GNV-ID	Examiner Initials  DS1 BF  DS1 BF
Angle/ Mode 60°/RL 60°/RL 60°/RL	Zone  1 2	Bea ⊠R ⊠R □R	am Direction  Radial   Circ  Radial   Circ  Radial   Circ  Radial   Circ	Sheet # N2GNV-CDS11 N2GNV-CDS12 N2GNV-CDS11	03/14/07 03/14/07 03/14/07	Time 1100 1110 1100	81°F 81°F 81°F	S/N: VH-9520 VH-9520 VH-9520	72.4 dB 78.0 dB 72.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indicat  Yes  Yes  Yes	dable tion(s)  No No	Indicatio Data Shee N2GNV-ID N2GNV-ID N/A	en Examiner Initials OS1 BF OS1 BF
Angle/ Mode 60°/RL 60°/RL 60°/RL 60°/RL	Zone  1 2 1 2 ts: Sizing	Bea ⊠R ⊠R □R □R	am Direction  Radial Circ	Sheet # N2GNV-CDS11 N2GNV-CDS12 N2GNV-CDS11 N2GNV-CDS12	03/14/07 03/14/07 03/14/07 03/14/07	Time 1100 1110 1100 1110	81°F 81°F 81°F 81°F	S/N: VH-9520 VH-9520 VH-9520 VH-9520	72.4 dB 78.0 dB 72.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indicat  Yes  Yes  Yes	dable tion(s)  No No	Indicatio Data Shee N2GNV-ID N2GNV-ID N/A	en Examiner Initials OS1 BF OS1 BF
Angle/ Mode 60°/RL 60°/RL 60°/RL 60°/RL	Zone  1 2 1 2 ts: Sizing	Bea ⊠R ⊠R □R □R	am Direction  Radial Circ	Sheet # N2GNV-CDS11 N2GNV-CDS12 N2GNV-CDS11	03/14/07 03/14/07 03/14/07 03/14/07	Time 1100 1110 1100 1110	81°F 81°F 81°F 81°F	S/N: VH-9520 VH-9520 VH-9520 VH-9520	72.4 dB 78.0 dB 72.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indicat  Yes  Yes  Yes	dable tion(s)  No No	Indicatio Data Shee N2GNV-ID N2GNV-ID N/A	en Examiner Initials OS1 BF OS1 BF
Angle/ Mode 60°/RL 60°/RL 60°/RL 60°/RL	Zone  1 2 1 2 ts: Sizing	Bea ⊠R ⊠R □R □R	am Direction  Radial Circ	Sheet # N2GNV-CDS11 N2GNV-CDS12 N2GNV-CDS11 N2GNV-CDS12	03/14/07 03/14/07 03/14/07 03/14/07	Time 1100 1110 1100 1110	81°F 81°F 81°F 81°F	S/N: VH-9520 VH-9520 VH-9520 VH-9520	72.4 dB 78.0 dB 72.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indicat  Yes  Yes  Yes	dable tion(s)  No No	Indicatio Data Shee N2GNV-ID N2GNV-ID N/A	en Examiner Initials OS1 BF OS1 BF
Angle/Mode 60°/RL 60°/RL 60°/RL Commen 0° used to	Zone  1 2 1 2 ts: Sizing of measure to	Bea	am Direction  Radial Circ  Radial Circ	Sheet # N2GNV-CDS11 N2GNV-CDS12 N2GNV-CDS11 N2GNV-CDS12 on of the flaw indica	03/14/07 03/14/07 03/14/07 03/14/07	Time 1100 1110 1100 1110	81°F 81°F 81°F 81°F	S/N: VH-9520 VH-9520 VH-9520 VH-9520	72.4 dB 78.0 dB 72.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indicat  Yes  Yes  Yes	dable tion(s)  No No	Indicatio Data Shee N2GNV-ID N2GNV-ID N/A N/A	en Examiner Initials OS1 BF OS1 BF
Angle/Mode 60°/RL 60°/RL 60°/RL Commen 0° used to	Zone  1 2 1 2 ts: Sizing of measure to Bret Flesner:	Bea	am Direction  Radial Circ  Radial Circ	Sheet # N2GNV-CDS11 N2GNV-CDS12 N2GNV-CDS11 N2GNV-CDS12 on of the flaw indica	Date 03/14/07 03/14/07 03/14/07 tion. 60°RL example Level: II	Time 1100 1110 1100 1110 mination perfe	81°F 81°F 81°F 81°F	S/N: VH-9520 VH-9520 VH-9520 VH-9520 or to sizing.	72.4 dB 78.0 dB 72.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indicat  Yes  Yes  Yes	dable tion(s)  No No No No	Indicatio Data Shee N2GNV-ID N2GNV-ID N/A N/A	en Examiner Initials  DS1 BF  DS1 BF  BF  BF  DS1 BF
Angle/Mode 60°/RL 60°/RL 60°/RL Commen 0° used to Examiner: Signatur Examiner:	Zone  1 2 1 2 ts: Sizing or measure to Bret Fless e: N/A	Bea	am Direction  Radial Circ  Radial Circ	Sheet # N2GNV-CDS11 N2GNV-CDS12 N2GNV-CDS11 N2GNV-CDS12	03/14/07 03/14/07 03/14/07 03/14/07 tion. 60°RL example	Time 1100 1110 1100 1110 mination perfe	81°F 81°F 81°F 81°F	S/N: VH-9520 VH-9520 VH-9520 VH-9520 or to sizing.  Examiner: N/A Signature: Examiner: N/A	72.4 dB 78.0 dB 72.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indicat  Yes  Yes  Yes	dable iden(s)  No No No	Indicatio Data Shee N2GNV-ID N2GNV-ID N/A N/A	en Examiner Initials  OS1 BF  OS1 BF  BF  BF
Angle/ Mode 60°/RL 60°/RL 60°/RL Commen 0° used to Examiner: Signatur Examiner: Signatur	Zone  1 2 1 2 ts: Sizing a measure t  Bret Flesr e: N/A e:	Bea RR	am Direction Radial Circ	Sheet # N2GNV-CDS11 N2GNV-CDS12 N2GNV-CDS11 N2GNV-CDS12 on of the flaw indica	Date  03/14/07  03/14/07  03/14/07  tion. 60°RL example Level: II  Level: N/A	Time 1100 1110 1100 1110 mination perfo	81°F 81°F 81°F 81°F	S/N: VH-9520 VH-9520 VH-9520 VH-9520 or to sizing.	72.4 dB 78.0 dB 72.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indicat  Yes  Yes  Yes	dable tion(s)  No No No No	Indicatio Data Shee N2GNV-ID N2GNV-ID N/A N/A	en Examiner Initials  DS1 BF  DS1 BF  BF  BF  DS1 BF
Angle/ Mode 60°/RL 60°/RL 60°/RL Commen 0° used to Examiner: Signatur Examiner: Signatur	Zone  1 2 1 2 ts: Sizing a measure temperature tempera	Bea RR	am Direction  Radial Circ	Sheet # N2GNV-CDS11 N2GNV-CDS12 N2GNV-CDS11 N2GNV-CDS12 on of the flaw indica	Date 03/14/07 03/14/07 03/14/07 tion. 60°RL example Level: II	Time 1100 1110 1100 1110 mination perfe	81°F 81°F 81°F 81°F	S/N: VH-9520 VH-9520 VH-9520 VH-9520 or to sizing.  Examiner: N/A Signature: Examiner: N/A	72.4 dB 78.0 dB 72.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indicat  Yes  Yes  Yes	dable tion(s)  No No No No	Indicatio Data Shee N2GNV-ID N2GNV-ID N/A N/A	en Examiner Initials  DS1 BF  DS1 BF  BF  BF  DS1 BF



#### N2G Nozzle-to-Shell Weld 60°RL Indication Data Sheet (N2GNV-IDS1)

R136

			Indic	ation R	ecording (D	etection Exa	mination)			
Scan Direction	Amplitude	L <sub>1</sub>	L <sub>max</sub>	L <sub>2</sub>	Metal Path (W <sub>1</sub> )	Metal Path (W <sub>max</sub> )	Metal Path (W <sub>2</sub> )	W <sub>1</sub>	W <sub>max</sub>	W <sub>2</sub>
Radial	115 % FSH	48.6"	49.0"	49.4"	4.80"	5.04" (2.52" depth)	5.2"	4.5"	5.0"	5.4"

#### **Examiner Notes:**

- Echo-dynamic characteristics typical of a fabrication type discontinuity (Slag)
  - o Broad wide signal presentation
- Recorded length position provided unique and defined start and end positions with ≥10:1 S/N ratio. Similar responses observed intermittently 360° below recordable levels (≤ 20% FSH)
- "W" dimensions measured from nozzle boss (Rnozzle)
- Indication amplitude recorded at Zone 2 scanning sensitivity
- Indication confirmed with Zone 1 calibration (> 100% FSH)
- No distinct tip diffracted signals
- Nozzle blend radius interference prevents confirmation with 28° shear component or 0° transducer
- Length Sizing information is an estimate only. See indication data sheet N2GNV-IDS2 for length and depth sizing information

Prepared By: Bret Flesner Signature: Sun filme	Level: II	Date: 03/13/07	Reviewed by: Adam Conti / Signature:	Level: III	Date: 03/18/07	
					Page: 4 of 25	7



#### N2G Nozzle-to-Shell Weld 45° & 60° Shear Wave Indication Data Sheet (N2GNV-IDS2)

R136

Indicat	ion Length I	nformation (	Note 1)	Indica	tion Depth Informa	rmation (Note 2)		
Probe	L <sub>1</sub>	L <sub>2</sub>	Total Length	Upper Tip Signal (depth)	Lower Tip Signal (depth)	Through Wall Extension (TWE) (Note 3)		
45° shear	49.0"	49.7"	0.70"	2.43"	2.77"	0.34"		
60° shear	48.8"	49.7"	0.90"	2.54"	2.70"	0.34"		

Note 1: Indication length information from 45° shear wave was limited due to nozzle blend radius interference. 60° shear wave data used for flaw length evaluation purposes.

Note 2: This indication does not provide typical upper and lower tip signal responses. It provided signal responses indicative of a fabrication type defect.

Note 3: Flaw depth identifies the shallowest and deepest extremities of the bounded flaw as defined in ASME Section XI, IWA-3000.

Prepared By: Bret Flesner Signature: Level: II	Date: 03/14/07	Reviewed by: Roam Canti/ Signature: Fem (in)	Level: III	Date: 03/18/07
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### N2G Nozzle-to-Shell Weld Flaw Characterization and Evaluation Worksheet

R136

Flaw Evaluati	on Parameters		
Nozzle ID	N2G		
*Thickness (UT measured OD to clad base m	6.50"		
S1 dimension (OD to upper flaw ti	2.43"/		
S2 dimension (clad base metal interface to lo	ower flaw tip)	3.73"	
*d		.18"	
Flaw Characterization		Subsurface Planar Flaw (S > 0.4d)	
*Flaw Length (ℓ)		0.90"	
*Flaw Depth (2α)*		.35"	
α/ℓ	. 4.1	0.20	
(*α/t%	2.8%		
*Allowable α / t % (0.20 α/ ℓ)	3.3%		

Code Year Used: ASME Code, Section XI, 2001 with Addenda thru 2003

\*Rounded in accordance with IWA-3200.

This indication is an allowable planar flaw in accordance with the acceptance criteria defined in IWB-3512-1.

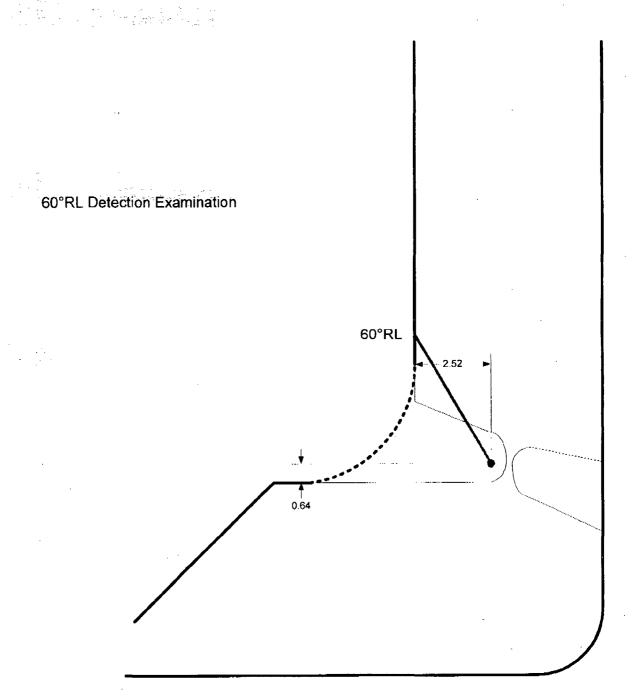
The flaw dimensions identified above define the bounding rectangle that fully contains the area of the flaw in accordance with IWA-3300 and Fig. IWA-3310 through IWA-3390.

Prepared by: Agam Conti Signature:	Level: III	Date: 03/18/07	Reviewed By: Bret Flesner Signature:	Level: II	Date: 03/18/07
					Page: 6 of 25

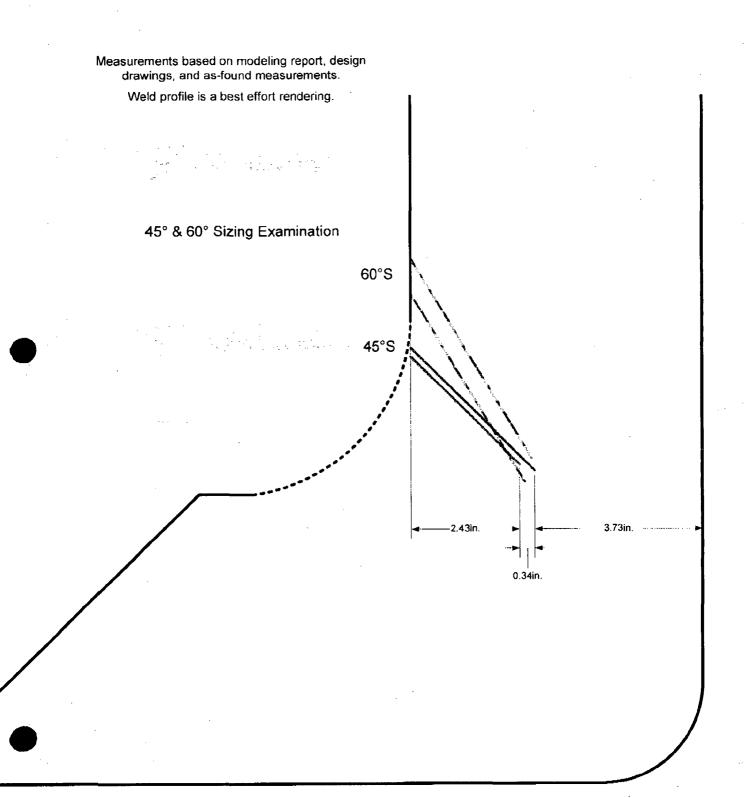
R136

Measurements based on modeling report, design drawings, and as-found measurements.

Weld profile is a best effort rendering.

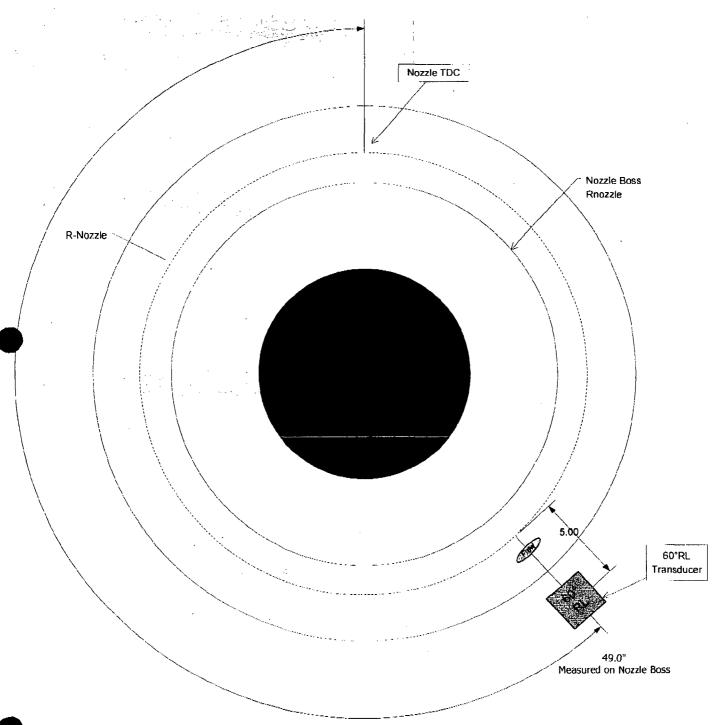


R136



	DESCRIPTION								
I A	Browns Ferry N2G Indication Plot Sheet								
AREVA	DRAWN BY	DATE	TITLE	PAGE 9 OF 25					
	Bret Flesner	03/14/07	N2GNV-IPS3						

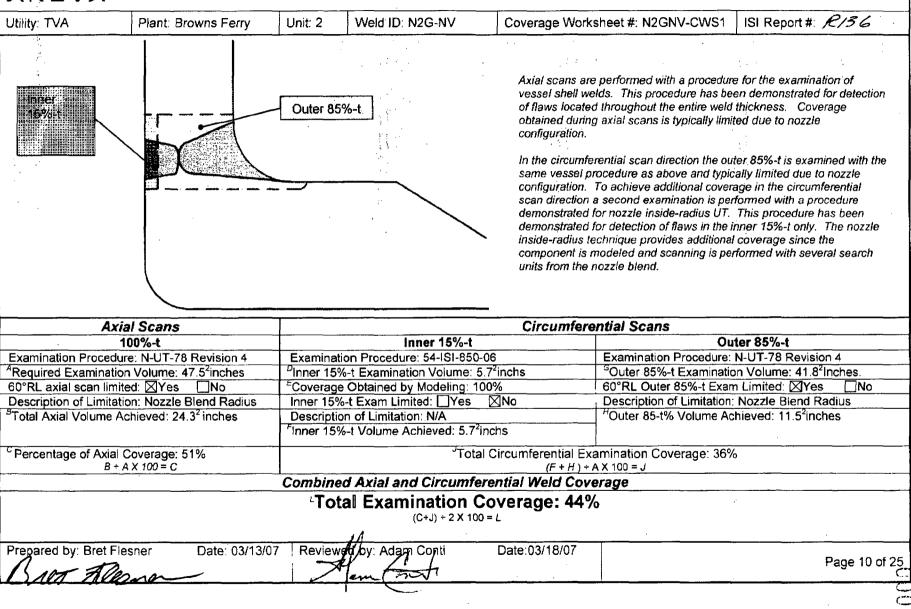
R136



View looking towards nozzle



### RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet



CT

Browns Ferry N2G Nozzle-to-Shell Weld Coverage Plot

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DRAWN BY

DRAWN BY

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TITLE

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Bret Flesner

03/13/07

N2GNV-CPS1 1

R136

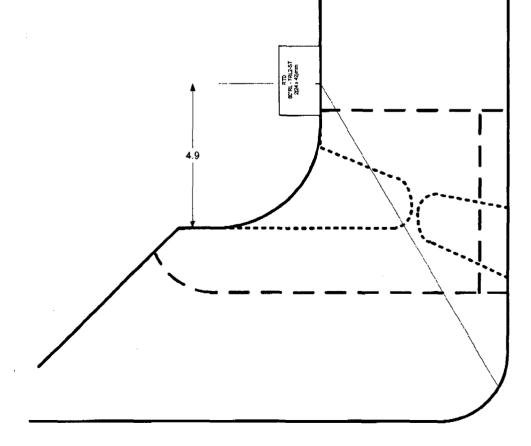
000256

Nozzle-to-Shell weld examination coverage for axial (radial) scan

Total area of examination volume: 47.5 sq. in. Total area of examination volume achieved: 24.3 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned.

Measurements based on modeling report, design drawings, and as-found measurements.



DESCRIPTION
Browns Ferry N2G Nozzle-to-Shell Weld Coverage Plot

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DATE
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PAGE
Bret Flesner
03/13/07
N2GNV-CPS2
12 OF 25

R136

000257

Nozzle-to-Shell weld examination coverage for circumferential scan

Total area of examination volume: 47.5 sq. in.

Total area of outer 85%-t exam volume achieved: 11.5 sq. in.

Total area of inner 15%-t volume: 5.7 sq. in.

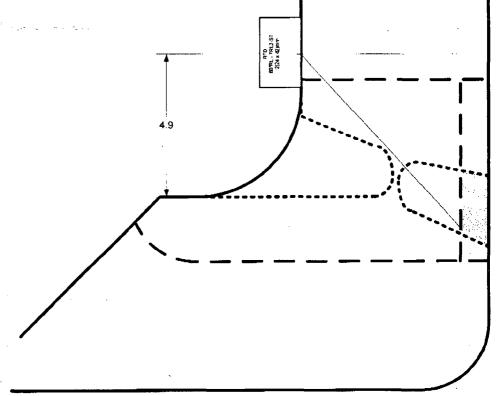
Total area of inner 15%-t exam volume achieved: 5.7 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned.

Inner 15%-t area examined from the blend with Supplement 5 techniques.

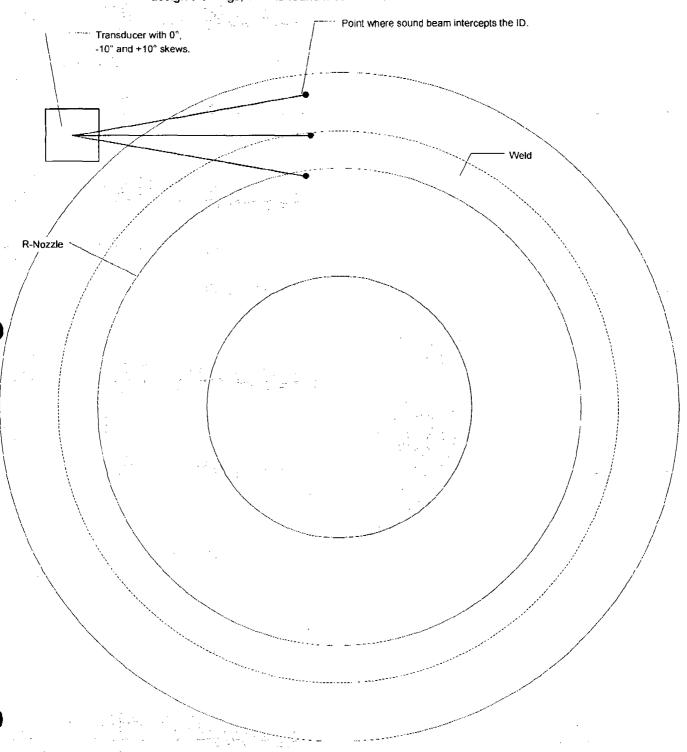
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Measurements based on modeling report, design drawings, and as-found measurements.





Top View
Measurements based on modeling report,
design drawings, and as-found measurements.





## Reactor Pressure Vessel 630259 Manual Ultrasonic Calibration Data Sheet

Uiii	IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	Site: Browns	Ferry Nucl	ear Plant	Unit: 2		Outage: (	Cycle 14 RFO	
Ca	libration Data Sheet Number:	N2GNV-CDS1	ISI Report Number: 2136						
Со	mponent ID: N2G-NV		Component Description: N2 Nozzle-to-Vessel Weld						
Exa	amination Procedure: 54-ISI-	850-06	Applicable SDCN(s): 30-9044520-000						
	Ultrasonic Inst	trument	Transducer						
Ма	nufacture: Staveley		Manufact	ure: KBA		Model:	Model: Benchmark 892-600		
Мо	del: Sonic 136	Serial Number: 0111PR			Frequency: 2.25 MHz				
Sei	rial Number: 136P1200G0814	Size: 0.50" x 1.0"			Shape: Rectangle				
Lin	earity Sheet No.: LDS2	eet No.: LDS2 # of Elements: 1 Configuration: Sir				ıration: Single			
	Instrument Se	ettings	Refracted	d Angle: 40°		Measur	ed Angle: *50	0	
ш	Range: 7.00" ⊠Sound Pa	ange: 7.00" ⊠Sound Path				Measur	ed Skew Ang	le: *+120°	
RANGE	Delay: 7.77"			near		Radius:	3.5"		
"	Velocity: 0.127 in / μS	Cable Ty	pe: RG-174	Length: 12'	Interme	diate Connec	tors: 0		
RCVR	Display: Filt2			Verifi	cation Bloc	ok			
	Frequency: 2.25MHz	Type: N/	N/A S/N: N			N/A			
	Reject: Off	Reflec	Reflector: N/A			. N	I/A		
	Pulse Width: 222nS		Swe	ер:	N/A		N/A		
	Damping: 500Ω		Amplitu	Amplitude: N/A				I/A	
	Mode: ⊠Pulse Echo □[	G	Gain: N/			N	I/A		
PULSER	Rep Rate: 2kHz	Basic Calibration Block							
질	Pulser: ☐150V ☐300V	(*Sonic 137 only)	Block ID: BF-18			Material: Clad CS			
	*Pulser voltage adjustable with the Sonic 137 instrument only.		Thickness: 6.0" with 0.125" clad			Diameter: Flat			
	The Sonic 136 has a fix	ked pulser voltage.	Temperature: 71 °F			Therm. SN: VH-9520			
			Couplant	Couplant: Ultragel II B			Batch No.: 05325		
		Referen	ce Sensi	tivity Infor	mation				
Ref	lector: ID Notch	Sweep: 3.6 div		Amplitude: 8	0 %FSH	Gair	Gain: 60.2 dB		
Cal	In: Date 03/13/07 Time 1143	Check: Date N/A Time N	N/A Check: Date N/A Time N/A			A Out:	Out: Date 03/13/07 Time 1602		
			Comr	nents					
7" o	f soundpath delayed off screen to	o display 7" to 14" on A-scan	١.						
wed con	ring the calibration process a mai ge incident angle is cut such that tacted the EPRI NDE Center for a " skew but is actually +120".	a 50° refracted shear wave	is generate	d rather than t	the specified 4	0°. To assure	examination co	verage TVA	
	nature:		03/13/07	Examiner: N/A Signature			Level: N/A	Date: N/A	
	EVA Review: Adam Confinature:	Level: III Date:	03/18/07	Page 1			Page 14 of 25		



## Reactor Pressure Vessel 000260 Manual Ultrasonic Calibration Data Sheet

Util	it <b>y</b> : TVA		Site: Brown	s Ferry N	uclear l	Plant	Unit: 2		Outage: C	ycle 14 RFO	
Calibration Data Sheet Number: N2GNV-CDS2					ISI Report Number: \$136						
Cor	mponent ID: N2G-NV				Component Description: N2 Nozzle-to-Vessel Weld						
Exa	mination Procedure: 54-IS	-850-06			Applica	able SDCI	N(s): 30-90	44520-00	00		
Ultrasonic Instrument					Transducer						
Mai	Manufacture: Staveley				Manufacture: KBA				Model: Benchmark 892-600		
Model: Sonic 136				Serial	Serial Number: 01C4NX			Frequency: 2.25 MHz			
Ser	ial Number: 136P1200G081	456	, 12 ( 12 ( ) 1 (	Size: 0	Size: 0.50" x 1.0" Shape: Rectangle						
Lin	earity Sheet No.: LDS2			# of El	lements	nts: 1 Configuration: Single					
	Instrument Settings			Refrac	ted An	gle: 40°		Mea	sured Angle: 39°		
E	Range: 7.00" Sound F	ath □De	epth	Skew	Angle:	+120°		Mea	sured Skew Angl	e: *-120°	
RANGE	Delay: 6.71"			Mode:	Shear			Rad	lius: 3.5"	· · · · · · · · · · · · · · · · · · ·	
LC.	Velocity: 0.127 in / μS			Cable	Type: I	RG-174	Length: 12'	Inte	rmediate Connect	ors: 0	
	Display: Filt2						Verifi	cation E	Block		
RCVR	Frequency: 2.25MHz			Туре:	ype: N/A S			S/N: N/	S/N: N/A		
	Reject: Off			Ref	Reflector: N/A		N/A	N/A		/A	
	Pulse Width: 222nS		5	Sweep:		N/A		N	/A		
	Damping: 500Ω		Amp	Amplitude: N/A		N/A		N	/A		
	Mode: ⊠Pulse Echo □Dual				Gain: N/A		N/A	N/A		/A	
PULSER	Rep Rate: 2kHz				Basic Calibration Block						
PΩ	Pulser: 150V 300V (*Sonic 137 only)			Block	Block ID: BF-18			Material: Clad CS			
	*Pulser voltage adjustable with	*Pulser voltage adjustable with the Sonic 137 instrument only.			Thickness: 6.0" with 0.125" clad			Diameter: Flat			
	The Sonic 136 has a				Temperature: 71 °F			Therm. SN: VH-9520			
	1		•	Coupi	Couplant: Ultragel II			Batch No.: 05325			
			Refere	ence Ser	nsitivii	y inforn	nation	· · · · · · · · · · · · · · · · · · ·			
Re	flector: ID Notch	Sweep: 2	2.7 div		Amplitude: 80 %FSH				Gain: 55.0 dB		
Cal	In: Date 03/13/07 Time 1152	Check: D	ate N/A Time	N/A	N/A Check: Date N/A Time N/A			۹ ا	Out: Date 03/13/07 Time 1555		
		<del></del>	<del></del> _	Co	ommen	ts					
6"	of soundpath delayed off so	reen to displ	ay 6" to 13"	on A-scar	١.						
*Tr	ansducer incorrectly labeled	l +120° skev	w by the mar	ufacturer	; howev	er actual	skew is -12	0°.			
	aminer: Bret Flesner Inature: Som File	, I	rel: Il Dat	te: 03/13/0		aminer: N gnature	I/A		Level: N/A	Date: N/A	
	EVA Review: Adam Continuature:	te: 03/18/0	07			-		Page 15 of 25			



#### Reactor Pressure Vessel 000261 Manual Ultrasonic Calibration Data Sheet

Util	lity: TVA	Site: Bro	wns Fe	arry Nuclea	uclear Plant Unit: 2 Outage: Cycle 14 RI				ycle 14 RFO	
Cal	libration Data Sheet Number:	N2GNV-CDS3	-	ISI I	ISI Report Number: R136					
Cor	mponent ID: N2G-NV			Com	ponent De	scription: N2	Nozzle-to-V	essel Weld		
Exa	amination Procedure: 54-ISI-8	150-06		Appl	licable SD0	CN(s): 30-90	44520-000			
	Ultrasonic Inst	rument				Tr	ransducer			
Ма	nufacture: Staveley		N	Manufactur	re: KBA		Model:	Model: Benchmark 892-600		
Мо	del: Sonic 136			Serial Number: 0111PL			Freque	ncy: 2.25 MHz		
Ser	rial Number: 136P1200G0814	56	5	Size: 0.50"	x 1.0"	·	Shape:	Rectangle		
Lin	earity Sheet No.: LDS2		#	# of Eleme	nts: 1		Configu	uration: Single		
	Instrument Se	ttings	F	Refracted A	Angle: 60°		Measur	red Angle: 59°		
114	Range: 8.00" Sound Pat	th Depth	5	Skew Angle: ±(33° to 66°) Measure				red Skew Angle	e: N/A	
RANGE	Delay: 9.22"		Į.	Mode: She	: Shear Radius: N/A					
œ	Velocity: 0.127 in / μS		C	Cable Typs	Cable Type: RG-174 Length: 12' Intermediate Connectors: 0					
	Display: Filt2		Verification Block							
RCVR	Frequency: 2.25MHz			Type: N/A			S/N: N/A	S/N: N/A		
<u>.</u>	Reject: Off			Reflecto	or:	N/A		N/	'A	
	Pulse Width: 222nS			Swee	p:	N/A		N/	Ά .	
	Damping: 500Ω			Amplitud	le:	N/A		N/	/A	
	Mode: ⊠Pulse Echo □□	Dual		Gai	Gain: N/A			N/	/A	
PULSER	Rep Rate: 2kHz	1		Basic Calibration Block						
김	Pulser:150V300V (	(*Sonic 137 only)	f	Block ID: B	3F-18		Material: C	lad CS		
	*Pulser voltage adjustable with the	e Sonic 137 instrumen	t only.	Thickness:	6.0" with 0	).125" clad	Diameter:	Flat		
	The Sonic 136 has a fix			Temperatu	ıre. 71 °F		Therm. SN	Therm. SN: VH-9520		
			(	Couplant: \	Ultragel II	,	Batch No.:	Batch No.: 05325		
	<del>-</del>	Ref	ference	e Sensiti	vity Infor	mation	_, .,,		,,,,,	
Re	flector: ID Notch	Sweep: 4.5 div		Α	mplitude: 8	30 %FSH	Gai	in: 59.2 dB		
Cal	I In: Date 03/13/07 Time 1131	Check: Date N/A	Fime N/F	A C	heck: Date	N/A Time N/	A Out	: Date 03/13/07	Time 1603	
				Comm	ents					
8" s	soundpath delayed off screen to di	isplay from 8" to 16" o	on the A-	-scan.						
	aminer: Bret Flesner gnature: Brat Tillem		Date: 0		Examiner: Signature	N/A		Level: N/A	Date: N/A	
	REVA Review Adam Conti	Level: III	Date: 0	03/18/07					Page 16 of 25	



## Reactor Pressure Vessel 600262 Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	Site: Browns	Ferry Nucl	lear F	Plant	Unit: 2		Outage:	Cycle 14 RFO	
Ca	libration Data Sheet Number: N2GN	NV-CDS4	IS	SI Rep	ort Num	nber: R13	6			
Co	mponent ID: N2G-NV	**	Co	ompo	nent Des	scription: N2	Nozzle-to-\	/essel Weld		
Exa	amination Procedure: N-UT-78 Rev	ision 4	· Ar	pplica	ble SDC	N(s): N/A				
	Ultrasonic Instrume	ent				Tra	ansducer			
Ма	nufacture: Staveley		Manufac	ture:	RTD		Model	Model: TRL2-ST		
Мо	del: Sonic 136		Serial Number: 07-305			Freque	ency: 2 MHz			
Ser	ial Number: 136P1200G081456		Angle: 60	0°			Measu	red Angle: 60	•	
Lin	earity Sheet No.: LDS2		Mode: R	efrac	ted Long	itudinal	Size: 2	2(24x42)mm		
	Instrument Setting	s	Focus: F	S-12	?5mm		Squint	Angle: 5°		
ш	Range: 8.00" Sound Path	]Depth	# of Elem	nents	: 2	Shape: Rect	. Config	uration: Dual	- SBS	
RANGE	Delay: 1.34"			ype: F	RG-174	Length: 1	2' Interm	ediate Conne	ctors: 0	
<u> </u>	Velocity: 0.227 in / µS		Verification Block					— ha a <b>wiferous</b> secons		
Display: Filt 2			Type: N/	Ά			S/N: N/A			
RCVR	Frequency: 2.25 MHz	Reflec	ctor: N/A			. N/A				
	Reject: Off	Swe	veep: N/A				N/A			
,	Pulse Width: 222 nS	Amplitu	ude:		N/A		1	N/A		
	Damping: 500 Ω	G	ain:	_	N/A			V/A		
<u>or</u>	Mode: ☐Pulse Echo					Basic Ca	libration	Block		
PULSER	Rep Rate: 2kHz	· · · · · · · · · · · · · · · · · · ·	Block ID:	: BF-′	18		Material: 0	cs		
<u>a</u> .	Pulser: 150V 300V (*Sonic	137 only)	Thicknes	ss: 6.0	)" with 0.	125" Clad	Diameter:	Flat		
	*Probe voltage is adjustable with the Sonic		Tempera	ature:	71 °F		Therm. SN	1: VH-9520		
	Sonic 136 has a fixed pulser	voltage.	Couplant	t: Ultr	agel II		Batch No.	Batch No.: 05325		
		Referen	ce Sensi	itivity	/ Inform	nation				
Ref	lector: 1/4-t SDH	Sweep: 3.7 div			Amplitud	e: 80 %FSH		Gain: 58.4 d	В	
Cal	In: Date 03/13/07 Time 1158	Check: Date N/A T	ime N/A		Check: D	ate N/A Time	N/A	Out: Date 03.	/13/07 Time 1557	
		-	Com	men	ts					
Zor	e 1 - Near Surface calibration.									
	Iminer: Bret Flesner nature: Sat Tilema		03/13/07		Examiner: N/A Signature			Level: N/A	Date: N/A	
			03/18/07						Page 17 of 25	

			<b>k</b>	
A	R	E	VA	

## Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	Site: Browns	Ferry Nucle	ar Plant	Unit: 2		Outage:	Cycle 14 RFO	
Cal	ibration Data Sheet Number: N2GI	NV-CDS5	ISI	Report Nu	mber: R	136			
Coi	mponent ID: N2G-NV		Con	nponent De	escription: N2	Nozzie-to-V	essel Weld:		
Exa	mination Procedure: N-UT-78 Rev	ision 4	Арр	olicable SD	CN(s): N/A				
	Ultrasonic Instrume	ent			Tr	ansducer			
Ma	nufacture: Staveley		Manufactu	re: RTD		Model:	Model: TRL2-ST		
Мо	del: Sonic 136		Serial Nun	nber: 07-30	5	Freque	ency: 2 MHz		
Ser	ial Number: 136P1200G081456		Angle: 60°	,		Measu	red Angle: 60		
Lin	earity Sheet No.: LDS2		Mode: Ref	fracted Lon	gitudinal	Size: 2	(24x42)mm		
	Instrument Setting	s.	Focus: FS	~125mm	v	Squint	Angle: 5°		
ш	Range: 18.0" Sound Path	_Depth	# of Eleme	f of Elements: 2 Shape: Rect. Co			uration: Dual	- SBS	
RANGE	Delay: 1.34"		Cable Type: RG-174 Length: 12'				ediate Connec	ctors: 0	
II.	Velocity: 0.227 in / μS			•	Verifi	cation Blo	ck		
	Display: Filt 2		Type: N/A			S/N: N/A			
RCVR	Frequency: 2.25 MHz	Reflecte	tor: N/A			N/A			
	Reject: Off	Swee	p:	N/A		1	√/A		
	Pulse Width: 222 nS	100 m	Amplitud	ie:	N/A			N/A	
	Damping: 500 Ω		Ga	in:	N/A		1	N/A	
ΩĽ	Mode: □Pulse Echo  ☑Dual			Basic Ca	libration i	Block			
PULSER	Rep Rate: 2kHz		Block ID: E	3F-18		Material: C	s		
۵	Pulser: 150V 300V (*Sonic	137 only)	Thickness	: 6.0" with (	0.125" Clad	Diameter:	Flat	·	
	*Probe voltage is adjustable with the Sonic Sonic 136 has a fixed pulser		Temperatu	ure: 71 °F	<u> </u>	Therm. SN	I: VH-9520	<u> </u>	
	Some 136 has a fixed pulser		Couplant: Ultragel II Batch N				No.: 05325		
		Referen	ce Sensiti	vity Infor	mation				
Ref	lector: ID Notch	Sweep: 6.3 div		Amplitu	de: 80 %FSH		Gain: 73.2 d	В	
Cal	In: Date 03/13/07 Time 1158	Check: Date N/A Ti	ime N/A	Check:	Date N/A Tim	e N/A	Out: Date 03	/13/07 Time 1557	
			Comm	ents				,	
Zor	e 2 - Full Volume calibration.								
			•						
	miner: Bret Flesner nature: 100 Therman	_evel: II Date: (	- 1	Examiner: Signature	N/A		Level: N/A	Date: N/A	
	EVA Review: Adam Control	evel: III Date: (	03/18/07		<del></del>	4 4 A	<u> </u>	Page 18 of 25	



#### Reactor Pressure Vessel 000264 Manual Ultrasonic Calibration Data Sheet

Utili	ity: TVA	Site: B	rowns F	erry Nuclea	ar Plant	Unit: 2		Outage: C	ycle 14 RFO	
Cal	libration Data Sheet Number:	N2GNV-CDS6		ISI	Report Nu	umber: $\mathcal{K}_{l}$	136			
Cor	mponent ID: N2G-NV			Con	nponent De	escription: N2	Nozzle-to-	Vessel Weld		
Exa	amination Procedure: N-UT-79	9 Revision 1		Арр	licable SD	CN(s): N/A			,	
	Ultrasonic Inst	rument				Tra	ansduce	r		
Maı	nufacture: Staveley			Manufactu	ire: KBA		Mode	Model: Benchmark 113-242-591		
Mor	del: Sonic 136			Serial Number: 00XT7F				uency: 2.25 MHz	·	
Ser	rial Number: 136P1200G08145	56		Size: 0.50"	· · · · · · · · · · · · · · · · · · ·			e: Round		
Line	earity Sheet No.: LDS2			# of Eleme	ents: 1		Confi	guration: Single		
	Instrument Se	ttings		Refracted	Angle: 45°	· ——————	Meas	sured Angle: 45°	w .	
ш	Range: 10.0" Sound Pat	th  Depth	7- 2	Skew Angle: N/A				ured Skew Angle	e: N/A	
ZANGE	Delay: 0.380"			Mode: She	Mode: Shear Rad			us: Flat		
OL	Velocity: 0.127 in / μS			Cable Typ	e: RG-174	Length: 6'	Intern	mediate Connect	ors: 0	
~	Display: Filt2			l	<u> </u>					
RCVR	Frequency: 2.25MHz			Type: CS F	Rompas		S/N: 791	413	<del></del>	
	Reject: Off			Reflecto	or:	2" Reflector		8" Ref	flector	
<b>)</b>	Pulse Width: 222nS			Swee	ep:	2.0 div.		8.0	div.	
	Damping: 500Ω	Damping: 500Ω			de:	80 %FSH		80 %	FSH	
	Mode: ⊠Pulse Echo □D	Mode: ⊠Pulse Echo □Dual			iin:	19.4 dB		45.2	: dB	
PULSER	Rep Rate: 2kHz					Basic Ca	alibration	Block		
PL	Pulser: 150V 300V (	(*Sonic 137 only)		Block ID: BF-18			Material:	Clad CS		
	*Pulser voltage adjustable with the	e Sonic 137 instrume	ent only.	Thickness:	: 6.0" with	0.125" clad	Diamete	Diameter: Flat		
	The Sonic 136 has a fix			Temperatu	ure: 70 °F		Therm. S	Therm. SN: VH-9520		
		·		Couplant:	Ultragel II		Batch No	Batch No.: 05325		
		R	eferenc	ce Sensiti	ivity Info	rmation				
Re	flector: (See Verification)	Sweep: (See Ve	rification	n) A	\mplitude:	N/A	G	Sain: N/A		
Cal	I In: Date 03/14/07 Time 0938	Check: Date N/A	Time N/	/A C	heck: Date	e N/A Time N/A	0	ut: Date 03/14/07	Time 1208	
				Comm	ents		- x			
Thi	is full volume calibration used	to locate and cha-	racterize	e flaw indica	ation prior	to sizing.				
	aminer: Bret Flesner gnature: Sugar Filler	Level: II	Date: (	I .	Examiner: Signature	N/A		Level: N/A	Date: N/A	
	REVA Review: Adam Contingnature:	Level: III	Date: (	03/18/07					Page 19 of 25	



## Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	Site: Br	rowns	Ferry Nu	iclear Pl	ant Unit: 2		Outage: 0	Cycle 14 RFO	
Ca	ibration Data Sheet Number:	N2GNV-CDS7			ISI Rep	ort Number: <u>K</u>	136			
Co	mponent ID: N2G-NV	-		(	Compon	ent Description: N	2 Nozzle-to	Vessel Weld	·	
Exa	amination Procedure: N-UT-7	9 Revision 1		P	Applicab	e SDCN(s): N/A				
	Ultrasonic Inst	rument		equal for		T	ransduce	,		
Ma	nufacture: Staveley			Manufa	cture: K	ВА	Mode	l: Benchmark 1	13-242-591	
Мо	del: Sonic 136			Serial N	Number:	00XT7F	Frequ	iency: 2.25 MHz	· · · · · · · · · · · · · · · · · · ·	
Sei	ial Number: 136P1200G0814	56		Size: 0.	.50"		Shap	e: Round		
Lin	earity Sheet No.: LDS2			# of Ele	ements:	1	Confi	guration: Single		
	Instrument Se	ettings		Refract	ed Angle	e: 45°	Meas	ured Angle: 45°	_	
9	Range: 4.00" Sound Pa	th Depth		Skew A	ngle: N	A	Meas	ured Skew Ang	e: N/A	
RANGE	Delay: 2.38"		· jar.	Mode:	Shear	, <u></u> _	Radio	ıs: Flat		
œ	Velocity: 0.127 in / μS			Cable 1	Γype: R0	6-174 Length: 6'	nediate Connec	tors: 0		
~_	Display: Filt2					Verif	ication Bl	ock		
RCVR	Frequency: 2.25MHz				Type: CS Rompas S/			N: 791413		
_	Reject: Off			Refl	ector:	ctor: 2" Reflector		5" Re	5" Reflector	
	Pulse Width: 222nS			Sv	weep:	0.0 div.		7.5 div.		
	Damping: 500Ω		.,	Ampl	itude:	80 %FSH		20 %	%FSH	
	Mode: ⊠Pulse Echo □Dual				Gain:	23.4 dB		34.	4 dB	
SER	Rep Rate: 2kHz					Basic C	alibration	Block		
PUL	Pulser: □150V □300V	(*Sonic 137 only)		Block II	D: BF-18	3	Material:	Clad CS		
	*Pulser voltage adjustable with th		it only.	Thickness: 6.0" with 0.125" clad			Diameter	Diameter: Flat		
	The Sonic 136 has a fix	ked pulser voltage.		Tempe	rature: 7	0 °F	Therm. S	herm. SN; VH-9520		
				Coupla	nt: Ultra	gel II	Batch No	.: 05325		
		Re	feren	ce Sens	sitivity	Information		-		
Ref	lector: (See Verification)	Sweep: (See Ver	ificatio	n)	Amplit	ude: N/A	G	ain: N/A		
Cal	In: Date 03/14/07 Time 0941	Check: Date N/A	Time N	V/A	Check	Date N/A Time N/	/A O	ut: Date 03/14/07	Time 1211	
				Con	nments					
Thi	s "depth zone" calibration use	d for sizing informa	ation.	2" sound	lpath de	ayed off screen to	display 2"	to 6" on A-scan.		
1/2	-t SDH in basic calibration blo	ck 5.2 divisions @	40.4 c	dB.						
	nature: Steet Flesner	Level: II	Date:	03/14/07	/07 Examiner: N/A Signature Level: N/A Date: N			Date: N/A		
				03/18/07	Page 20 of 2				Page 20 of 25	



#### Reactor Pressure Vessel 600266 Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	Site: Browns	Ferry Nucle	ear Plant	Unit: 2		Outage: (	Cycle 14 RFO	
Ċal	ibration Data Sheet Number: N2GNV-0	DDS8	ISI	Report Nu	imber: 13/3	6	<del></del>		
Cor	mponent ID: N2G-NV		Cor	mponent De	escription: N2	Nozzle-to-Ve	essel Weld		
Exa	amination Procedure: N-UT-79 Revision	n 1	Apr	plicable SD	CN(s): N/A				
	Ultrasonic Instrument				Tra	ansducer		- <u>-</u>	
Mai	nufacture: Staveley		Manufactu	ure: KBA		Model: I	Model: Benchmark 113-242-591		
Mo	del: Sonic 136		Serial Nur	mber: 006Y	LP	Frequer	cy: 2.25 MHz	 Z	
Ser	ial Number: 136P1200G081456		Size: 0.50	)"		Shape:	Round		
Line	earity Sheet No.: LDS2		# of Eleme	ents: 1		Configu	ration: Single		
	Instrument Settings		Refracted	Angle: 60°		Measure	ed Angle: 59°	•	
ш	Range: 14.0" ⊠Sound Path □De	epth	Skew Ang	jle: N/A		Measure	ed Skew Ang	le: N/A	
RANGE	Delay: 0.594"		Mode: She	ear		Radius:	Flat	<del>-</del>	
DC.	Velocity: 0.127 in / µS		Cable Typ	Type: RG-174 Length: 6' Intermediate Connectors: 0					
	Display: Filt2		Verification Block						
RCVR	Frequency: 2.25MHz	Type: CS	Rompas S/N: 791413			3			
	Reject: Off	Reflect	ector: 2" Reflector			14" R	eflector		
	Pulse Width: 222nS	Swee	ер:	1.4 div.		10.0	) div.		
-	Damping: 500Ω	Amplitud	de:	80 %FSH		80 %	%FSH		
	Mode: ⊠Pulse Echo □Dual	Ga	in:	25.2 dB		48.	2 dB		
PULSER	Rep Rate: 2kHz				Basic Ca	libration B	lock		
P.	Pulser: ☐150V ☐300V (*Sonic 137 o	nly)	Block ID: I	BF-18		Material: Cla	ad CS	,	
	*Pulser voltage adjustable with the Sonic 137	instrument only.	Thickness	s: 6.0" with 0	).125" clad	Diameter: F	lat		
	The Sonic 136 has a fixed pulser vo	oltage.	Temperatu	ure: 70 °F		Therm. SN: VH-9520			
			Couplant:	Ultragel II		Batch No.: 0	Batch No.: 05325		
_		Referen	ce Sensiti	ivity Infor	mation	- 00 pM			
Ref	lector: (See Verification) Sweep: (	See Verificatio	n) A	Amplitude: N	1/A	Gain	: N/A		
Cal	In: Date 03/14/07 Time 0955 Check: Date 03/14/07 Time 0955	ate N/A Time N	I/A C	Check: Date	N/A Time N/A	Out:	Date 03/14/07	7 Time 1214	
This	s full volume calibration used to locate a	nd characteriz	Comm		o sizing.				
	rniner: Bret Flesner Leve	el: II Date:		Examiner: I Signature	N/A		Level: N/A	Date: N/A	
		el: III Date:	03/18/07					Page 21 of 25	



## Reactor Pressure Vessel 630267 Manual Ultrasonic Calibration Data Sheet

Jtil	ity: TVA	Site: Brow	ns Ferry N	luclear l	Plant Unit: 2		Outage:	Cycle 14 RFO	
Cal	ibration Data Sheet Number: N20	NV-CDS9		ISI Re	port Number: RI	36			
Co	mponent ID: N2G-NV			Compo	onent Description: N2	Nozzie-to-Ve	essel Weld		
Exa	amination Procedure: N-UT-79 Re	vision 1		Applica	able SDCN(s): N/A				
	Ultrasonic Instrum	ent			Tra	ansducer			
Ma	nufacture: Staveley		Manu	facture:	KBA	Model:	Model: Benchmark 113-242-591		
Мо	del: Sonic 136		Serial	Serial Number: 006YLP			ncy: 2.25 MH:	<u> </u>	
Ser	ial Number: 136P1200G081456		Size:	0.50"		Shape:	Round		
Line	earity Sheet No.: LDS2		# of E	lements	s: 1	Configu	ration: Single		
	Instrument Settin	gs	Refra	cted An	gle: 60°	Measur	ed Angle: 59°		
w	Range: 6.00" Sound Path	Depth	Skew	Angle:	N/A	Measur	ed Skew Ang	le: N/A	
RANGE	Delay: 2.44"		Mode	: Shear		Radius:	Flat		
<u>«</u>	Velocity: 0.127 in / μS		Cable	Type: F	RG-174 Length: 6'	Interme	diate Connec	tors: 0	
	Display: Filt2				Verific	cation Bloc	k		
RCVR	Frequency: 2.25MHz		Туре:	CS Ro	npas	S/N: 79141	3		
	Reject: Off	ff Reflector:			2" Reflector		8" R€	flector	
	Pulse Width: 222nS		3	Sweep:	0.0 div.		10.0	) div.	
	Damping: 500Ω		Amı	olitude:	80 %FSH		15 %	6FSH	
	Mode: ⊠Pulse Echo □Dual			Gain:	26.6 dB		40.	8 dB	
PULSER	Rep Rate: 2kHz				Basic Ca	libration B			
PUL	Pulser: 150V 300V ('Sonic	137 only)	Block	ID: BF-	18	Material: CI	ad CS		
	*Pulser voltage adjustable with the Son	ic 137 instrument on	Thickr	ness: 6.	0" with 0.125" clad	Diameter: F	lat		
	The Sonic 136 has a fixed pu		-	erature:	70 °F	Therm. SN:	VH-9520		
		•	Coupl	ant: Ulti	ragel II	Batch No.:	05325		
		Refer	ence Ser	nsitivit	y Information				
Ref	lector: (See Comments) Swe	eep: (See Commi	ents)	Amp	litude: (See Commen	its) Gair	ı: (See Comn	nents)	
Cal	In: Date 03/14/07 Time 1000 Che	ck: Date N/A Tim	e N/A	Che	ck: Date N/A Time N/A	Out:	Date 03/14/07	Time 1216	
			Co	mmen	ts				
This	s "depth zone" calibration used fo	r sizing informatio	n. 2" sou	ndpath	delayed off screen to	display 2" to	.8" on A-scan	•	
	t SDH in basic calibration block 1. It SDH in basic calibration block 6.								
	aminer: Bret Flesner nature: Apar Filemon	te: 03/14/0		7 Examiner: N/A Signature			Date: N/A		
	EVA Review: Adam Conti	te: 03/18/0	)7	Page 22 of 25					



# Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet

Util	lity: TVA	Site: Brown	ns Ferry N	Juclear Pla	nt Unit: 2		Outage: 0	Cycle 14 RFO	
Cal	libration Data Sheet Number:	N2GNV-CDS10		ISI Repo	rt Number:	R136			
Co	mponent ID: N2G-NV			Compone	ent Description:	N2 Nozzle-t	to-Vessel Weld		
Exa	amination Procedure: N-UT-7	9 Revision 1		Applicable	e SDCN(s): N//	Α			
	Ultrasonic Inst	rument		<u> </u>		Transduc	er		
Ма	nufacture: Staveley		Manu	ifacture: KE	ЗА	Mod	Model: Gamma RHP 242-043		
Мо	del: Sonic 136		Serial	Serial Number: 00YH67			equency: 2.25 MHz		
Sei	rial Number: 136P1200G0814	56	Size: (	0.50"		Sha	ape: Round		
Lin	earity Sheet No.: LDS2		# of E	Elements: 1		Cor	nfiguration: Single	-	
	Instrument Se	ttings	Refra	cted Angle	: 0°	Mea	asured Angle: N/A		
ш	Range: 10.0" Sound Pat	th □Depth	Skew	Angle: N/A	4	Mea	asured Skew Angl	e: N/A	
RANGE	Delay: 0.101"		Mode	Mode: Longitudinal Radius: N					
<u> </u>	Velocity: 0.229 in / μS		Cable	Cable Type: RG-174 Length: 6' Intermediate Connectors:					
~	Display: Filt2			Verification Block					
RCVR	Frequency: 2.25MHz			pe: CS Rompas S		S/N: 79	/N; 791413		
	Reject: Off			eflector:	1" Backy	wail	10" Ba	ackwall	
•	Pulse Width: 222nS			Sweep:	1.0 div	v.	10.0 div.		
1	Damping: 500Ω		Amr	plitude:	, N/A		N	/A	
	Mode: ⊠Pulse Echo □□	Mode: ⊠Pulse Echo □Dual			N/A		· N	/A	
PULSER	Rep Rate: 2kHz				Basic	Calibratio	libration Block		
Ę	Pulser: ☐150V ☐300V (	(*Sonic 137 only)	Block	ID: BF-18		Materia	al: Clad CS		
	*Pulser voltage adjustable with the	e Sonic 137 instrument on	Thickr	ness: 6.0"	with 0.125" clad	1 Diamet	Diameter: Flat		
	The Sonic 136 has a fix		· .	erature: 70	) °F	Therm.	Therm. SN: VH-9520		
	·		Coupl	lant: Ultrag	el II	Batch N	Batch No.: 05325		
_		Refere	ence Ser	nsitivity I	nformation			,	
Ref	flector: N/A	Sweep: N/A		Amplitu	ıde: N/A		Gain: N/A		
Cal	In: Date 03/14/07 Time 1005	Check: Date N/A Time	e N/A	Check:	Date N/A Time	N/A	Out: Date 03/14/07	Time 1218	
Cal	libration used for thickness me	easurments only.	Co	omments					
	aminer: Bret Flesner nature:	Level: II Dat	te: 03/14/0	07 Exami	iner: N/A ture	<u> </u>	Level: N/A	Date: N/A	
	EVA Review: Adam Conti	Level III Dat	te: 03/18/0	07				Page 23 of 25	



#### Reactor Pressure Vessel 000269 Manual Ultrasonic Calibration Data Sheet

Util	ty: TVA	Site: Bi	rowns Ferry	Nuclear F	'iant	Unit: 2		Outage:	Cycle 14 RFO	
Cal	bration Data Sheet Number: N2GN	NV-CDS11		ISI Rep	ort Nun	mber: K	136			
Cor	nponent ID: N2G-NV			Compo	nent De	scription: N2	Nozzie-to-\	vessel Weld		
Exa	mination Procedure: N-UT-78 Rev	ision 4		Applica	ble SDC	CN(s): N/A				
	Ultrasonic Instrume	ent				Tra	ansducer			
Mai	nufacture: Staveley	Takan pekinalan	Manu	ıfacture:	RTD		Model	Model: TRL2-ST		
Mod	del: Sonic 136		Seria	I Numbe	r: 07-30	ency: 2 MHz				
Ser	ial Number: 136P1200G081456		Angle	e: 60°			Measu	red Angle: 60	•	
Line	earity Sheet No.: LDS2		Mode	: Refract	ted Long	gitudinal	Size: 2	2(24x42)mm		
	Instrument Setting	s	Focu	s: FS~12	5mm		Squint	Angle: 5°		
111	Range: 8.00" Sound Path	_Depth	# of E	ements	: 2	Shape: Rec	t. Config	juration: Dual	- SBS	
RANGE	Delay: 1.34"	<del></del>	Cable	e Type: F	RG-174	Length: 1	2' Interm	nediate Connectors: 0		
or ·	Velocity: 0.227 in / μS			Verification Block						
	Display: Filt 2			: N/A	S/N:					
RCVR	Frequency: 2.25 MHz			eflector:	or: N/A			N/A		
<b>.</b>	Reject: Off			Sweep:		N/A		N/A		
	Pulse Width: 222 nS			plitude:		N/A			N/A	
	Damping: 500 Ω			Gain:		N/A			N/A	
œ.	Mode: □Pulse Echo  ☑Dual					Basic Ca	libration	Block		
PULSER	Rep Rate: 2kHz	play: Filt 2  Type: N/A  Reflector:  N/A  System of the content o	cs							
<u>a</u>	Pulser: 150V 300V (*Sonic	137 only)	Thick	ness: 6.0	0" with 0	).125" Clad	Diameter	Flat	· · · · · · · · · · · · · · · · · · ·	
			. The Temp	perature:	70 °F		Therm. Si	N: VH-9520		
	Sonic 136 has a fixed pulser	voltage.	Coup	Couplant: Ultragel II			Batch No.: 05325			
		Re	ference Se	nsitivit	y Infori	mation				
Ref	lector: 1/4-t SDH	Sweep: 3.7	vib		Amplitue	de: 80 %FSH		Gain: 58.4 d	В	
Cal	In: Date 03/14/07 Time 0932	Check: Date	N/A Time N/A	4	Check: [	Date N/A Time	e N/A	Out: Date 03	/14/07 Time 1222	
			C	ommen	ts					
Zor	ne 1 - Near Surface calibration.									
Thi	s calibration used to locate flaw price	or to sizing.			•					
	aminer: Bret Flesner nature:	Level: II	Date: 03/14/0	- 1 .	miner: I	N/A		Level: N/A	Date: N/A	
	EVA Review: Adam/Continature:	Level: III	Date: 03/18/0	07					Page 24 of 25	



## Reactor Pressure Vessel 600270 Manual Ultrasonic Calibration Data Sheet

Jtili	ty: TVA	Site: Browns f	erry Nuclear	Plant	Unit: 2		Outage:	Cycle 14 RFO	
Cal	bration Data Sheet Number: N2GNV-	CDS12	ISI Re	eport Nun	nber: R13	66			
Çor	mponent ID: N2G-NV		Comp	onent De	scription: N2	Nozzle-to-V	essel Weld.		
Exa	mination Procedure: N-UT-78 Revisio	n 4	Applic	cable SDC	CN(s): N/A				
	Ultrasonic Instrument				Tra	ansducer			
Mai	nufacture: Staveley		Manufacture	: RTD		Model:	TRL2-ST		
Mad	del: Sonic 136		Serial Numb	er: 07-30	5	Freque	ncy: 2 MHz		
Ser	ial Number: 136P1200G081456		Angle: 60°			Measur	ed Angle: 60	0	
Line	earity Sheet No.: LDS2		Mode: Refracted Longitudinal Size: 2(24x42)mm						
	Instrument Settings		Focus: FS~	125mm		Squint /	Angle: 5°		
ш	Range: 18.0" ⊠Sound Path □D	epth	# of Elemen	ts: 2	Shape: Rect	Configu	ration: Dual	- SBS	
RANGE	Delay: 1.34"		Cable Type: RG-174 Length: 12' Inte			2' Interme	diate Connec	ctors: 0	
αc ·	Velocity: 0.227 in / μS			Verific	cation Bloc	ck			
	Display: Filt 2		Type: N/A			S/N: N/A			
RCVR	Frequency: 2.25 MHz	Reflector	: N/A			N/A			
"	Reject: Off		Size: 2(24x42)mm   Size: 2(24x42)mm   Focus: FS~125mm   Squint Angle: 5°     # of Elements: 2   Shape: Rect.   Configuration: Dual - SBS     Cable Type: RG-174   Length: 12'   Intermediate Connectors: 0     Verification Block     Type: N/A	N/A					
	Pulse Width: 222 nS		Amplitude	:	N/A			N/A	
	Damping: 500 Ω		Gain	:	N/A		1	N/A	
œ	Mode: □Pulse Echo ☑Dual			Basic Ca	libration E	Block			
PULSER	Rep Rate: 2kHz		Block ID: BF	-18		Material: C	S		
₫.	Pulser: 150V 300V (*Sonic 137	only)	Thickness: 6	3.0" with 0	).125" Clad	Diameter: !	lat		
	*Probe voltage is adjustable with the Sonic 137		Temperatur	e: 70 °F		Therm. SN	: VH-9520		
	Sonic 136 has a fixed pulser volta	age.	Couplant: Ultragel II Bate			Batch No.:	atch No.: 05325		
		Referen	ce Sensitiv	ity Infor	mation				
Ref	flector: ID Notch Swe	eep: 6.3 div		Amplitue	de: 80 %FSH		Gain: 73.2 d	В	
Cal	In: Date 03/14/07 Time 0934 Che	eck: Date N/A Ti	me N/A	Check: I	Date N/A Time	e N/A	Out: Date 03	/14/07 Time 1225	
	ne 2 - Full Volume calibration. s calibration used to locate flaw prior to	sizing.	Comme	nts					
	nature: Sor Fileman	_	<u> </u>	1 -			Date: N/A		
AREVA Review: Address Continue Level: III Date: 03/18/07 Page 25 of 2						Page 25 of 25			

## Examination Report, R-143 N2H-NV, RPV Nozzle-To-Head Weld



#### RPV Nozzle Ultrasonic Examination Summary Sheet

000271

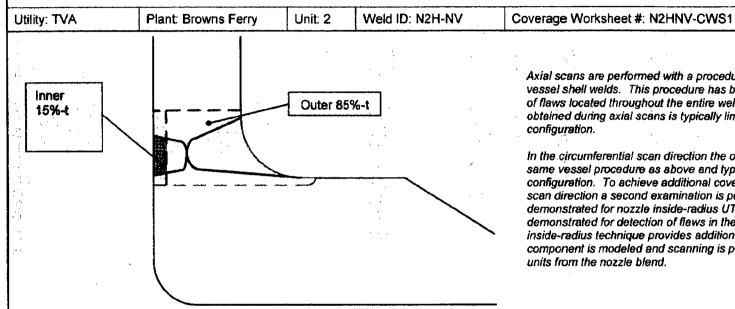
				Summa	ary Sheet				
Utility: TVA	Site: Browns F	erry Nuclear P	lant U	nit: 2	Outage: Cycle 14	ISI Report	#: R143		
Component Number:	N2H-NV	Component	Description: N	2 Nozzle t	o Vessel Weld	System: R	PV		
Code Category: B-D		Code Item: E	33.90		Code Class: 1	Material: C	S		
ISO / Drawing(s): 2-0	CHM-2046-C-01	3 2-ISI-0270-C	-01		·				
Procedure Number	er Proced	dure Revision	SE	CN	Pro	cedure Misc. I	nfo		
N-UT-78		4.	V	IA	Revision 11 of the f	PDI-UT-6 qualifi	ed equipment table		
N-UT-79		1 -	N	IA	Revision 5 of the P	DI-UT-7 qualific	ed equipment table		
54-ISI-850		06	30-9044	1520-000		port: IR-2003-1 Letter dated 3			
Ca	libration Sheets			Data eets	Indication Data Sheets		m Results		
N2ANV-CDS1			<del></del>	/-ED\$1			able Indications		
N2ANV-CDS2							Flaw Indications flaw evaluation)		
N2ANV-CDS3				····		'	Flaw Indications		
N2ANV-CDS4						(unacceptal	ble flaw evaluation)		
N2ANV-CDS5			<del></del>						
Summary:									
reportable indication In accordance with	from the vessel surface in both the axial (radial) and circumferential scan directions. These examinations resulted in no reportable indications.  In accordance with UT procedure 54-ISI-850-06 and the referenced TVA / EPRI modeling report the following additional examinations were performed. These examinations resulted in no reportable indications.								
		N2 I	Nozzle Mode	elina Pari	meters				
	Probe Refra	acted Angle	Probe Ske		Scan Surface				
	40		-120°		Blend Radius				
	50		+120°		Blend Radius				
	60		±(33°-66°	7	Vessel				
minimum coverage examination proced 50.55a. The 60°RI obtained to 50%. If	This ultrasonic examination was performed in accordance with the criteria of 10 CFR50.55a (b)(2)(xv)(G) and the minimum coverage requirements of 10 CFR50.55a (b)(2)(xv)(K) was achieved to the maximum extent possible. The examination procedure requires an additional circumferential scan of the outer 85%-t which is not addressed in 10CFR 50.55a. The 60°RL examinations were limited due to the nozzle configuration which reduced the examination volume obtained to 50%. Refer to coverage sketch(s) and worksheet for a description of the scanning volume, examination coverage, and scan limitations.								
This examination satisfies the requirements of ASME Section XI (2001 thru 2003 Addenda) and was performed using ASME Section XI, Appendix VIII qualified personnel, procedures, and equipment.  Note: See TVA Request for Relief PDI-1 and PDI-2. Dockets No. 50-261/296, 50-327/328, and 50-0390. This relief request reduced the area to be examined per IWB-2500-7 (a) and (b) to the well plus ½" on each side.									
		-							
Prepared by: Bret F Signature:		Date	: 3/20/07	Review Signatu	ed by: Atlan Continue	$\Rightarrow$	Date: 3/21/07		
Customer: Matt Welch Will Date: 3/				ANII: Signatu	1 ota		Date: 5/2/67		
			<del>- ( - '</del>		1	-(	Page 1 of 11		



#### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

Utility: TV					te: Browns Fe	rry Nuclear F	Plant				Jnit: 2		Outage	: Cycle 14 RFI	0
			Number: N2	HNV-EDS1				ISI Report N			····	<del></del>			
Compone	ent ID: N	2H-NV	<u> </u>			· · · · · · · · · · · · · · · · · · ·	····	Component	Description:	N2 Noz	zle-to-Ve	essel We	ld		
						Exa		n Information					<del></del>		
				-C-01 & 2-ISI-02	70-C-01			ocation: Nozzle Bo			Lo	Location	: Nozzle	TDC	
Examinat	tion Limite	ed: ⊠Y	'es □No					rage Sheet Numbe	er(s): N2HN\	/-CWS1			<del></del>		
Scan Information													·		
Examination	on Procedu	ıre: 54-l	ISI-850-06		Applicable SD	CN's: 30-904	4520-000					Scan Su	rface: O[	Blend Radius	
Angle/ Mode				on Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Li	mited	Recon Indicat		Indication Data Sheet #	Examiner Initials
*50°S	-120°		N2HN	V-CDS1	03/12/07	1101	84°F	VH-9525	72.0 dB	□Yes	⊠No	□Yes	⊠No	N/A	GC
40°S	+120°		N2HN	V-CDS2	03/12/07	1031	84°F	VH-9525	72.0 dB	□Yes	⊠No	☐Yes	⊠No	N/A	GC
NA.	N/A		1	WA	N/A	. N/A	N/A.:	N/A	N/A	□Yes	□No	☐Yes	□No	N/A	N/A
NA	N/A		· I	WA	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A	N/A
Examination	on Procedu	ure: 54-l	ISI-850-06		Applicable SD	CN's: 30-904	4520-000					Scan Su	rface: Ol	Vessel Shell	
Angle/ Skew Calibration Sheet # Date Time Temp Thermometer Scan Gain Scan Limited								imited	Recor- Indicat		Indication Data Sheet #	Examiner Initials			
60°S ±33° to 66° N2HNV-CDS3 03/12/07 1421 82°F VH-9520 72.0 dB							☐Yes	⊠No	□Yes	⊠No	N/A	BF			
N/A	N/A			WA	N/A	N/A	N/A	N/A	N/A	☐Yes	□No	☐Yes	□No	N/A	N/A
Examination Procedure: N-UT-78 revision 4 Applicable SDCN's: N/A												Scan Su	rface: Ol	O Vessel Shell	
Examination	on Proceau	UIG. 14-0	11-10 166/2/01	• •											
Examinati Angle/ Mode	Zone		Direction	Calibration Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	.imited	Recor Indicat		Indication Data Sheet #	Examiner Initials
Angle/		Beam		Calibration	<del>                                     </del>	T	Temp 82°F		Scan Gain 78.4 dB	Scan L ⊠Yes			ion(s)		
Angle/ Mode	Zone	Beam	Direction	Calibration Sheet #	Date	Time		S/N:			□No	Indicat	ion(s)	Data Sheet #	Initials
Angle/ Mode 60°/RL	Zone 1	Beam ⊠Rad	Direction	Calibration Sheet # N2HNV-CDS4	Date 03/12/07	Time 1525	82°F	S/N: VH-9520	78.4 dB	⊠Yes	□No □No	Indicat ☐Yes	ion(s)  No	Data Sheet # N/A	Initials BF
Angle/ Mode 60°/RL 60°/RL	Zone 1 2	Beam ⊠Rad ⊠Rad	Direction  dial Circ  dial Circ	Calibration Sheet # N2HNV-CDS4 N2HNV-CDS5	Date 03/12/07 03/12/07	Time 1525 1605	82°F 82°F	S/N: VH-9520 VH-9520	78.4 dB 76.0 dB	⊠Yes ⊠Yes	□No □No □No	Indicat ☐Yes ☐Yes	ion(s)  No  No	Data Sheet # N/A N/A	Initials BF BF
Angle/ Mode 60°/RL 60°/RL 60°/RL	Zone 1 2 1 2	Beam ⊠Rad ⊠Rad	Direction  dial □Circ  dial □Circ  dial □Circ	Calibration Sheet # N2HNV-CDS4 N2HNV-CDS5 N2HNV-CDS4	03/12/07 03/12/07 03/12/07	Time 1525 1605 1525	82°F 82°F 82°F	S/N: VH-9520 VH-9520 VH-9520	78.4 dB 76.0 dB 78.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Indicat  Yes  Yes  Yes	ion(s)  No  No	Data Sheet # N/A N/A N/A	Initials  BF  BF
Angle/ Mode 60°/RL 60°/RL 60°/RL Commen	Zone 1 2 1 2 sts:	Beam ⊠Rad ⊡Rad □Rad	n Direction  dial □Circ  dial □Circ  dial ⊠Circ  dial ⊠Circ	Calibration Sheet # N2HNV-CDS4 N2HNV-CDS5 N2HNV-CDS4 N2HNV-CDS5	Date 03/12/07 03/12/07 03/12/07 03/12/07	Time 1525 1605 1525 1605	82°F 82°F 82°F	S/N: VH-9520 VH-9520 VH-9520	78.4 dB 76.0 dB 78.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Indicat  Yes  Yes  Yes	ion(s)  No  No	Data Sheet # N/A N/A N/A	Initials  BF  BF
Angle/ Mode 60°/RL 60°/RL 60°/RL Commen	Zone 1 2 1 2 sts:	Beam ⊠Rad ⊡Rad □Rad	n Direction  dial □Circ  dial □Circ  dial ⊠Circ  dial ⊠Circ	Calibration Sheet # N2HNV-CDS4 N2HNV-CDS5 N2HNV-CDS4	Date 03/12/07 03/12/07 03/12/07 03/12/07	Time 1525 1605 1525 1605	82°F 82°F 82°F	S/N: VH-9520 VH-9520 VH-9520	78.4 dB 76.0 dB 78.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Indicat  Yes  Yes  Yes	ion(s)  No  No	Data Sheet # N/A N/A N/A	Initials  BF  BF
Angle/ Mode 60°/RL 60°/RL 60°/RL Commen	Zone 1 2 1 2 sts:	Beam ⊠Rad ⊡Rad □Rad	n Direction  dial □Circ  dial □Circ  dial ⊠Circ  dial ⊠Circ	Calibration Sheet # N2HNV-CDS4 N2HNV-CDS5 N2HNV-CDS4 N2HNV-CDS5	Date 03/12/07 03/12/07 03/12/07 03/12/07	Time 1525 1605 1525 1605	82°F 82°F 82°F	S/N: VH-9520 VH-9520 VH-9520	78.4 dB 76.0 dB 78.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Indicat  Yes  Yes  Yes	ion(s)  No  No	Data Sheet # N/A N/A N/A	Initials  BF  BF
Angle/ Mode 60°/RL 60°/RL 60°/RL Commen	Zone  1 2 1 2 sts:	Beam  Rad  Rad  Rad  Rad	n Direction  dial □Circ  dial □Circ  dial □Circ  dial □Circ  dial □Circ	Calibration Sheet # N2HNV-CDS4 N2HNV-CDS5 N2HNV-CDS4 N2HNV-CDS5	Date 03/12/07 03/12/07 03/12/07 03/12/07	Time 1525 1605 1525 1605 angle	82°F 82°F 82°F 82°F	S/N: VH-9520 VH-9520 VH-9520 VH-9520	78.4 dB 76.0 dB 78.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Indicat  Yes  Yes  Yes	ion(s)  No  No	Data Sheet # N/A N/A N/A N/A	Initials BF BF BF
Angle/ Mode 60°/RL 60°/RL 60°/RL Commen * See note	Zone  1 2 1 2 sts: e on calibra George C	Beam  Rad  Rad  Rad  Rad	n Direction  dial □Circ  dial □Circ  dial □Circ  dial □Circ  ta sheet for dial	Calibration Sheet #  N2HNV-CDS4  N2HNV-CDS5  N2HNV-CDS4  N2HNV-CDS5	Date 03/12/07 03/12/07 03/12/07 03/12/07	Time 1525 1605 1525 1605	82°F 82°F 82°F 82°F	S/N: VH-9520 VH-9520 VH-9520 VH-9520	78.4 dB 76.0 dB 78.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Indicat  Yes  Yes  Yes	ion(s)  No No No	Data Sheet # N/A N/A N/A N/A	Initials  BF  BF
Angle/ Mode 60°/RL 60°/RL 60°/RL Commen * See note	Zone  1 2 1 2 sts: e on calibra George C	Beam  Rad  Rad  Rad  Rad  hapman	n Direction  dial □Circ  dial □Circ  dial □Circ  dial □Circ  dial □Circ	Calibration Sheet #  N2HNV-CDS4  N2HNV-CDS5  N2HNV-CDS4  N2HNV-CDS5	Date 03/12/07 03/12/07 03/12/07 03/12/07 e 50° measured Level: II	Time 1525 1605 1525 1605 angle.	82°F 82°F 82°F 82°F	S/N: VH-9520 VH-9520 VH-9520 VH-9520 Examiner: N/A Signature:	78.4 dB 76.0 dB 78.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Indicat  Yes  Yes  Yes	ion(s)  No No No No	N/A N/A N/A N/A N/A N/A N/A N/A	BF BF BF BF
Angle/ Mode 60°/RL 60°/RL 60°/RL Commen * See note Examiner: Signatur Examiner:	Zone  1 2 1 2 tts: e on calibra  George C Te: Bret Flest	Beam  Rad  Rad  Rad  Rad  hapman	Direction  dial □Circ  dial □Circ  dial □Circ  dial □Circ  ta sheet for dial	Calibration Sheet #  N2HNV-CDS4  N2HNV-CDS5  N2HNV-CDS4  N2HNV-CDS5  etails relating to the	Date 03/12/07 03/12/07 03/12/07 03/12/07	Time 1525 1605 1525 1605 angle	82°F 82°F 82°F 82°F	S/N: VH-9520 VH-9520 VH-9520 VH-9520 Examiner: N/A Signature: Examiner: N/A	78.4 dB 76.0 dB 78.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Indicat  Yes  Yes  Yes	ion(s)  No No No	N/A N/A N/A N/A N/A N/A N/A N/A	Initials BF BF BF
Angle/ Mode 60°/RL 60°/RL 60°/RL Commen * See note Examiner: Signatur Examiner: Signatur Signatur	Zone  1 2 1 2 sts: e on calibra George C re: Bret Flesf re: S	Beam  Rad  Rad  Rad  Rad  hapman	Direction  dial Circ  dial Circ  dial Scirc  dial Scirc  ta sheet for design of the sheet for design o	Calibration Sheet #  N2HNV-CDS4  N2HNV-CDS5  N2HNV-CDS4  N2HNV-CDS5  etails relating to the	Date 03/12/07 03/12/07 03/12/07 03/12/07 e 50° measured Level: II Level: II	Time 1525 1605 1525 1605 angle.  Date: 03/1	82°F 82°F 82°F 82°F	S/N: VH-9520 VH-9520 VH-9520 VH-9520 Examiner: N/A Signature:	78.4 dB 76.0 dB 78.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Indicat  Yes  Yes  Yes	ion(s)  No No No No	N/A N/A N/A N/A N/A N/A N/A N/A	BF BF BF BF
Angle/ Mode 60°/RL 60°/RL 60°/RL Commen * See note Examiner: Signatur Examiner: Signatur Signatur	Zone  1 2 1 2 sts: e on calibra George C re: Bret Flesf re: eview: Ada	Beam  Rad  Rad  Rad  Rad  hapman	Direction  dial Circ  dial Circ  dial Scirc  dial Scirc  ta sheet for design of the sheet for design o	Calibration Sheet #  N2HNV-CDS4  N2HNV-CDS5  N2HNV-CDS4  N2HNV-CDS5  etails relating to the	Date 03/12/07 03/12/07 03/12/07 03/12/07 e 50° measured Level: II	Time 1525 1605 1525 1605 angle.	82°F 82°F 82°F 82°F	S/N: VH-9520 VH-9520 VH-9520 VH-9520 Examiner: N/A Signature: Examiner: N/A	78.4 dB 76.0 dB 78.4 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Indicat  Yes  Yes  Yes	ion(s)  No No No No	N/A N/A N/A N/A N/A N/A N/A N/A	BF BF BF BF

#### **RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet**



Axial scans are performed with a procedure for the examination of vessel shell welds. This procedure has been demonstrated for detection of flaws located throughout the entire weld thickness. Coverage obtained during axial scans is typically limited due to nozzle configuration.

ISI Report #: R143

In the circumferential scan direction the outer 85%-t is examined with the same vessel procedure as above and typically limited due to nozzle configuration. To achieve additional coverage in the circumferential scan direction a second examination is performed with a procedure demonstrated for nozzle inside-radius UT. This procedure has been demonstrated for detection of flaws in the inner 15%-t only. The nozzle inside-radius technique provides additional coverage since the component is modeled and scanning is performed with several search units from the nozzle blend.

Axial Scans	Circumferential Scans								
100%-t	Inner 15%-t	Outer 85%-t							
Examination Procedure: N-UT-78 Revision 4	Examination Procedure: 54-ISI-850-06	Examination Procedure: N-UT-76 Revision 4							
<sup>A</sup> Required Examination Volume: 47.5 <sup>2</sup> inches	<sup>D</sup> Inner 15%-t Examination Volume: 5.7 <sup>2</sup> inchs	<sup>G</sup> Outer 85%-t Examination Volume: 41.8 <sup>2</sup> Inches.							
60°RL axial scan limited: ⊠Yes  □No	ECoverage Obtained by Modeling: 100%	60°RL Outer 85%-t Exam Limited:   ☐ Yes ☐ No							
Description of Limitation: Nozzle Blend Radius	Inner 15%-t Exam Limited: ☐Yes ☒No	Description of Limitation: Nozzle Blend Radius							
<sup>B</sup> Total Axial Volume Achieved: 27.1 <sup>2</sup> inches	Description of Limitation: N/A	HOuter 85-t% Volume Achieved: 14.92inches							
	Finner 15%-t Volume Achieved: 5.72inchs								
CPercentage of Axial Coverage: 57% B + A X 100 = C	Total Circumferential Examination Coverage: 43%  (F + H) + A X 100 = J								

Combined Axial and Circumferential Weld Coverage

'Total Examination Coverage: 50%

 $(C+J) + 2 \times 100 = L$ 

Prepared by: Bret Flesner

Date: 03/21/07

Reviewed by: Adam Conti

Date:03/21/07

Page 3 of 11

DESCRIPTION
Browns Ferry N2H Nozzle-to-Shell Weld Coverage Plot

DRAWN BY
DATE
TITLE
PAGE
Bret Flesner
03/20/07
N2HNV-CPS1
4 OF 11

R143

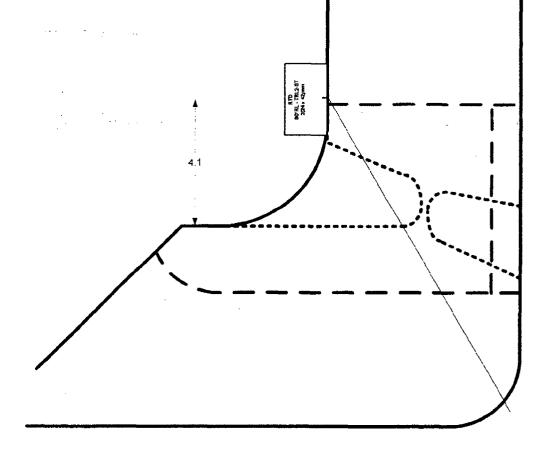
Nozzle-to-Shell weld examination coverage for axial (radial) scan

Total area of examination volume: 47.5 sq. in. Total area of examination volume achieved: 27.1 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius.

100% of the accessible surface scanned.

Measurements based on modeling report, design drawings, and as-found measurements.



DESCRIPTION
Browns Ferry N2H Nozzle-to-Shell Weld Coverage Plot

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RILYS

Nozzle-to-Shell weld examination coverage for circumferential scan

Total area of examination volume: 47.5 sq. in.

Total area of outer 85%-t exam volume achieved: 14.9 sq. in.

Total area of inner 15%-t volume: 5.7 sq. in.

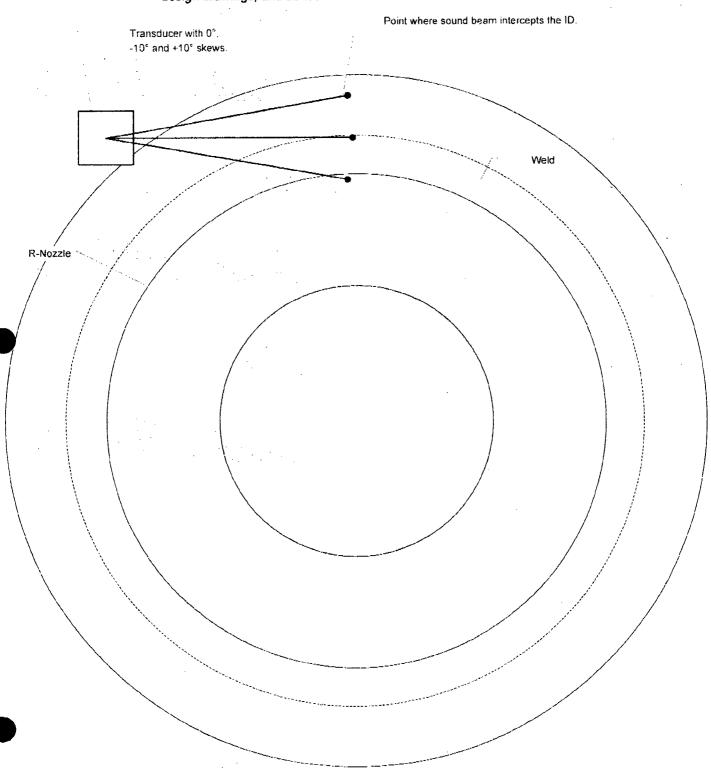
Total area of inner 15%-t exam volume achieved: 5.7 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned.

Inner 15%-t area examined from the blend with Supplement 5 techniques.

Measurements based on modeling report, design drawings, and as-found measurements.

#### Top View Measurements based on modeling report, design drawings, and as-found measurements.





#### Reactor Pressure Vessel 600277 Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	Site: Bi	rowns l	Ferry Nuc	clear F	Plant	Unit: 2			Outage: 0	Cycle 14 RFO	
Cal	ibration Data Sheet Number:	N2HNV-CDS1		ISI Report Number: R143								
Co	mponent ID: N2H-NV			С	ompo	nent Des	cription: N2	Nozzle-	to-Vessel	Weld		
Exa	amination Procedure: 54-ISI-	350-06		Applicable SDCN(s): 30-9044520-000								
	Ultrasonic Inst	rument			Transducer							
Ма	nufacture: Staveley			Manufacture: KBA					Model: Benchmark 892-600			
Мо	del: Sonic 136		Serial N	umbe	r: 0111Pl	₹	Fre	equency: 2	2.25 MHz			
Sei	ial Number: 136P1200G0814		Size: 0.	5" x 1.	0"		Sh	ape: Rect	angle			
Lin	earity Sheet No.: LDS1			# of Ele	ments	: 1		Co	nfiguration	n: Single	. <u></u>	
	Instrument Se	ettings		Refracte	d Ang	le: 40°		Me	asured Ar	ngle: * 50	)°	
ш	Range: 15.0" Sound Pa	th Depth		Skew A	ngle: -	120°		Me	asured Si	kew Angl	e: *+120°	
RANGE	Delay: 0.587"			Mode: S	hear			Ra	dius: 3.5"			
Ľ	Velocity: 0.127 in / μS			Cable T	ype: F	RG-174	Length: 12'	Inte	ermediate	Connect	tors: 0	
	Display: Filt2						Verific	cation	Block			
RCVR	Frequency: 2.25 MHz		Type: CS Rompas S			S/N: 9	S/N: 99-6251					
	Reject: Off		Reflector: 1" Radius			2" Radius			adius			
	Pulse Width: 222 nS		Sweep: 0.6 div.				1.3 div.					
	Damping: 500 Ω			Amplitude: 70 %FSH				80 %	FSH .			
	Mode: ⊠Pulse Echo □□	Oual		Gain: 29.8 dB				29.8 dB				
ULSER	Rep Rate: 2kHz			Basic Calibra					ration Block			
뒬	Pulser: ☐150V ☐300V	*Sonic 137 only)		Block ID: BF-18				Materi	Material: Clad CS			
	*Pulser voltage adjustable with th	e Sonic 137 instrumer	nt only.	Thickne	ss: 6.	)" with 0.	125" Clad	Diame	Diameter: Flat			
	The Sonic 136 has a fo	red pulser voltage.	-	Temperature: 69 °F					Therm. SN: VH-9525			
				Couplant: Ultragel II Ba					Batch No.: 05325			
		Re	feren	ce Sens	itivit	/ Inform	nation					
Ref	flector: ID Notch	Sweep: 6.1 div			Amp	litude: 80	%FSH		Gain: 58.2 dB			
Caí	In: Date 03/12/07 Time 0815	Check: Date 03/12	2/07 Ti	ime 1100	Chec	k: Date N	I/A Time N/A		Out: Date 03/12/07 Time 1200			
043 exa	*During the calibration process a manufacturing error was discovered with the TVA supplied 40° -120° skew wedge (product code 365-043-122). The wedge incident angle is cut such that a 50° refracted shear wave is generated rather than the specified 40°. To assure examination coverage TVA contacted the EPRI NDE Center for additional modeling using the actual manufactured 50° angle.  Additionally the wedge is also incorrectly labeled -120° skew but is actually +120°.											
	aminer: George Chapman nature: Excellent	Level: II	Date:	03/12/07	2/07 Examiner: N/A Signature				Le	vel: N/A	Date: N/A	
	EVA Review: Addm Conti	Level: III	Date:	03/21/07	V21/07 Page 7						Page 7 of 11	



#### Reactor Pressure Vessel © Manual Ultrasonic Calibration Data Sheet

Site: Browns Ferry Nuclear Plant

Unit: 2

•	000278 Sheet
	Outage: Cycle 14 RFO

Calibration Data Sheet Number: N2HNV-CDS2   ISI Report Number: 次   1/2									
Display: Fitt2   Display: Fitt2   Trequency: 2.25 MHz   Trequency: 40°   Measured Angle: 40°   Measured Angle: 40°   Measured Angle: 40°   Measured Skew Angle: *-120°   Measured Skew Angle: *-120°   Measured Skew Angle: *-120°   Trequency: 2.25 MHz   Trequency:									
Manufacture: Staveley   Manufacture: KBA   Model: Benchmark 892-600     Model: Sonic 136   Serial Number: 01C4NX   Frequency: 2.25 MHz     Serial Number: 136P1200G081455   Size: 0.5" x 1.0"   Shape: Rectangle									
Manufacture: Staveley   Manufacture: KBA   Model: Benchmark 892-600     Model: Sonic 136   Serial Number: 01C4NX   Frequency: 2.25 MHz     Serial Number: 136P1200G081455   Size: 0.5" x 1.0"   Shape: Rectangle     Line	*******								
Serial Number: 01C4NX   Frequency: 2.25 MHz									
Serial Number: 136P1200G081455   Size: 0.5* x 1.0"   Shape: Rectangle									
Measured Angle: 40°   Measured Skew Angle: *-120°   Skew Angle: *-120°   Measured Skew Ang	<b></b>								
Refracted Angle: 40°   Measured Angle: 40°   Measured Angle: 40°									
Range: 15.0*									
Delay: 0.587"   Mode: Shear   Radius: 3.5"									
Velocity: 0.127 in / μS   Cable Type: RG-174   Length: 12'   Intermediate Connectors: 0									
Velocity: 0.127 in / μS   Cable Type: RG-174   Length: 12'   Intermediate Connectors: 0									
Frequency: 2.25 MHz Reject: Off Reject: Off Reflector: 1" Radius 2" Radius Pulse Width: 222 nS Sweep: 0.6 div. 1.3 div.  Damping: 500 Ω Amplitude: 70 %FSH 80 %FSH Mode: ☑Pulse Echo ☑Dual Gain: 28.0 dB 28.0 dB  Rep Rate: 2kHz Pulser: ☐150V ☐300V (*Sonic 137 only) Block ID: BF-18 Material: Clad CS *Pulser voltage adjustable with the Sonic 137 instrument only. The Sonic 136 has a fixed pulser voltage.  Thickness: 6.0" with 0.125" Clad Diameter: Flat Temperature: 69 °F Therm. SN: VH-9525 Couplant: Ultragel II Batch No.: 05325									
Reject: Off       Reflector:       1" Radius       2" Radius         Pulse Width: 222 nS       Sweep:       0.6 div.       1.3 div.         Damping: 500 Ω       Amplitude:       70 %FSH       80 %FSH         Mode: ☑Pulse Echo ☑Dual       Gain:       28.0 dB       28.0 dB         Rep Rate: 2kHz       Basic Calibration Block         Pulser: ☐150V ☐300V ("Sonic 137 only)       Block ID: BF-18       Material: Clad CS         "Pulser voltage adjustable with the Sonic 137 instrument only. The Sonic 136 has a fixed pulser voltage.       Thickness: 6.0" with 0.125" Clad       Diameter: Flat         Temperature: 69 °F       Therm. SN: VH-9525         Couplant: Ultragel II       Batch No.: 05325									
Reject: Off       Reflector:       1" Radius       2" Radius         Pulse Width: 222 nS       Sweep:       0.6 div.       1.3 div.         Damping: 500 Ω       Amplitude:       70 %FSH       80 %FSH         Mode: ☑Pulse Echo ☑Dual       Gain:       28.0 dB       28.0 dB         Rep Rate: 2kHz       Basic Calibration Block         Pulser: ☐150V ☐300V ("Sonic 137 only)       Block ID: BF-18       Material: Clad CS         "Pulser voltage adjustable with the Sonic 137 instrument only. The Sonic 136 has a fixed pulser voltage.       Thickness: 6.0" with 0.125" Clad       Diameter: Flat         Temperature: 69 °F       Therm. SN: VH-9525         Couplant: Ultragel II       Batch No.: 05325									
Damping: 500 Ω Amplitude: 70 %FSH 80 %FSH  Mode: ☑Pulse Echo ☑Dual Gain: 28.0 dB 28.0 dB  Rep Rate: 2kHz  Pulser: ☐150V ☐300V (*Sonic 197 only) Block ID: BF-18 Material: Clad CS  *Pulser voltage adjustable with the Sonic 137 instrument only. The Sonic 136 has a fixed pulser voltage.  Thickness: 6.0* with 0.125* Clad Diameter: Flat  Temperature: 69 °F Therm. SN: VH-9525  Couplant: Ultragel II Batch No.: 05325									
Mode:									
Rep Rate: 2kHz  Pulser: 150V 300V (*Sonic 137 only)  Pulser voltage adjustable with the Sonic 137 instrument only. The Sonic 136 has a fixed pulser voltage.  Block ID: BF-18  Thickness: 6.0" with 0.125" Clad  Thickness: 6.0" with 0.125" Clad  Temperature: 69 °F  Couplant: Ultragel II  Batch No.: 05325  Reference Sensitivity Information									
*Pulser voltage adjustable with the Sonic 137 instrument only. The Sonic 136 has a fixed pulser voltage.  Thickness: 6.0" with 0.125" Clad Diameter: Flat  Temperature: 69 °F Therm. SN: VH-9525  Couplant: Ultragel II Batch No.: 05325  Reference Sensitivity Information									
*Pulser voltage adjustable with the Sonic 137 instrument only. The Sonic 136 has a fixed pulser voltage.  Thickness: 6.0" with 0.125" Clad Diameter: Flat  Temperature: 69 °F Therm. SN: VH-9525  Couplant: Ultragel II Batch No.: 05325  Reference Sensitivity Information	•								
*Pulser voltage adjustable with the Sonic 137 instrument only. The Sonic 136 has a fixed pulser voltage.  Temperature: 69 °F  Couplant: Ultragel II  Reference Sensitivity Information									
The Sonic 136 has a fixed pulser voltage.  Temperature: 69 °F Therm. SN: VH-9525  Couplant: Ultragel II Batch No.: 05325  Reference Sensitivity Information									
Reference Sensitivity Information									
Reflector: ID Notch Sweep: 5.2 div Amplitude: 80 %FSH Gain; 49.2 dB									
	Out: Date 03/12/07 Time 1155								
Comments									
*Transducer incorrectly labeled +120° skew by the manufacturer; however actual skew is -120°.									
Examiner: George Chapman Level: II Date: 03/12/07 Examiner: N/A Signature Level: N/A Date: N/A	(								
AREVA Review: Adam Contis Level: III Date: 03/21/07 Page	of 11								



#### Reactor Pressure Vessel 600279 Manual Ultrasonic Calibration Data Sheet

Util	Ottility: IVA Site: Browns Ferry Nuclear Plant Unit: 2 Outage: Cycle 14 RFO											
Cal	ibration Data Sheet Number: N2HI	NV-CDS3		ISI Report Number: R143								
Cor	mponent ID: N2H-NV	·		Compo	nent Desc	ription: N2	Nozzle-t	o-Vesel Weld				
Exa	amination Procedure: 54-ISI-850-00	5		Applicable SDCN(s): 30-9044520-000								
	Ultrasonic Instrume	nt		Transducer								
Mai	nufacture: Staveley		Manu	facture:	KBA		Мос	Model: Benchmark 892-600				
Mo	del: Sonic 136	Seria	l Numbe	er: 00X1XB	3	Fred	quency: 2.25 MHz					
Ser	rial Number: 136P1200G081456	Size:	0.5" x 1	.0"		Sha	pe: Rectangle					
Line	earity Sheet No.: LDS2		# of E	lements	s: 1		Con	figuration: Single				
	Instrument Setting	<b> S</b>	Refra	cted An	gle: 60°	***	Mea	sured Angle: 59°				
Ш	Range: 20.0" Sound Path	☐Depth	Skew	Angle:	±33° to 66	0	Mea	sured Skew Angl	e: N/A			
RANGE	Delay: 0.813"		Mode	: Shear			Rad	ius: Flat				
٣	Velocity: 0.127 in / μS		Cable	Type: I	RG-174 L	ength: 12'	Inte	rmediate Connect	tors: 0			
a.	Display: Filt2	,				Verific	ation E	Block				
RCVR	Frequency: 2.25 MHz		Туре:	N/A			S/N:	S/N: N/A				
	Reject: Off			Reflector: N/A		N/A	N/		/A			
	Pulse Width: 222 nS	ta de la composición de la composición La composición de la		Sweep: N/A			ż	N	/A			
	Damping: 500 Ω		Am	plitude:	ude: N/A			N/A				
	Mode: ⊠Pulse Echo □Dual			Gain: N/A				N/A				
PULSER	Rep Rate: 2kHz			Basic Calibration Block								
n₁ 104	Pulser: 150V 300V (*Sonic	137 only)	Block	Block ID: BF-18			Material: Clad CS					
	*Pulser voltage adjustable with the Sonic	c 137 instrument	only. Thick	Thickness: 6.0" with 0.125" Clad			Diameter: Flat					
	The Sonic 136 has a fixed pub		*	Temperature: 68 °F			Therm. SN: VH-9520					
			Coup	Couplant: Ultragel II B				Batch No.: 05325				
		Ref	erence Se	nsitivit	y Inform	ation						
Ref	flector: ID Notch Swe	ep: 5.8 div		Amp	litude: 80	%FSH	(	Gain: 60.8 dB				
Cal	In: Date 03/12/07 Time 1210 Chec	k: Date N/A	Time N/A	Che	ck: Date N/	A Time N/A	(	Out: Date 03/12/07 Time 1725				
			C	ommen	te							
						r						
	arniner: Bret Flesner nature:	Level: II	Date: 03/12/		Examiner: N/A Level: N/A Signature			Date: N/A				
AR	EVA Review Adam Conti	Level: III	Date: 03/21/						Page 9 of 11			



# Reactor Pressure Vessel 000280 Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	Site: Br	owns Ferry N	Ferry Nuclear Plant Unit: 2					Cycle 14 RFO			
Cal	ibration Data Sheet Number: N2H	INV-CDS4		ISI Report Number: R143								
Col	nponent ID: N2H-NV			Compo	nent Des	scription: N2	Nozzle-to-	Vessel Weld				
Exa	mination Procedure: N-UT-78 Re	vision 4	#	Applicable SDCN(s): N/A								
	Ultrasonic Instrum	ent		Transducer								
Ma	nufacture: Staveley		Manuf	facture:	RTD		Model	Model: TRL2-ST				
Мо	del: Sonic 136		Serial	Number	r. <b>07-3</b> 05	<b>)</b>	Frequ	ency: 2 MHz				
Sei	ial Number: 136P1200G081456	·	Angle	: 60°			Measu	ared Angle: 60°				
Lin	earity Sheet No.: LDS2		Mode:	Refract	ted Long	itudinal	Size:	2(24x42)mm				
	Instrument Setting	gs	Focus	: FS~12	5mm		Squint	Angle: 5°				
ш	Range: 8.00" Sound Path	☐Depth	# of E	lements	: 2	Shape: Rect	. Config	juration: Dual -	SBS			
RANGE	Delay: 1.34"	-	Cable	Type: R	RG-174	Length: 1	2' Interm	ediate Connec	tors: 0			
<b>"</b>	Velocity: 0.227 in / μS					Verific	cation Blo	ock				
	Display: Filt 2		Type:	N/A			S/N: 1	N/A				
RC R	Frequency: 2.25 MHz		Re	flector:		N/A	N/A					
	Reject: Off		8	Sweep: N/A				N/A				
	Pulse Width: 222 nS	Amp	mplitude: N/A				N	/A				
	Damping: 500 Ω	<u> 2014</u>		Gain: N/A					/A			
~	Mode: □Pulse Echo  ⊠Dual		.:.≠. ₹	Basic Calibration Block								
PULSER	Rep Rate: 2kHz		Block	Block ID: BF-18 M				Material: Clad CS				
<u> </u>	Pulser: 150V 300V (*Sonic	c 137 only)	Thickr	Thickness: 6.0" with 0.125" Clad				Diameter: Flat				
	*Probe voltage is adjustable with the Son		The Temp	erature:	68 °F		Therm. St	Therm. SN: VH-9520				
	Sonic 136 has a fixed pulse	er voltage.	Coupl	ant: Ultr	agel II		Batch No.	atch No.: 05325				
		Ref	ference Ser	nsitivity	/ Inform	nation						
Ref	lector: 1/4-t SDH	Sweep: 3.7 d	iv		Amplitud	le: 80 %FSH		Gain: 58.4 d8	3			
Cal	In: Date 03/12/07 Time 1220	Check: Date N	I/A Time N/A		Check: D	ate N/A Time	N/A	I/A Out: Date 03/12/07 Time 1720				
Zoi	Comments  Zone 1 - Near Surface calibration.											
	eminer: Bret Flesner nature: Buth Talame	1	Date: 03/12/0	,	Examiner: N/A Signature			Level: N/A	Date: N/A			
	EVA Review: Adam Contin	Level: III	Date: 03/21/0	07					Page 10 of 11			



#### Reactor Pressure Vessel 600281 Manual Ultrasonic Calibration Data Sheet

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Cal	ibration Data Sheet Number: N2H	INV-CD\$5		ISI Re	eport Nur						
Col	mponent ID: N2H-NV			Comp	onent De	scription: N2	Nozzle-to	-Vessel Weld			
Еха	amination Procedure: N-UT-78 Re	vision 4		Applicable SDCN(s): N/A							
	Ultrasonic Instrum	ent				Tra	nsduce	9r			
Mai	nufacture: Staveley		Mai	nufacture	: RTD		Mode	Model: TRL2-ST			
Мо	del: Sonic 136		Ser	ial Numb	er: 07-30	5	Frequ	uency: 2 MHz			
Ser	ial Number: 136P1200G081456	Ang	jle: 60°			Meas	ured Angle: 60°				
Line	earity Sheet No.: LDS2		Mod	de: Refra	cted Long	gitudinal	Size:	2(24x42)mm			
	Instrument Settin	gs	Foc	us: FS~1	125mm		Squir	nt Angle: 5°			
tu	Range: 18.0" Sound Path	□Depth	# of	Element	ts: 2	Shape: Reci	. Confi	guration: Dual -	SBS		
RANGE	Delay: 1.34"	. :	Cat	ole Type:	RG-174	Length: 1	2' Interr	nediate Connec	tors: 0		
<b>"</b>	Velocity: 0.227 in / μS	Salar garage	7 T. 4			Verific	ation Bl	ock			
	Display: Fift 2		Тур	e: N/A	١		S/N:	N/A			
RCVR	Frequency: 2.25 MHz		F	Reflector	:	N/A		N	N/A		
_	Reject: Off			Sweep	:	N/A		N	/A		
	Pulse Width: 222 nS	A	mplitude		N/A		N	/A			
	Damping: 500 Ω			Gain: N/A				N	//A		
<u>~</u>	Mode: ☐Pulse Echo ☑Dual			Basic Calibration Block							
PULSER	Rep Rate: 2kHz		Bloc	Block ID: BF-18 M			Material:	Material: Clad CS			
ď	Pulser: 150V 300V (*Sonic	: 137 only)	Thic	ckness: 6	6.0" with 0	.125" Clad	Diameter: Flat				
	*Probe voltage is adjustable with the Son		. The Ten	nperature	e: 68 °F		Therm. S	Therm. SN: VH-9520			
	Sonic 136 has a fixed pulse	r voltage.	Cor	Couplant: Ultragel II Ba				Batch No.: 05325			
		Re	ference S	ensitivi	ity Infon	mation					
Ref	flector: ID Notch	Sweep: 6.3 d	liv		Amplitud	de: 80 %FSH		Gain: 73.2 dB			
Cal	In: Date 03/12/07 Time 1224	N/A Time N	/A	Check: [	Date N/A Time	N/A	Out: Date 03/12/07 Time 1722				
				Comme	nts						
Zor	ne 2 - Full Volume calibration.	• • • •									
									•		
	aminer: Bret Flesner nature: Bret ###	Level: II	Date: 03/1		xaminer: f	N/A		Level: N/A	Date: N/A		
	EVA Review: Arian Conti	Level. III	Date: 03/2	1/07					Page 11 of 11		

## Examination Report, R-174 N2K-NV, RPV Nozzle-To-Head Weld



#### RPV Nozzle Ultrasonic Examination Summary Sheet

000282

AREVA				<i></i>					
Utility: TVA	Site: Browns F	erry Nuclear Plai	t: 2	Outage: Cycle 14	ISI Report #: 17174				
Component Number	: N2K-NV	Component De	escription: N2	Nozzle t	o Vessel Weld	System: RPV			
Code Category: B-D		Code Item: B3	.90		Code Class: 1	Material: CS			
ISO / Drawing(s): 2-0	CHM-2046-C-01 8	\$ 2-ISI-0270-C-0							
Procedure Number	er Proced	dure Revision	SDC	N		Procedure Misc. Info			
N-UT-78		4	Revision 11 of th	e PDI-UT-6 qualified equipment table					
N-UT-79		1	NA		Revision 5 of the	PDI-UT-7 qualified equipment table			
54-ISI-850		06	30-904452	20-000		Report: IR-2003-19 Section 3 PRI Letter dated 3/5/07			
Ca	llibration Sheets		Exam E Shee		Indication Data Sheets	Exam Results			
N2KNV-CDS1			N2KNV-I						
N2KNV-CDS2	-		1.2		"	(acceptable flaw evaluation)			
N2KNV-CDS3						Reportable Flaw Indications			
N2KNV-CDS4			<del></del>			(unacceptable flaw evaluation)			
N2KNV-CDS4			+						
Summary:									
examinations were	performed. Th		ons resulted i			ing report the following additional ns.			
Probe Refracted		Skew	Scan Si	ırface					
40°S		20°	Blend R						
50°S		20°	Blend R						
60°S		°-66°)	Ves						
This ultrasonic examination was performed in accordance with the criteria of 10 CFR50.55a (b)(2)(xv)(G) and the minimum coverage requirements of 10 CFR50.55a (b)(2)(xv)(K) was achieved to the maximum extent possible. The examination procedure requires an additional circumferential scan of the outer 85%-t which is not addressed in 10CFR 50.55a. The 60°RL examinations were limited due to the nozzle configuration which reduced the examination volume obtained to 44%. Refer to coverage sketch(s) and worksheet for a description of the scanning volume, examination coverage, and scan limitations.  This examination satisfies the requirements of ASME Section XI (2001 thru 2003 Addenda) and was performed using ASME Section XI, Appendix VIII qualified personnel, procedures, and equipment.  Note: See TVA Request for Relief PDI-1 and PDI-2. Dockets No. 50-261/296, 50-327/328, and 50-0390. This relief									
request reduced the area to be examined per IWB-2500-7 (a) and (b) to the weld plus ½" on each side.  Prepared by: Thomas Brown  Pate: 3/34/07  Reviewed by: Jam Conti									
Signature:	D Brown		3/21/07	Signatu	<del>-</del>	Date: 4/11/07			
Customer: Matt We Signature:	Hear le	Cal Date:		ANII: Signatu	ге:	Tome Date: 5/21/07			
ľ						Page 1 of 11			

			ľ	
Δ	R	F	V	Δ

#### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

Utility: T\					e: Browns Fer	ry Nuclear F	Plant				Init: 2		)utage	: Cycle 14 RF	0	
Examination Data Sheet Number: N2KNV-EDS1									umber: 🍂	7/14						
Compone	Component ID: N2K-NV							Component Description: N2 Nozzle-to-Vessel Weld								
						Exa		n Information								
			<i>1</i> -2046	-C-01, 2-ISI-0270	)-C-01		W <sub>c</sub> Location: Nozzle Boss (Rnozzle) L₀ Location: Nozzle TDC									
Examina	tion Limit	ed:⊠Yes	□No				Cove	rage Sheet Numbe	er(s): N2KN\	/-CWS1_						
<u>:</u>							Scan In	formation								
Examinati	on Proced	ure: 54-ISI-85	0-06		Applicable SD	CN's: 30-904	4520-000					Scan Surfa	ace: O	Blend Radius		
Angle/ Mode	Skew	(	Calibratio	on Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Li	mited	Recorda Indication		Indication Data Sheet #	Examiner Initials	
*50° / s	-120°		N2KN	V-CDS1	3/21/07	1145	88°F	VH-9520	71.8 dB	□Yes	⊠No	☐Yes [2	⊠No ¹	N/A	ТВ	
40°/s	+120°		N2KN	V-CDS2	3/21/07	1127	88°F	VH-9520	71.0 dB	□Yes	⊠No	□Yes [2	No	N/A	ТВ	
NA/	N/A		1	I/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes [	□No	N/A	N/A	
NA/	N/A		N	I/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes [	JNo	N/A	N/A	
Examinati	on Proced	ure: 54-ISI-85	0-06		Applicable SD	CN's: 30-904	4520-000					Scan Surfa	ace: O[	Vessel Shell		
Angle/ Mode	Skew		Calibratio	on Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	imited	Recorda Indication		Indication Data Sheet #	Examiner Initials	
60°/s	±33° to 6	66°	N2KN	V-CDS3	3/21/07	1107	88°F	VH-9520	72.6 dB	□Yes	⊠No	☐Yes 🛭	⊠No	N/A	TB	
N/A /	N/A			VA	N/A	N/A	N/A	N/A	N/A	□Yes	□No	☐Yes [	□No	N/A	N/A	
Examinati	on Proced	ure: N-UT-78	revision	4	Applicable SD	CN's: N/A						Scan Surfa	ace: Of	Vessel Shell		
Angle/ Mode	Zone	Beam Dire	ction	Calibration Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	imited	Recorda Indication		Indication Data Sheet #	Examiner Initials	
60°/RL	1	⊠Radial [	]Circ	N2KNV-CDS4	3/21/07	1000	88°F	VH-9520	79.0 dB	⊠Yes	□No	∐Yes [	⊠No	N/A	ТВ	
60°/RL	2	⊠Radial [	]Circ	N2KNV-CDS5	3/21/07	1032	88°F	VH-9520	78.0 dB	⊠Yes	□No	□Yes [	⊠No	N/A	ТВ	
60°/RL	1	Radial	⊠Circ	N2KNV-CDS4	3/21/07	1000	88°F	VH-9520	79.0 dB	⊠Yes	□No	☐Yes [	⊠No	N/A	ТВ	
60°/RL	2	□Radial	Circ	N2K NV-CDS5	3/21/07	1032	88°F	VH-9520	78.0 dB	⊠Yes	□No	∐Yes [	⊠No	N/A	ТВ	
Commer	its:		·					•								
* See cali	bration dat	ta sheet for a	ditional	details on the 50°	shear examinatio	on										
000 30.1	5.20011 001	5,1001 101 61		20,310 011 1110 00	ones onaminan	••••			•							
1																
	Thomas I	Brown	·		Level: II	Date: 3/21		Examiner: N/A					Level:	N/A Da	te: N/A	
Signatu		708	19-		1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1	1		Signature.						N100	AL ALIA	
Examiner Signatur		11			Level: N/A	Date: N/A		Examiner: N/A Signature:				·	Level:	N/A Da	te: N/A	
	eview: Ac	arr/Conti /	7 /		Level: III	Date: 4/11		oigilataio.								
Signatu		1/		7												
			<del></del>		· · · ·										Page 2 of 11	



#### RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet

Utility: TVA

Plant: Browns Ferry

Unit: 2

Weld ID: N2K-NV

Outer 85%-t

Axial scans are performed with a procedure for the examination of vessel shell welds. This procedure has been demonstrated for detection of flaws located throughout the entire weld thickness. Coverage obtained during axial scans is typically limited due to nozzle configuration.

Coverage Worksheet #: N2KNV-CWS1

ISI Report #: /</74/

In the circumferential scan direction the outer 85%-t is examined with the same vessel procedure as above and typically limited due to nozzle configuration. To achieve additional coverage in the circumferential scan direction a second examination is performed with a procedure demonstrated for nozzle inside-radius UT. This procedure has been demonstrated for detection of flaws in the inner 15%-t only. The nozzle inside-radius technique provides additional coverage since the component is modeled and scanning is performed with several search units from the nozzle blend.

Axial Scans	Circumferential Scans							
100%-t	Inner 15%-t	Outer 85%-t						
Examination Procedure: N-UT-78 Revision 4	Examination Procedure: 54-ISI-850-06	Examination Procedure: N-UT-78 Revision 4						
*Required Examination Volume: 47.52inches	Inner 15%-t Examination Volume: 5.72inchs	<sup>6</sup> Outer 85%-t Examination Volume: 41.8 <sup>2</sup> Inches.						
60°RL axial scan limited: ⊠Yes □No	<sup>E</sup> Coverage Obtained by Modeling: 100%	60°RL Outer 85%-t Exam Limited: ⊠Yes ☐No						
Description of Limitation: Nozzle Blend Radius	Inner 15%-t Exam Limited: Yes No	Description of Limitation: Nozzle Blend Radius						
<sup>8</sup> Total Axial Volume Achieved: 24.3 <sup>2</sup> inches	Description of Limitation: N/A	<sup>H</sup> Outer 85-t% Volume Achieved: 11.5 <sup>2</sup> inches						
	FInner 15%-t Volume Achieved: 5.72inchs							
<sup>C</sup> Percentage of Axial Coverage: 51% B + A X 100 = C		al Examination Coverage: 36% H) + A X 100 = J						
	Combined Axial and Circumferential Weld	Coverage						

'Total Examination Coverage: 44%

 $(C+J) + 2 \times 100 = L$ 

Prepared by: Bret Flesner Date: 03/21/07 Reviewed by: Adam-Conti Date: 04/11/07

Page 3 of 11

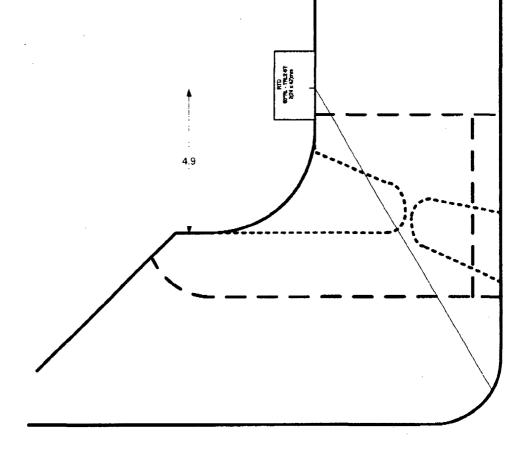
l	DESCRIPTION								
Α	Browns Ferry N2K Nozzle-to-Shell Weld Coverage Plot								
AREVA	DRAWN BY	DATE	TITLE	PAGE					
	Bret Flesner	03/21/07	N2KNV-CP\$1	4 OF 11					

Nozzle-to-Shell weld examination coverage for axial (radial) scan

Total area of examination volume: 47.5 sq. in. Total area of examination volume achieved: 24.3 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned.

Measurements based on modeling report, design drawings, and as-found measurements.



Browns Ferry N2K Nozzle-to-Shell Weld Coverage Plot

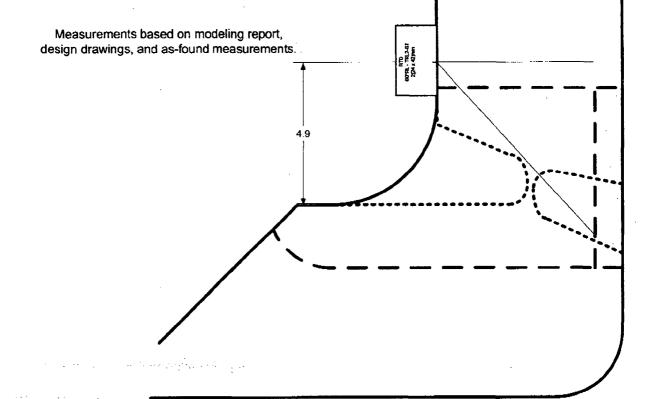
DRAWN BY
DATE
TITLE
PAGE
N2KNV-CPS2
5 OF 11

Nozzle-to-Shell weld examination coverage for circumferential scan

Total area of examination volume: 47.5 sq. in.
Total area of outer 85%-t exam volume achieved: 11.5 sq. in.
Total area of inner 15%-t volume: 5.7 sq. in.
Total area of inner 15%-t exam volume achieved: 5.7 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned.

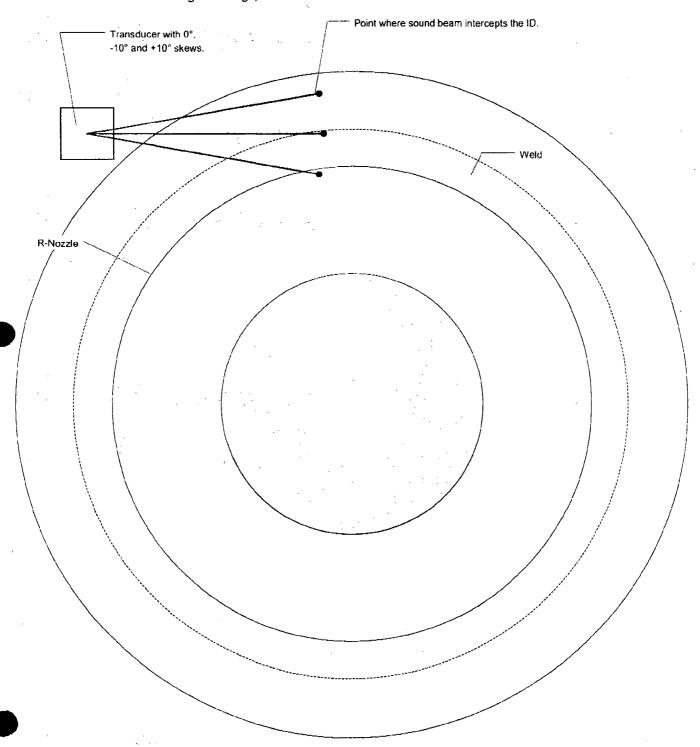
Inner 15%-t area examined from the blend with Supplement 5 techniques.



DESCRIPTION
Browns Ferry N2K Nozzle-to-Shell Weld Coverage Plot
DRAWN BY
DR

Top View

Measurements based on modeling report,
design drawings, and as-found measurements.





#### Reactor Pressure Vessel 600288 Manual Ultrasonic Calibration Data Sheet

Útil	ity: TVA	Site: Br	rowns Ferry N	luclear Plar	nt Unit: 2		Outage: 0	Cycle 14 RFO		
Calibration Data Sheet Number: N2KNV-CDS1				ISI Report Number:			R174			
Co	mponent ID: N2K-NV			Component Description: N2 Nozzle-to-Vessel Weld						
Exa	amination Procedure: 54-ISI-8	350-06		Applicable	SDCN(s): 30-90-	44520-000				
	Ultrasonic Inst	rument			Tr	ansducer				
Ма	nufacture: Staveley		Manu	facture: KB	Α	Model: 6	Benchmark 89	92-600		
Мо	del: Sonic 136		Serial	Number: 0	111PR	Frequer	ncy: 2.25 MHz			
Sei	ial Number: 703l		Size:	0.5" x 1.0"		Shape:	Rectangle			
Lin	earity Sheet No.: LDS4	<u> </u>	# of E	lements: 1		Configu	ration: Single			
	Instrument Se	ettings	Refra	cted Angle:	40°	Measure	ed Angle: * 50	)°		
111	Range: 15.0" Sound Pa	th Depth	Skew	Angle: -120	D°	Measure	ed Skew Angl	e: * +120°		
RANGE	Delay: 0.519"		Mode	: Shear		Radius:	3.5"			
o2	Velocity: 0.127 in / μS		Cable	Type: RG-	174 Length: 12'	Interme	diate Connec	tors: 0		
	Display: Filt2				Verifi	cation Bloc	k			
RCVR	Frequency: 2.25 MHz		Туре:	oe: CS Rompas		S/N: 79141	3			
u.	Reject: Off	<del></del>	Re	flector:	ector: 1" Radius		2" Radius			
)	Pulse Width: 222 nS.			Sweep: 0.6 div.		1.3 div.		div.		
	Damping: 500 Ω		Am	plitude:	70 %FSH		80 %FSH			
	Mode: ⊠Pulse Echo □□	)ual		Gain: 36.4 d		36.4 dB		4 dB		
Ä	Rep Rate: 2kHz			Basic Ca			lock			
PULSER	Pulser: 150V 300V (*Sonic 137 only)		Block	Block ID: BF-18		Material: Cl	ad CS			
	*Pulser voltage adjustable with th	- Casia 427 Instrumer	Thick	Thickness: 6.0" with 0.125" Clad			Diameter: Flat			
	The Sonic 136 has a for			Temperature: 72 °F			Therm. SN: VH-9525			
			Coup	Couplant: Ultragel II			Batch No.: 05325			
		Re	ference Se	nce Sensitivity Information						
Re	flector: ID Notch	Sweep: 6.1 div		Amplitu	de: 80 %FSH	Gain: 62.6 dB				
Cal	In: Date 03/21/07 Time 0831	Check: Date 03/2	1/07 Time 114	4 Check:	Date N/A Time N/A	A Out: Date 03/21/07 Time 1220				
			C	omments						
inc TV	uring the calibration process a ident angle is cut such that a ! A contacted the EPRI NDE Co orrectly labeled -120° skew bo	50° refracted shea enter for additional	r wave is gen I modeling usi	erated rathe	er than the specific	ed 40°. To a:	ssure examin	ation coverage		
	aminer: Thomas Brown	Level: II	Date: 3/21/0	: 3/21/07 Examiner: N/A Signature			Level: N/A	Date: N/A		
AREVA Review Adam Conti Level: III Date: Signature:				7				Page 7 of 1		



### Reactor Pressure Vessel 600289 Manual Ultrasonic Calibration Data Sheet

<u> </u>	Ster TVA	Cita: D-	Lung Form: N		Dlant	Unit: 2		Outage	Cuclo 14 PEO
									Cycle 14 RFO
Calibration Data Sheet Number: N2KNV-CDS2				ISI Report Number: R174  Component Description: N2 Nozzle-to-Vessel Weld					
	mponent ID: N2K-NV			<del> </del>		<del></del>			
Exa	amination Procedure: 54-ISI-850-0	<del></del>	<del></del>	Applica	ble SD0	CN(s): 30-90	44520-00	00	
	Ultrasonic Instrum	ent				· Tr	ansduc	er	
Ма	nufacture: Staveley			ıfacture:				lel: Benchmark 89	
	del: Sonic 136	, <del></del>	. ——	Numbe	·	NX ·		quency: 2.25 MHz	<u> </u>
	rial Number: 7031		Size:	0.5" x 1.	0"			pe: Rectangle	
Lin	earity Sheet No.: LDS4		# of E	Elements	: 1		Con	figuration: Single	
	Instrument Setting	gs	Refra	cted Ang	le: 40°	·—	Mea	sured Angle: 40°	
ш	Range: 15.0" Sound Path	☐Depth	Skew	Angle: +	-120°		Mea	sured Skew Angl	e: * -120°
RANGE	Delay: 0.519"		Mode	: Shear			Rad	ius: 3.5"	
œ	Velocity: 0.127 in / μS		Cable	Type: F	RG-174	Length: 12'	Inter	rmediate Connec	tors: 0
	Display: Filt2					Verifi	cation B	Block	•
RCVR	Frequency: 2.25 MHz		Туре	Type: CS Rompas		S/N: 791413			
	Reject: Off		Re	Reflector: 1" Radius		2" Rad		adius	
) .	Pulse Width: 222 nS			Sweep: 0.6 div.			1.3	div.	
	Damping: 500 Ω	Damping: 500 Ω			Amplitude: 70 %FSH			80 %	6FSH
	Mode: ⊠Pulse Echo □Dual	. "		Gain:	Gain: 36.0 dB			36.	0 dB
PULSER	Rep Rate: 2kHz	<del></del>		Basic C			alibration Block		
PUL	Pulser: ☐150V ☐300V (*Sonic	2 137 only)	Block	Block ID: BF-18			Material: Clad CS		
	*Pulser voltage adjustable with the Son	ic 137 instrument	Thick	Thickness: 6.0" with 0.125" Clad			Diameter: Flat		
	The Sonic 136 has a fixed pu		, , , , , , , , , , , , , , , , , , , ,	Temperature: 72°F			Therm. SN: VH-9525		
			Coup	Couplant: Ultragel ii B		Batch N	Batch No.: 05325		
		Ref	erence Se	nsitivity	y Infor	mation			
Ref	Rector: ID Notch Swe	ep: 5.2 div		Amp	litude: 8	0 %FSH	-	Gain: 58.0 dB	
Cal	In: Date 03/21/07 Time 0834 Che	ck: Date 03/21/	07 Time 112	ime 1126 Check: Date N/A Time N/A		A Out: Date 03/21/07 Time 1222		Time 1222	
			C	omment	9				
* TI	* The transducer wedge is incorrectly labeled -120° skew by the manufacturer; however actual skew is +120°.								
Examiner: Thomas Brown Level: II Date: 6					miner: I	N/A	<del></del>	Level: N/A	Date: N/A
			Date: 4/11/0	<del></del> -					Page 8 of 11



## Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet 30290

	inty. TVA	Site. Diowiis	<del></del>		01111, 2	<u> </u>			
Calibration Data Sheet Number: N2KNV-CDS3				ISI Report Number: R174					
Component ID: N2K-NV				Component Description: N2 Nozzle-to-Vessel Weld					
Exa	amination Procedure: 54-ISI-8	50-06	Α¢	oplicable SDC	CN(s): 30-904	44520-000			
	Ultrasonic Insti	rument			Tra	ansducer		<del></del>	
Ma	nufacture: Staveley		Manufac	ture: KBA		Model:	Benchmark 8	92-600	
Мо	del: Sonic 136		Serial Nu	ımber: 0111	PL	Freque	ncy: 2.25 MHz		
Se	rial Number: 7031		Size: 0.5	" x 1.0"		Shape:	Rectangle		
Lin	earity Sheet No.: LDS4		# of Elen	nents: 1		Configu	uration: Single		
	Instrument Se	ttings	Refracte	d Angle: 60°		Measu	red Angle: 59°		
111	Range: 20.0" Sound Pati	h Depth	Skew An	gle: ±33° to 6	66°	Measu	red Skew Angl	le: N/A	
RANGE	Delay: 0.842"		Mode: SI	hear		Radius	: Flat		
2	Velocity: 0.127 in / µS		Cable Ty	pe: RG-174	Length: 12'	Interme	ediate Connec	tors: 0	
	Display: Filt2				Verific	cation Blo	ck		
RCVR	Frequency: 2.25 MHz		Type: CS	Rompas		S/N: 791413			
<u> </u>	Reject: Off		Reflec	ector: 1" Radius			2" R	adius	
	Pulse Width: 222 nS		Swe	Sweep: 0.6 div.		1.1 div.		div.	
	Damping: 500 Ω		Amplitude: 70 %FSH		70 %FSH	H 80 %F		%FSH	
	Mode: ⊠Pulse Echo □D	Gain: 33,8 dB		33.8 dB		8 dB			
SER	Rep Rate: 2kHz		Basic Cal			libration E	Block		
PULSER	Pulser: ☐150V ☐300V (*	Sonic 137 only)	Block ID: BF-18			Material: Clad CS			
	*Pulser voltage adjustable with the	Sonic 137 instrument only	Thickness: 6.0" with 0.125" Clad			Diameter: Flat			
	The Sonic 136 has a fixe	•	Temperature: 72 °F T			Therm. SN: VH-9525			
			Couplant: Ultragel II Bat			Batch No.:	Batch No.: 05325		
		Referen	ce Sensi	tivity Inform	nation	L		<del></del>	
Re	flector: ID Notch	Sweep: 5.8 div		Amplitude: 8	0 %FSH	Gai	n: 65.8 dB		
Cal	In: Date 03/21/07 Time 0827	Check: Date 03/21/07 Tii	me 1106	Check: Date	N/A Time N/A	Out	Out: Date 03/21/07 Time 1224		
			Comi	ments	. —	<u> </u>	<del></del>		
	· ·								
	aminer: Thomas Brown	Level: II Date:	03/21/07	Examiner: N/A Signature			Level: N/A	Date: N/A	
AR	EVA Review Adam Continature:	Level: III Date:	4/11/07					Page 9 of 11	
<u></u>	Jan (n)	<u> </u>							

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AREVA

### Reactor Pressure Vessel 630291 Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	Site: Brov	wns Ferry I	Nuclear	Plant	Unit: 2		Outage: (	Cycle 14 RFO	
Calibration Data Sheet Number: N2KNV-CDS4				ISI Report Number: R174						
Co	mponent ID: N2K-NV	Na N		Component Description: N2 Nozzle-to-Vessel Weld.						
Exa	amination Procedure: N-UT-78 Re	evision 4		Applicable SDCN(s): N/A						
	Ultrasonic Instrum	ent	,	Transducer						
Ma	nufacture: Staveley		Manu	facture:	RTD		Model	: TRL2-ST		
Мо	del: Sonic 136		Seria	Numbe	er: 07-30	)5 、	Frequ	ency: 2 MHz		
Ser	ial Number: 7031	· · ·	Angle	: 60°			Measi	ured Angle: 61°		
Lin	earity Sheet No.: LDS4		Mode	: Refrac	ted Long	gitudinal	Size: 2	2(24x42)mm		
	Instrument Settin	gs	Focu	s: FS~12	25mm		Squin	t Angle: 5°		
ш	Range: 8.00" Sound Path	☐Depth	# of E	lements	s: 2	Shape: Rec	t. Config	juration: Dual	SBS	
RANGE	Delay: 1.38"		Cable	Type: I	RG-174	Length: 1	2' Interm	ediate Connec	tors: 0	
œ	Velocity: 0.230 in / µS		""			Verifi	cation Blo	ock		
	Display: Filt 2		Туре	CS Roi	mpas		S/N: 7914	113		
RCVR	Frequency: 2.25 MHz		Re	Reflector: 1" Radius		2" Radius		adius		
,	Reject: Off			Sweep:	eep: 1.2 div.			2.5 div.		
	Pulse Width: 222 nS		Am	plitude:	ude: 25 %F\$H			80 %FSH		
	Damping: 500 Ω			Gain:	Sain: 52.0 dB			52.0 dB		
α	Mode: □Pulse Echo  ☑Dual			Basic Calibration B						
PULSER	Rep Rate: 2kHz		Block	Block ID: BF-18			Material: 0	Material: Clad CS		
Д.	Pulser: 150V 300V (*Soni	c 137 only)	Thick	Thickness: 6.0" with 0.125" Clad			Diameter:	Flat		
	*Probe voltage is adjustable with the Sor		he Temp	Temperature: 72 °F			Therm. SI	Therm. SN: VH-9525		
	Sonic 136 has a fixed pulse	er voltage.	Coup	Couplant: Ultragel II E			Batch No.: 05325			
		Refe	rence Se	nsitivit	y Infor	mation				
Ref	lector: 1/4-t SDH	Sweep: 3.8 div			Amplitu	ude: 80 %FSf	đ	Gain: 62.8 dB		
Cal	In: Date 03/21/07 Time 0823	Check: Date 03/	/21/07 Time	e 0959	Check:	Date N/A Tin	ne N/A	Out: Date 03/21/07 Time 1226		
			Co	mmen	ts	,				
Zor	e 1 - Near Surface calibration.									
	miner: Thomas Brown mature: D B	Level: II D	ate: 03/21/		Zexaminer: N/A Signature			Level: N/A	Date: N/A	
	EVA Review Adam Copylo nature:	ate: 4/11/0	7					Page 10 of 11		



#### Reactor Pressure Vessel 600292 Manual Ultrasonic Calibration Data Sheet

Utility: TVA Site: Browns		ns Ferry N	Nuclear Plant Unit: 2			Outage: Cycle 14 RFO			
Calibration Data Sheet Number: N2KNV-CDS5				ISI Report Number: R1			3174		
Component ID: N2K-NV				Component Description: N2 Nozzle-to-Vessel Weld.					
Exa	mination Procedure: N-UT-78 Rev	vision 4		Applica	ble SDC	CN(s): N/A			
	Ultrasonic Instrume	ent		Transducer					
Ма	nufacture: Staveley		Manufa	acture:	RTD		Model:	TRL2-ST	
Мо	del: Sonic 136		Serial	Numbe	r: 07-30	5 🕶	Freque	ncy: 2 MHz	
Ser	ial Number: 7031		Angle:	60°			Measu	red Angle: 61°	
Line	earity Sheet No.: LDS4		Mode:	Refrac	ted Long	gitudinal	Size: 2	(2 <b>4x42)m</b> m	,
	Instrument Setting	gs	Focus:	FS~12	.5mm		Squint	Angle: 5°	
w	Range: 18.0" Sound Path	Depth	# of Ele	ements	: 2	Shape: Rect	. Configu	ration: Dual	SBS
RANGE	Delay: 1.38"			Type: F	RG-174	Length: 1	2' Interme	diate Connec	tors: 0
L.	Velocity: 0.230 in / μS					Verific	cation Blo	ck	
	Display: Filt 2		Туре: (	CS Ror	npas		S/N: 79141	3	
RCVR	Frequency: 2.25 MHz		Ref	lector:	or: 1" Radius			2" Radius	
	Reject: Off			weep:	weep: 0.5 div.			1.1 div.	
	Pulse Width: 222 nS		Amp	litude:	ude: 25 %FSH			80 %FSH	
	Damping: 500 Ω			Gain:	sin: 52.0 dB			52.	0 dB
Œ.	Mode: ☐Pulse Echo			Basic Calibr			libration E	Block	
PULSER	Rep Rate: 2kHz		Block I	Block ID: BF-18			Material: Clad CS		
۵	Pulser: 150V 300V (*Sonic	: 137 only)	Thickn	Thickness: 6.0" with 0.125" Clad			Diameter: Flat		
	*Probe voltage is adjustable with the Soni		ne Tempe	Temperature: 72 °F		Therm. SN: VH-9525			
	Sonic 136 has a fixed pulser	voitage.	Coupla	Couplant: Ultragel II		Batch No.: 05320			
		Refer	ence Sen	sitivit	y Inform	nation			· · <del></del>
Ref	lector: ID Notch	Sweep: 6.3 div			Amplitud	de: 80 %FSH		Gain: 77.2 dB	
Cal	In: Date 03/21/07 Time 0824	Check: Date 03/2	21/07 Time	1031	Check: E	Date N/A Time	N/A	Out: Date 03/21/07 Time 1228	
			Cor	mmen	ts				
Zor	e 2 - Full Volume calibration.								
	miner: Thomas Brown	Level: II Da	te: 03/21/0		Examiner: N/A Signature			Level: N/A	Date: N/A
	EVA Review Adem Continuature:	te: 4/11/07						Page 11 of 11	

# Examination Report, R-151 N3A-NV, RPV Nozzle-To-Head Weld



#### RPV Nozzle Ultrasonic Examination Summary Sheet

000293

Utility: TVA Site: Browns Ferry Nuclear Plan		nt Unit: 2	Outage: Cycle 14	ISI Report#: R151		
Component Number: N3A-NV Component Des			escription: N3 Nozzle t	o Vessel Weld	System: RPV	
Code Category: B-D Code Item: B3.9			.90	Code Class: 1	Material: CS	
ISO / Drawing(s): 2-	CHM-2046-C-01 8	2-ISI-0222-C-0	1			
Procedure Numb	er Proced	ure Revision	SDCN	Pro	ocedure Misc. Info	
N-UT-78		4	NA	Revision 11 of the PDI-UT-6 qualified equipment ta		
N-UT-79		1	NA	Revision 5 of the PDI-UT-7 qualified equipment ta		
54-ISI-850		06	30-9044520-000	Modeling Report: IR-2003-19 Section 4 EPRI Letter dated 3/5/07		
Ca	alibration Sheets		Exam Data Sheets	Indication Data Sheets	Exam Results	
N3ANV-CDS1			N3ANV-EDS1		☐ No Recordable Indications ☐ Recordable Flaw Indications	
N3ANV-CDS2					(acceptable flaw evaluation)	
N3ANV-CDS3					Reportable Flaw Indications	
N3ANV-CDS4					(unacceptable flaw evaluation)	
N3ANV-CDS5	N3ANV-CDS5				1	
Summary:						

In accordance with UT procedure N-UT-78 Revision 4, 60° refracted longitudinal wave examinations were performed from the vessel surface in both the axial (radial) and circumferential scan directions. These examinations resulted in no reportable indications.

In accordance with UT procedure 54-ISI-850-06 and the referenced TVA / EPRI modeling report the following additional examinations were performed. These examinations resulted in no reportable indications.

N3 Nozzle Modeling Parameters							
Probe Refracted Angle	Probe Skew	Scan Surface					
50°S	-115°	Blend Radius					
40°S	+115°	Blend Radius					
60°S	±(52°-74°)	Vessel					

This ultrasonic examination was performed in accordance with the criteria of 10 CFR50.55a (b)(2)(xv)(G) and the minimum coverage requirements of 10 CFR50.55a (b)(2)(xv)(K) was achieved to the maximum extent possible. The examination procedure requires an additional circumferential scan of the outer 85%-t which is not addressed in 10CFR 50.55a. The 60°RL examinations were limited due to the nozzle configuration which reduced the examination volume obtained to 41%. Refer to coverage sketch(s) and worksheet for a description of the scanning volume, examination coverage, and scan limitations.

This examination satisfies the requirements of ASME Section XI (2001 thru 2003 Addenda) and was performed using ASME Section XI, Appendix VIII qualified personnel, procedures, and equipment.

**Note:** See TVA Request for Relief PDI-1 and PDI-2. Dockets No. 50-261/296, 50-327/328, and 50-0390. This relief request reduced the area to be examined per IWB-2500-7 (a) and (b) to the weld plus ½" on each side.

Prepared by: Bret Flesner Signature:	Date: 3/22/07	Reviewed by: Kdam Contil Signature:	Date: 3/23/07
Customer: Matt Welch	Date: 3/27/07	ANII: Signature: Land	Date: 5(2)(47
			Page 1 of 11

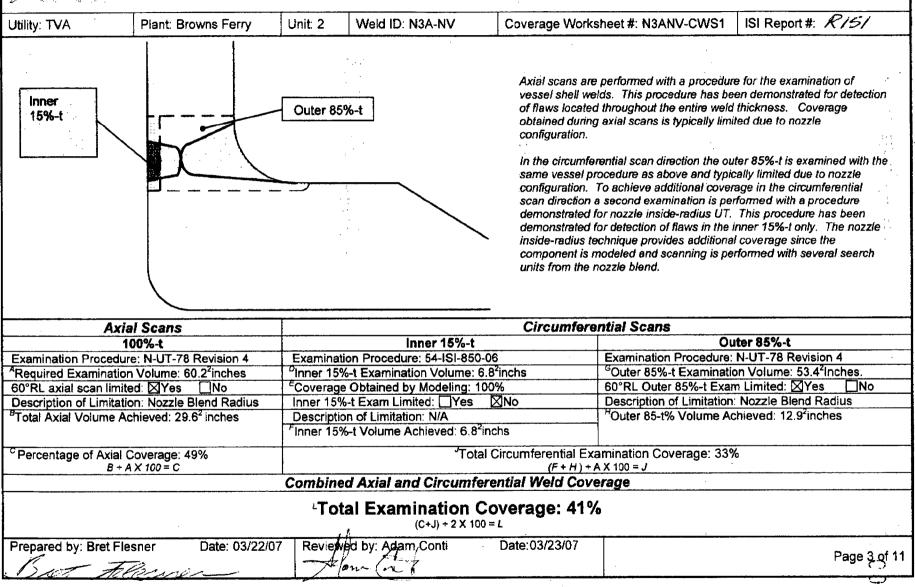
n[]



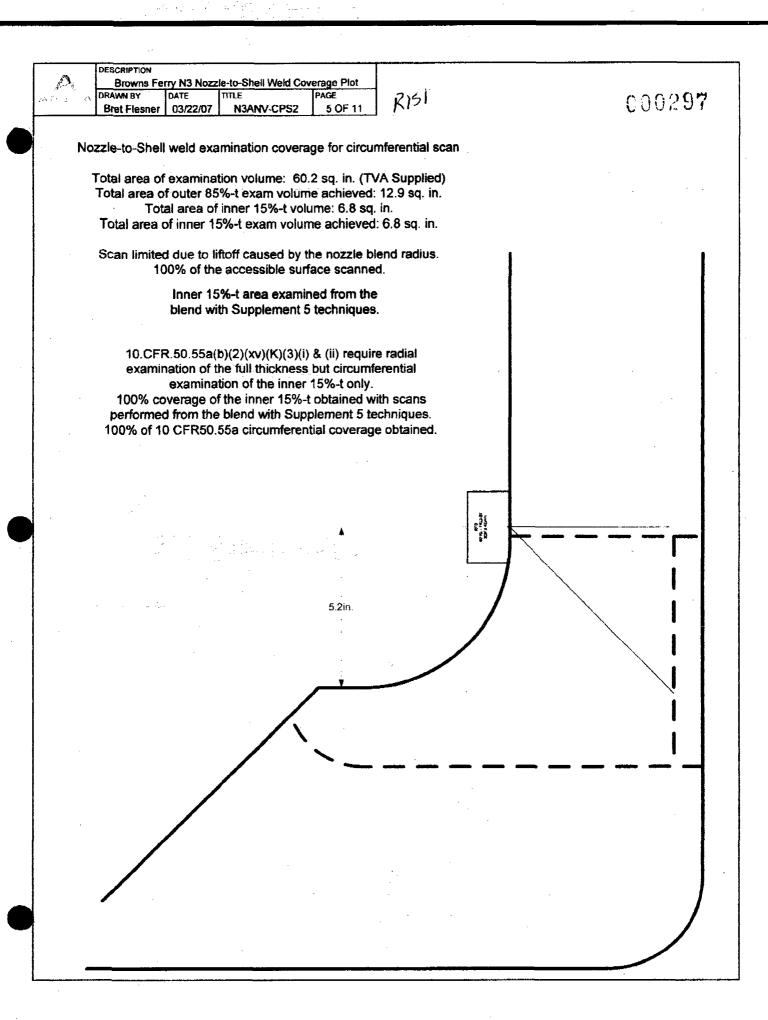
#### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

	Site: Browns Ferry Nuclear Plant Unit: 2 Outage: Cycle 14 RFO														
		Sheet Number: N	3ANV-EDS1				ISI Report N			<del> </del>				<del></del>	
Compone	ent ID; N	I3A-NV					Component	Description:	N3 Nozz	le-to-V	essel We				
100 ( D-		D OLUM 0046	0.04.0.0101.00	00.0.04	Exa		n Information	(D			1 4'	, † <u>1</u>	TDO		
		nber: 2-CHM-2046 ed: ⊠Yes ⊟No		22-C-01			ocation: Nozzle Bo rage Sheet Numbe			<u> </u>	Location	1: NOZZIE	IDC		
Examina	tion Limite	ed:⊠Yes □No					rage Sheet Number formation	er(s): N3A-C	W51						· · · · · · · · · · · · · · · · · · ·
													·		
Examinati	on Procedi	ure: 54-ISI-850-06		Applicable SD	CN's: 30-9044	1520-000		· · · · · · · · · · · · · · · · · · ·			Scan St	urface: Of	D Blend Rad	ius	
Angle/ Mode	Skew	Calibrat	ion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Lir	mited	Recor Indicat		Indication Data Shee		Examiner Initials
*50°S						82° F	VH-8937	70.0 dB	☐Yes	⊠No	☐Yes	⊠N∘	N/A		GC
40°S	+115°	N3AN	IV-CDS2	03/22/07	1022	82° F	VH-8937	70.0 db	☐Yes	⊠No	☐Yes	⊠No	N/A		GC
N/A	N/A		N/A	N/A	N/A,	N/A	N/A	N/A	□Yes	□No	□Yes	∐No	N/A	$\neg \neg$	N/A
N/A	N/A N/A N/A N/A N/A N/A N/A N/A □Yes □No □Yes □No N/A N/A														
Examinati	on Procedi	ure: 54-ISI-850-06		Applicable SD	CN's: 30-9044	520-000		,			Scan St	ırface: Ol	D Vessel Sho	ell	
Angle/ Mode	Mode Skew Calibration Sheet # Date Time Temp S/N: Scan Gain Scan Limited Indication(s) Data Sheet # Initials														
60°S	60°S ±52° to 74° N3ANV-CDS3 03/22/07 1000 82° F VH-8937 75.0 dB □Yes ☑No □Yes ☑No N/A GC														
N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A		N/A
Examinati	on Proced	ure: N-UT-78 rev.4		Applicable SD	CN's: N/A						Scan St	urface: Ol	D Vessel Sh	eil	
Angle/ Mode	Zone	Beam Direction	Calibration Sheet#	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Li	imited	Recor Indicat		Indication Data Sher		Examiner initials
60°RL	1	⊠Radial □Circ	N3ANV-CDS4	03/22/07	1110	82° F	VH-8937	73.8 dB	⊠Yes	□No	□Yes	⊠No	N/A		BF
60°RL	2	⊠Radial □Circ	N3ANV-CDS5	03/22/07	1140	82° F	VH-8937	84.0 dB	⊠Yes	□No	□Yes	⊠No	N/A		BF
60°RL	1	☐Radial ⊠Circ	N3ANV-CDS4	03/22/07	1110	82° F	VH-8937	73.8 dB	⊠Yes	□N∘	☐Yes	⊠No	N/A		BF
60°RL	2	☐Radial ⊠Circ	N3ANV-CDS5	03/22/07	1140	82° F	VH-8937	75.0 dB	⊠Yes	□N∘	☐Yes	⊠No	N/A		BF
Commer	nts:									-					
* See cali	haration de	nta sheet for addition	al dataile on the EO	ahaar avamina	tion										
See Call	Daration Ga	ita sheet ioi accision	ar details on the 50	Sileal examina	uon.										
							· · · · · · · · · · · · · · · · · · ·							<del></del>	
Examiner Signatu	: Bret Flesi re:	ler for the	lesno	Level: II	Date: 03/2		Examiner: NA Signature:	÷				Level:	N/A	Date: I	N/A
Examiner	Examiner: George Chapman  Level: II  Date: 03/22/07  Examiner: N/A  Signature:  Signature:  Level: N/A  Date: N/A  Date: N/A  Company  Company  Date: N/A  Date: N/A  Signature:														
	eview: Ada	in Conti	1-7	Level: III	Date: 03/2			<del></del>						<del></del>	
Olgridiu	,,,	you on							<del> </del>					Pa	ige 2 of 11
			· · · · · · · · · · · · · · · · · · ·										<del></del>		<u> </u>

### RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet



DESCRIPTION Browns Ferry N3 Nozzie-to-Shell Weld Coverage Plot R151 DATE 000296 DRAWN BY N3ANV-CPS1 **Bret Flesner** Nozzle-to-Shell weld examination coverage for axial (radial) scan Total area of examination volume: 60.2 sq. in. (TVA supplied) Total area of examination volume achieved: 29.6 sq. in. Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned. 5.2m.



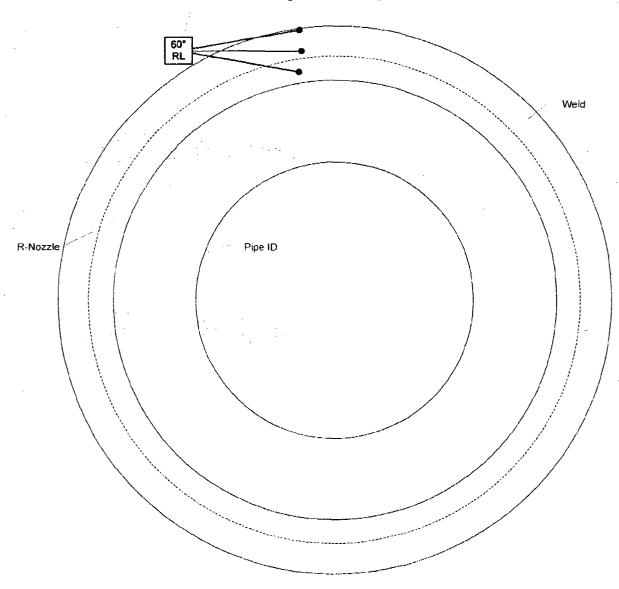
DESCRIPTION
Browns Ferry N3 Nozzle-to-Shell Weld Coverage Plot
DRAWN BY DATE TITLE PAGE
Bret Flesner 03/22/07 N3ANV-CPS3 6 OF 11

R151

000298

## Top View Measurements based on modeling report, design drawings, and as-found measurements.

Transducer showing - & + 10° skew angles





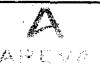
## Reactor Pressure Vessel 600299 Manual Ultrasonic Calibration Data Sheet

Utility: TVA Site: Brown				wns Fer	ry Nu	clear P	lant	Unit: 2			Outage: (	cycle 14 RFO	
Cal	bration Data Sheet Number:	N3ANV-C	DS1			SI Rep	ort Nun	nber:	RIS	21			
Cor	nponent ID: N3A-NV				C	ompo	nent Des	cription: N3	Nozzle-t	o-Ves	sel Weld		
Exa	mination Procedure: 54-ISI-8	50-06			Δ	pplica	ole SDCI	N(s): 30-904	14520-00	00			
	Ultrasonic Instr	ument						Tra	ansduc	sducer			
Mai	nufacture: Staveley ::			Ma	anufa	cture: I	<b>KBA</b>	·	Mod	Model: Benchmark 892-600			
Мо	del: Sonic 136	٠.		Se	Serial Number: 0111PV				Frequency: 2.25 MHz				
Ser	ial Number: 136P1200G08145	55		Si	Size: 0.5" x 1.0"				Sha	pe: R	ectangle		
Line	earity Sheet No.: LDS1			# (	# of Elements: 1					nfigura	ation: Single		
	Instrument Set	ttings		Re	efracte	ed Ang	le: 40°		Mea	asureo	d Angle: * 50	•	
Е	Range: 15.0" Sound Pati	n 🔲 De	pth	Sk	Skew Angle: -115°			Меа	asured	Skew Angl	e: * +115°		
RANGE	Delay: .604"			M	Mode: Shear Rad					lius: 4	.75"		
œ.	Velocity: 0.127 in / μS			Ca	Cable Type: RG-174 Length: 6'					rmedi	ate Connect	ors: 0	
Display: Filt2								Verific	ation E	Block			
Frequency: 2.25 MHz				Ту	/pe: C	S Rom	pas		S/N: 99	-6251			
	Reject: Off				Refle	ector:		1" Radius	1		2" Radius		
	Pulse Width: 222 nS				Sw	eep: 0.65 div.				1.3 div.			
	Damping: 500 Ω				Amplitu			75 %FSH			80 %	FSH	
	Mode: ⊠Pulse Echo □De	ual			(	Gain:		29.0 dB			29.0	) dB	
PULSER	Rep Rate: 2kHz							Basic Ca	libratio	n Bk	ock		
PUL	Pulser: ☐150V ☐300V (*	Sonic 137 or	nly)	Ble	ock IC	): BF-1	BF-18			Material: Clad CS			
	*Pulser voltage adjustable with the	Sonic 137	instrument o	only.	nickne	ss: 6.0	" with 0.	125" Clad	Diameter: Flat				
	The Sonic 136 has a fixe			- 1	emper	ature:	74 °F		Therm.	SN: \	/H-8937	`	
				Co	ouplar	nt: Ultra	agel II		Batch N	lo.: 0	5125		
			Refe	erence	Sens	itivity	Inform	nation					
Ref	lector: ID Notch	Sweep: 6	.1 div			Ampl	itude: 80	%FSH		Gain:	58.6 dB		
Cal	In: Date 03/22/07 Time 0905	Check: Da	ate 03/22/0	77 Time	1041	Chec	k: Date N	I/A Time N/A		Out: D	ate 03/22/07	Time 1230	
				•	Con	nment	3				-		
*During the calibration process a manufacturing error wa incident angle is cut such that a 50° refracted shear way TVA contacted the EPRI NDE Center for additional mod incorrectly labeled -115° skew but is actually +115°.				vave is g	genera	ated ra	ther than	the specifie	d 40°. 1	o ass	sure examina	ation coverage	
Examiner: George Chapman Level: II Date Signature:				Date: 03/	03/22/07 Examiner: N/A Signature Level: N/			Level: N/A	Date: N/A				
	AREVA Review: Adam Contil / Level: III Date				/23/07	Page 7 of 1					Page 7 of 11		



# Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	Site: Bro	wns Ferr	y Nuclear	Plant Unit: 2		Outage:	Cycle 14 RFO		
Cal	ibration Data Sheet Number:	N3ANV-CDS2		ISI Re	port Number:	RISI				
Cor	mponent ID: N3A-NV			Comp	onent Description:	N3 Nozzle	-to-Vessel Weld			
Exe	mination Procedure: 54-ISI-I	850-06		Applic	able SDCN(s): 30	-9044520	000			
	Ultrasonic Inst	trument			-	Transdu	sducer			
Mar	nufacture: Staveley		Ма	inufacture:	KBA	М	Model: Benchmark 892-600			
Mod	del: Sonic 136		Se	rial Numbe	er: 0111PM	F	equency: 2.25 MH	Z		
Ser	ial Number: 136P1200G0814	55	Siz	te: 0.5" x 1	.0"	s	hape: Rectangle			
Line	earity Sheet No.: LDS1		#0	f Element	s: 1	C	onfiguration: Single	· · · · · · · · · · · · · · · · · · ·		
	Instrument Se	ettings	Re	fracted An	gle: 40°	М	easured Angle: 40	0		
Щ	Range: 15.0″ ⊠Sound Pa	th □Depth	Ske	ew Angle:	+115°	М	easured Skew Ang	jle: * -115°		
RANGE	Delay: .604"		Мо	de: Shear		adius: 4.75"				
<u> </u>	Velocity: 0.127 in / μS		Cal	ble Type:	RG-174 Length:	termediate Connec	etors: 0			
œ	Display: Filt2			Ve	rification	Block				
RCVR	Frequency: 2.25 MHz	Тур	pe: CS Ro	mpas	S/N: 9	99-6251				
	Reject: Off		Reflector:	1" Rad	uis	2" F	Radius			
<b>,</b> 	Pulse Width: 222 nS		Sweep:	0.65 d	v.	1.3	3 di <b>v</b> .			
:	Damping: 500 Ω			mplitude:	70 %F	SH	80 9	%FSH		
	Mode: ⊠Pulse Echo □□	Dual		Gain:	27.8 d	В	27.	8 dB		
PULSER	Rep Rate: 2kHz				Basic	Calibrat	ion Block			
ᅙ	Pulser: 150V 300V	(*Sonic 137 only)	Blo	ck ID: BF-	18	Mater	Material: Clad CS			
	*Pulser voltage adjustable with th	e Sonic 137 instrument	only.	ckness: 6.	0" with 0.125" Cla	d Diam	Diameter: Flat			
, ,	The Sonic 136 has a fix	æd pulser voltage.	Ter	mperature	: 74°F	Them	n. SN: VH-8937	\		
			Cor	uplant: Ult	ragel II	Batch	No.: 05125	·		
		Ref	erence S	Sensitivii	y Information					
Ref	lector: ID Notch	Sweep: 5.2 div		Amr	olitude: 80 %FSH		Gain: 48.6 dB			
Cal	In: Date 03/22/07 Time 0908	Check: Date 03/22/	07 Time 1	021 Che	ck: Date N/A Time	N/A	Out: Date 03/22/0	7 Time 1235		
*Tra	ansducer incorrectly labeled -	115° skew by the m		Commen er; howeve		·115°.				
Examiner: George Chapman Level: II Date				e: 03/22/07 Examiner: N/A Signature			Level: N/A	Date: N/A		
	VA Review Adam conti	Date: 03/2	:3/07	)7						



## Reactor Pressure Vessel 000301 Manual Ultrasonic Calibration Data Sheet

Util	πy: IVA	rowns F	eny Nuc	clear Pla	int	Unit: 2			Outage: C	Sycie 14 KFO		
Cal	ibration Data Sheet Number: N3	ANV-CDS3		1	SI Repo	rt Numl	per: $ ilde{arrho}$	151				
Cor	nponent ID: N3A-NV			C	ompone	ent Desc	ription: N3	Nozzie-	to-Vess	sel Weld		
Exa	mination Procedure: 54-ISI-850	06		Α	pplicabl	e SDCN	(s): 30-90	44520-0	000			
	Ultrasonic Instrur	nent		•			Tr	ansduc	er			
Mai	nufacture: Staveley			Manufa	cture: Kl	ВА		Мо	Model: Benchmark 892-600			
Mod	del: Sonic 136			Serial N	umber: 00X1XB / F			Fre	equency	/: 2.25 <b>M</b> Hz		
Ser	ial Number: 136P1200G081455			Size: 0.	5" x 1.0"			Sh	ape: Re	ectangle		
Line	earity Sheet No.: LDS1			# of Ele	ments: 1			Co	nfigurat	ion: Single		
	Instrument Setti	ngs	-	Refracte	ed Angle	: 60°		Me	asured	Angle: 60°		
ш	Range: 20.0" Sound Path	□Depth		Skew A	ngle: ±5	2° to 74		Me	asured	Skew Angl	e: N/A	
RANGE	Delay: 1.17"			Mode: Shear Radius: F					at			
8	Velocity: 0.127 in / μS	.	Cable T	ype: RG	-174 L	ength: 6'	Inte	ermedia	ite Connec	tors: 0		
	Display: Filt2						Verifi	cation	Block			
RCVR	Frequency: 2.25 MHz			Type: C	S Romp	as		S/N: 9	9-6251			
	Reject: Off			Refle	ector:		1" Radius			2" R	adius	
	Pulse Width: 222 nS			Sw	/еер:		0.5 div.		1.0 div.			
	Damping: 500 Ω			Ampli	tude:		70 %FSH			80 %	6FSH	
	Mode: ⊠Pulse Echo □ □Dual			(	Gain:		21.4 dB			21.	4dB	
PULSER	Rep Rate: 2kHz				-		Basic Ca	alibrati	on Blo	ck		
PUL	Pulser: ☐150V ☐300V (*Sor	ic 137 only)		Block IC	): BF-18			Materia	al: Clad	cs		
	*Pulser voltage adjustable with the So	nic 137 instrumer	nt only.	Thickne	ss: 6.0"	with 0.1	25" Clad	Diame	ter: Flat	1		
	The Sonic 136 has a fixed p			Temper	ature:	74 °F		Therm	. SN: V	H-8937		
			ſ	Couplar	nt: Ultrag	jel II		Batch	No.: 05	5125		
		Re	ferenc	ce Sens	itivity	nforma	ation					
Ref	lector: ID Notch Sv	veep: 6.0 div			Amplit	ude: 80 '	%FSH		Gain: 5	8.2 dB		
Cal	In: Date 03/22/07 Time 0915 Ch	eck: Date 03/22	2/07 Tir	пе 0959	Check:	Date N/	A Time N/	<b>A</b>	Out: Da	ate 03/22/07	Time 1233	
				Con	nments							
	miner; George Chapman	Level: II	Date: 0	03/22/07	Exam Signa	iner: N//	<b>A</b>			_evel: N/A	Date: N/A	
Signature: All Level: III Da				03/23/07			•	· · · · · · · · · · · · · · · · · · ·			Page 9 of 11	



# Reactor Pressure Vessel 630302 Manual Ultrasonic Calibration Data Sheet

Util	Utility: TVA Site: B			s Ferry Nuclear Pl		Unit: 2		Outage:	Outage: Cycle 14 RFO	
Ca	libration Data Sheet Number: N3Al	NV-CDS4		ISI Re	port Num	nber: R15	/			
Co	mponent ID: N3A-NV			Comp	onent De	scription: N3	Nozzle-to	o-Vessel Weld		
Exa	amination Procedure: N-UT-78 Rev	vision 4	4. 5.	Applic	able SDC	N(s): N/A				
	Ultrasonic Instrume	ent				Tra	ansduce	er		
Ma	nufacture: Staveley		Man	ufacture	RTD		Mod	Model: TRL2-ST		
Мо	del: Sonic 136		Seria	al Numb	er: 07-304	1 🗸	Fred	quency: 2 MHz		
Sei	ial Number: 136P1200G081456		Angl	e: 60°			Mea	sured Ångle: 61	0	
Lin	earity Sheet No.: LDS2		Mode	e: Refra	cted Long	itudinal	Size	: 2(24x42)mm		
	Instrument Setting	js	Focu	Focus: FS~125mm			Squ	int Angle: 5°		
ш	Range: 8.00" Sound Path	Depth	# of I	Element	s: 2	Shape: Red	. Con	figuration: Dual	- SBS	
RANGE	Delay: 1.34"		Cabl	е Туре:	RG-174	rmediate Conne	ctors: 0			
<u>.</u>	Velocity: 0.227 in / µS				Verific	cation B	Block			
_	Display: Filt 2		Туре	: N/A			S/N: N/	4		
RCVR	Frequency: 2.25 MHz		R	eflector:		N/A			N/A	
	Reject: Off			Sweep: N/A				N/A		
	Pulse Width: 222 nS			Amplitude: N/A					N/A	
	Damping: 500 Ω			Gain:		N/A			N/A	
α	Mode: □Pulse Echo ☑Dual	Mode: □Pulse Echo  ☑Dual				Basic Ca	libratio	n Block	, ,	
PULSER	Rep Rate: 2kHz		Block	Block ID: BF-18 N			Material	Material: Clad CS		
ď.	Pulser: 150V 300V (*Sonic	137 only)	Thick	Thickness: 6.0" with 0.125" Clad			Diamete	Diameter: Flat		
	*Probe voltage is adjustable with the Sonio		The Tem	perature	: 74 °F		Therm.	SN: VH-8937		
	Sonic 136 has a fixed pulser	r voltage.	Coup	olant: Ult	ragel II		Batch N	lo.: 05125		
		Re	ference Se	ensitivi	ty Infom	nation				
Rei	flector: 1/4-t SDH	Sweep: 3.7 c	vib		Amplitud	le: 80 %FSH		Gain: 59.8 d	IB .	
Cal	In: Date 03/22/07 Time 0850	Check: Date	N/A Time N/	4	Check: D	ate N/A Time	N/A	Out: Date 03	//22/07 Time 1252	
			C	ommer	ıts					
Zor	ne 1 - Near Surface calibration.									
	aminer: Bret Flesner nature:	Date: 03/22/	22/07 Examiner: N/A Signature		···	Level: N/A	Date: N/A			
	EVA Review/Adam Conti nature: A au -	Date: 03/23/	07	7 Page				Page 10 of 11		



#### Reactor Pressure Vessel 030303 Manual Ultrasonic Calibration Data Sheet

Util	Jtility: TVA Site: Brown			Ferry Nu	uclear	Plant	Unit: 2		Outage:	Cycle 14 RFO		
Cal	ibration Data Sheet Number: N3/	ANV-CDS5			ISI Re	port Nur	mber: R1	51	<b>1</b>			
Co	mponent ID: N3A-NV		· · ·		Comp	onent De	escription: N3	Nozzle-to	Vessel Weld.			
Exa	amination Procedure: N-UT-78 Re	evision 4			Applic	able SD(	CN(s): N/A					
	Ultrasonic Instrum	nent					Tr	ansduce	er			
Ma	nufacture: Staveley			Manufa	acture:	RTD		Mod	Model: TRL2-ST			
Мо	del: Sonic 136			Serial	Numbe	er: 07-30	4 🕚	Fred	juency: 2 MHz			
Ser	ial Number: 136P1200G081456			Angle: 60°					sured Angle: 61			
Lin	earity Sheet No.: LDS2		-44.5	Mode:	Refrac	ted Long	gitudinal	Size	2(24x42)mm			
	Instrument Settin	ıgs		Focus: FS~125mm			Squ	int Angle: 5°				
ш	Range: 18.0" Sound Path	□Depth		# of Ele	ement	s: 2	Shape: Rec	t. Con	figuration: Dual	- SBS		
RANGE	Delay: 1.34"			Cable Type: RG-174 Length: 12'					mediate Conne	ctors: 0		
LE.	Velocity: 0.227 in / µS			Verificati					lock	,		
	Display: Filt 2				N/A			S/N: N//	4			
RCVR	Frequency: 2,25 MHz				lector:		N/A		N/A			
	Reject: Off			Sweep:		N/A		N/A				
	Pulse Width: 222 nS		1 1 2 5	Amp	litude:		N/A			N/A		
	Damping: 500 Ω				Gain:		N/A			N/A		
œ	Mode: ☐Pulse Echo  ☑Dual						Basic Ca	alibratio	n Block			
PULSER	Rep Rate: 2kHz			Block i	D: BF-	18		Material	al: Clad CS			
α.	Pulser: 150V 300V (*Son	ic 137 only)		Thickn	ness: 6.0" with 0.125" Clad		Diamete	Diameter: Flat				
	"Probe voltage is adjustable with the So		ent. The	Tempe	rature	: 74 °F		Therm.	Therm. SN: VH-8937			
	Sonic 136 has a fixed puls	er voltage.		Coupla	nt: Ult	Itragel II Batch N			No.: 05125			
		R	Referen	ce Sen	sitivi	ty Infor	mation					
Ref	lector: ID Notch	Sweep: 6.3	div			Amplitu	de: 80 %FSH		Gain: 74.6 d	iB		
Cal	In: Date 03/22/07 Time 0852	Check: Date	e N/A Ti	ime N/A		Check: [	Date N/A Tim	e N/A	Out: Date 03	/22/07 Time 1250		
	,			Co	mmer	its						
Zor	ne 2 - Full Volume calibration.			•								
	nminer: Bret Flesner nature: But T.C., vic	Level: II	Date: (	03/22/07		aminer: I Inature	N/A		Level: N/A	Date: N/A		
	EVA Review Adam Com	Date: (	03/27/07	07					Page 11 of 11			

### Examination Report, R-175 N3B-NV, RPV Nozzle-To-Head Weld



### RPV Nozzle Ultrasonic Examination Summary Sheet

000304

AREVA	<u> </u>					-10	·			
Utility: TVA	Site: Browns F	erry Nuclear Plan	it U	nit: 2	Outage: Cycle 14	ISI Report #:	12175			
Component Number:	N3B-NV	Component De	scription: N	l3 Nozzle t	o Vessel Weld	System: RP\	/			
Code Category: B-D		Code Item: B3.	90		Code Class: 1	Material: CS	:			
ISO / Drawing(s): 2-0	HM-2046-C-01	& 2-ISI-0222-C-02								
Procedure Numbe	r Proced	dure Revision	SE	CN	Pro	cedure Misc. Inf	0			
N-UT-78		4	1	IA	Revision 11 of the F	PDI-UT-6 qualified	d equipment table			
N-UT-79		. 1	1	IA	Revision 5 of the P					
54-ISI-850		06	30-9044	1520-000		Modeling Report: IR-2003-19 Section 4 EPRI Letter dated 3/5/07				
Ca	libration Sheets		1	n Data eets	Indication Data Sheets	Exam ⊠No Recordab	Results			
N3BNV-CDS1			)	/-EDS1			Flaw Indications			
N3BNV-CDS2		<del></del>					aw evaluation)			
1	<u> </u>						law Indications			
N3BNV-CDS3							flaw evaluation)			
N3BNV-CDS4			ļ <u>.</u>			, ,	,			
N3BNV-CDS5										
Summary:										
In accordance with	UT procedure	N-UT-78 Revision	on 4, 60° i	efracted i	ongitudinal wave ex	aminations wer	e performed			
from the vessel sur	face in both the	e axial (radial) ar	nd circum	ferential s	can directions. The	se examination:	s resulted in no			
reportable indicatio		(122,21,7,21,								
Toportable maidate										
In apportance with	LIT procedure	54 ICI 950 06 a	nd the ref	arancad T	VA / EPRI modeling	report the follo	wing additional			
					portable indications.	report the lone	wing additional			
examinations were	репоннес. тп	ese examination	iis resuite	u III IIO IE	portable mulcations.					
	N3 Nozzle	Modeling Parar	meters							
Probe Refracted		Skew		Surface						
50°S	- 1	15°		Radius						
40°S		15°		Radius						
60°S		°-74°)		essel						
L	1 102	-/4)		3301						
Th:				أسم مالا بالان		E= /5\/0\/\\\\\\\	Sand tha			
i nis ultrasonic exa	mination was p	errormed in acci	ordance w	ith the cri	teria of 10 CFR50.5	ba (b)(2)(xv)(G)	and the			
minimum coverage	requirements	of 10 CFR50.55	a (b)(2)(x\	/)(K) was	achieved to the max	imum extent po	ssible. The			
examination proced	dure requires a	n additional circi	umferentia	al scan of	the outer 85%-t which	ch is not addres	sed in 10CFR			
50.55a. The 60°Rl	examinations	were limited due	e to the no	zzle conf	iguration which redu	ced the examir	ation volume			
obtained to 41%. F	Refer to coverag	ge sketch(s) and	d workshe	et for a de	escription of the scar	nning volume, e	xamination			
coverage, and scar		- • •				-				
This examination s	atisfies the requ	uirements of AS	ME Section	n XI (200	1 thru 2003 Addend	a) and was perf	formed using			
ASME Section XI, A	Appendix VIII a	ualified personn	el, proced	lures, and	l equipment.		•			
	, p = 0 = 1 = 1 = 1	<b>(*</b>		,						
Note: See TVA Re	quest for Relief	PDI-1 and PDI-	-2. Docke	ts No. 50	-261/296, 50-327/32	8, and 50-0390	. This relief			
					to the weld plus 1/2"					
. Squeek reduced th	- a, ca to be ex	annios per 1446	,	-, (0)		J., J.				
Prepared by: Thoma	oo Provin			Poviou	ed by: Adam Contil	1				
	AS BLOWU	Date: 3	/15/07			+	Date: 4/11/07			
Signature:	1) Dro-		, ,	Signatu	15 1	-				
Customer: Matt Wel	ch/ Weilu	clcl_ Date:	4/18/07	ANII:	10 Xi 120	0	Date: 11/27</td			
Signature:			· /- /- ·	Signatu	- June 4 M	um.	3(22)01			
	*	the property of					Page 1 of 11			

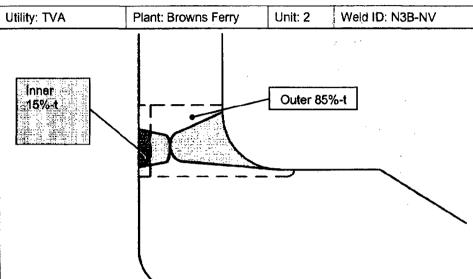


#### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

Utility: T\	<u>/A</u>		Si	te: Browns Ferry	Nuclear	Plant	···-		Unit: 2	Outa	ge: Cycle 14 KF	<u> </u>
		Sheet Number: N	3BNV-EDS1					lumber: 📝				
Compone	ent ID: N	3B-NV					Component	Description:	N3 Nozzle-to-V	essel Weld		
					Exa		Information			·		
		nber: 2-CHM-2046	S-C-01, 2-ISI-022	2-C-02			ation: Nozzle Bo			Location: Nozz	le TDC	
Examinat	ion Limite	ed:⊠Yes □No					ige Sheet Numbi	er(s): N3BN\	V-CWS1			
						Scan Info	rmation					
Examination	on Proced	ire: 54-ISI-850-06		Applicable SDC	N's: 30-904	44520-000				Scan Surface:	OD Blend Radius	
Angle/ Mode	Skew	Calibrat	ion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Limited	Recordable Indication(s)	Indication Data Sheet #	Examiner Initials
*50°/s	-115°	N3BN	IV-CDS1	03/15/07	1222	80° F	VH-9525	68.0 dB	∐Yes ⊠No	☐Yes ⊠No	N/A	TB
40°/s	+115°	N3BN	IV-CDS2	03/15/07	1250	80° F	VH-9525	65.0 dB	□Yes ⊠No	☐Yes ⊠No	N/A	ТВ
NA /	NA / N/A N/A			N/A	N/A	N/A	¹ N/A	N/A	□Yes □No	☐Yes ☐No	N/A	N/A
NA / N/A N/A N						N/A	N/A	N/A	□Yes □No	☐Yes ☐No	N/A	, N/A
Examinati	Examination Procedure: 54-ISI-850-06 Applicable SDCN's: 30-9044520-000 Scan Surface: OD Vessel Shell											
Angle/ Mode	Skew	Calibrat	ion Sheet#	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Limited	Recordable Indication(s)	Indication Data Sheet #	Examiner Initials
60°/s	±52° to 7	4° N3BN	NV-CDS3	03/15/07	1315	80° F	VH-9525	68.0 dB	∐Yes ⊠No	☐Yes ⊠No	N/A	ТВ
N/A /	N/A		N/A	N/A	N/A	N/A	N/A	N/A	☐Yes ☐No	☐Yes ☐No	N/A	N/A
Examinati	on Proced	ıre: N-UT-78 revisio	п 4	Applicable SDC	N's: N/A					Scan Surface:	OD Vessel Shell	
Angle/ Mode	Zone	Beam Direction	Calibration Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Limited	Recordable Indication(s)	Indication Data Sheet #	Examiner Initials
60°/RL	1	⊠Radial □Circ	N3BNV-CDS4	03/15/07	1142	80° F	VH-9525	76.0 dB	⊠Yes □No	☐Yes ⊠No	N/A	ТВ
60°/RL	2	⊠Radial □Circ	N3BNV-CDS5	03/15/07	1100	80° F	VH-9525	78.0 dB	⊠Yes □No	☐Yes ⊠No	N/A	ТВ
60°/RL	1	☐Radial ⊠Circ	N3BNV-CDS4	03/15/07	1142	80° F	VH-9525	76.0 dB	⊠Yes □No	☐Yes ⊠No	N/A	ТВ
60°/RL	2	☐Radial ⊠Circ	N3BNV-CDS5	03/15/07	1100	80° F	VH-9525	78.0 dB	⊠Yes □No	□Yes ⊠No	N/A	ТВ
Commen * See cali		a sheet for additiona	al details on the 50°	shear examination	٦.							
Examiner: Signatur		Brown		Level: II	Date: 03	/15/07	Examiner: Signature:		N/A	i		:: N/A
Examiner: N/A Level: N/A Date: N/A Signature:					/A	Examiner: Signature:	h	N/A	L	evel: N/A Date	: <b>N</b> /A	
AREVA R Signatur	eview: Ad	from m	<u> </u>	Level: III	Date: 4/	11/07				*····.		
Signatu	-/-	12.2			1							Page 2 of 11



### RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet



Axial scans are performed with a procedure for the examination of vessel shell welds. This procedure has been demonstrated for detection of flaws located throughout the entire weld thickness. Coverage obtained during axial scans is typically limited due to nozzle configuration.

Coverage Worksheet #: N3BNV-CWS1

ISI Report #: 12/75

In the circumferential scan direction the outer 85%-t is examined with the same vessel procedure as above and typically limited due to nozzle configuration. To achieve additional coverage in the circumferential scan direction a second examination is performed with a procedure demonstrated for nozzle inside-radius UT. This procedure has been demonstrated for detection of flaws in the inner 15%-t only. The nozzle inside-radius technique provides additional coverage since the component is modeled and scanning is performed with several search units from the nozzle blend.

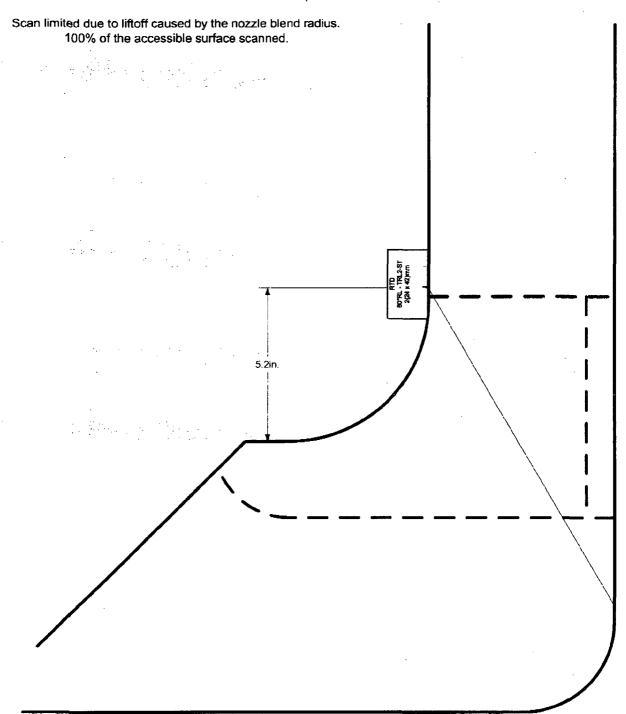
Axial Scans	Circum	nferential Scans
100%-t	Inner 15%-t	Outer 85%-t
Examination Procedure: N-UT-78 Revision 4	Examination Procedure: 54-ISI-850-06	Examination Procedure: N-UT-78 Revision 4
ARequired Examination Volume: 60.22 inches	<sup>D</sup> Inner 15%-t Examination Volume: 6.8 <sup>2</sup> inchs	GOuter 85%-t Examination Volume: 53.42 inches.
60°RL axial scan limited:	<sup>E</sup> Coverage Obtained by Modeling: 100%	60°RL Outer 85%-t Exam Limited:
Description of Limitation: Nozzle Blend Radius	Inner 15%-t Exam Limited: ☐Yes ☑No	Description of Limitation: Nozzle Blend Radius
<sup>B</sup> Total Axial Volume Achieved: 29.6 <sup>2</sup> inches	Description of Limitation: N/A	<sup>H</sup> Outer 85-t% Volume Achieved: 12.9 <sup>2</sup> inches
	Finner 15%-t Volume Achieved: 6.82inchs	
<sup>c</sup> Percentage of Axial Coverage: 49%  B + A X 100 = C		al Examination Coverage: 33%  H) + A X 100 = J
	Combined Axial and Circumferential Weld	Coverage
	<sup>L</sup> Total Examination Coverage: (C+J) + 2 × 100 = L	41%
Prepared by: Bret Flesner Date: 03/15/0	7 Reviewed by: Adam Conti Date:04/11/0	07 Page 3 of 11

DESCRIPTION
Browns Ferry N3 Nozzle-to-Shell Weld Coverage Plot
DRAWN BY
DATE TITLE PAGE
Bret Flesner 03/15/07 N3BNV-CPS1 4 OF 11

*R175* 

Nozzle-to-Shell weld examination coverage for axial (radial) scan

Total area of examination volume: 60.2 sq. in. (TVA supplied)
Total area of examination volume achieved: 29.6 sq. in.



DESCRIPTION A Browns Ferry N3 Nozzle-to-Shell Weld Coverage Plot R175 DRAWN BY AREVA N3BNV-CPS2 Bret Flesner 03/15/07 5 OF 11 000308 Nozzle-to-Shell weld examination coverage for circumferential scan Total area of examination volume: 60.2 sq. in. (TVA Supplied) Total area of outer 85%-t exam volume achieved: 12.9 sq. in. Total area of inner 15%-t volume: 6.8 sq. in. Total area of inner 15%-t exam volume achieved: 6.8 sq. in. Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned. Inner 15%-t area examined from the blend with Supplement 5 techniques. 10.CFR.50.55a(b)(2)(xv)(K)(3)(i) & (ii) require radial examination of the full thickness but circumferential examination of the inner 15%-t only. 100% coverage of the inner 15%-t obtained with scans performed from the blend with Supplement 5 techniques. 100% of 10 CFR50.55a circumferential coverage obtained. 5.2in.

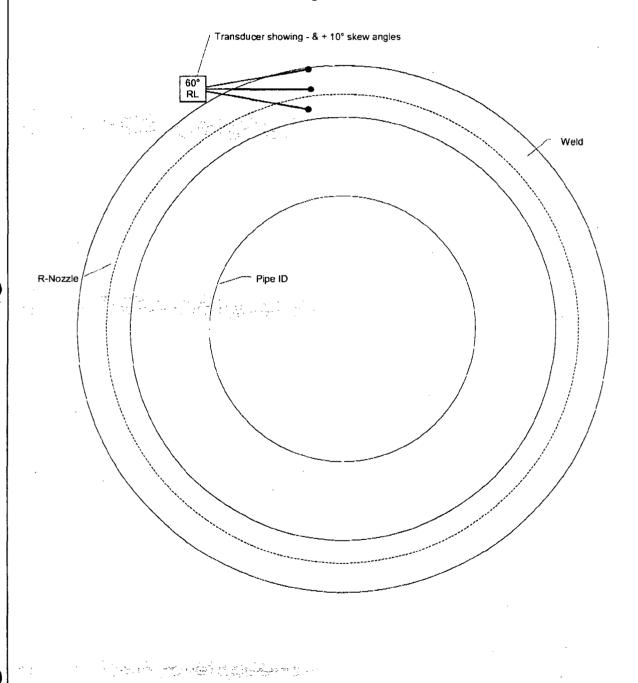
DESCRIPTION
Browns Ferry N3 Nozzle-to-Shell Weld Coverage Plot
DRAWN BY DATE TITLE PAGE
Bret Flesner 03/15/07 N3BNV-CPS3 6 OF 11

R175

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Top View

Measurements based on modeling report, design drawings, and as-found measurements.





# Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet 00310

التان	ity: TVA	Browns F	owns Ferry Nuclear Station Unit: 2				Outage: Cycle 14 RFO				
Cal	ibration Data Sheet Number:	N3BNV-CDS1		IS	SI Report Nu	mber:		R175			
Cor	nponent ID: N3B-NV			Co	omponent De	scription: N	3 Nozzle-to-Ve	essel Weld			
Exa	mination Procedure: 54-ISI-8	50-06		Ap	plicable SD0	CN(s): 30-90	44520-000				
	Ultrasonic Inst	rument				Tr	ansducer				
Mai	nufacture: Staveley	entani grave ejiği i kiledilili	ı	Manufac	ture: KBA		Model: E	Benchmark 89	92-600		
Мо	del: Sonic 136	The second section is a second	8	Serial Nu	mber: 0111f	ΡV .	Frequency: 2.25 MHz				
Ser	ial Number: 703l		5	Size: 0.5" x 1.0"			Shape:	Shape: Rectangle			
Line	earity Sheet No.: LDS4		#	f of Elem	nents: 1		Configu	ration: Single			
	Instrument Se	ttings	F	Refracted	d Angle: 40°		Measure	ed Angle: * 50	•		
ш	Range: 15.0" ⊠Sound Pat	h Depth		Skew An	gle: -115°		Measure	ed Skew Angl	e: * +115°		
RANGE	Delay: 1.27"		_	Mode: Sl	near		Radius:	4.75"			
ď	Velocity: 0.127 in / µS			Cable Ty	pe: RG-174	Length: 12'	Intermed	diate Connect	ors: 0		
	Display: Filt2					Verifi	cation Bloc	k			
RCVR	Frequency: 2.25 MHz			Type: CS	Rompas		S/N: 99-625	51			
	Reject: Off			Reflec	ctor:	1" Radius		2" Ra	adius		
	Pulse Width: 222 nS		Swe	reep: 0.65 div			1.3	div.			
	Damping: 500 Ω			Amplitu	ıde:	80 % FSH		80 %	FSH		
	Mode: ⊠Pulse Echo □□		Gain: 32.2				32.2	2 dB			
PULSER	Rep Rate: 2kHz	- 1 m - 1 m	Basic Ca			alibration B	lock				
질	Pulser: ☐150V ☐300V (	*Sonic 137 only)	E	Block ID: BF-18			Material: Clad CS				
	*Pulser voltage adjustable with the	e Sonic 137 instrume	ent only.	Thicknes	s: 6.0" with 0	).125" Clad	Diameter: F	iameter: Flat			
	The Sonic 136 has a fix			Tempera	ture: 76 °F		Therm. SN:	VH-9525	_		
			_ (	Couplant	: Ultragel II		Batch No.:	05325			
		R	eference	e Sensi	tivity Infor	mation					
Ref	lector: ID Notch	Sweep: 6.1 div			Amplitude: 8	0 %FSH	Gain	: 63.4 dB			
Cal	In: Date 3/15/07 Time 0907	Check: Date 3/15	5/07 Time	1221	Check: Date	N/A Time N//	A Out:	Date 03/15/07	Time 1410		
				Com	ments						
inci TV	uring the calibration process a dent angle is cut such that a 5 A contacted the EPRI NDE Ce orrectly labeled -115° skew bu	i0° refracted shear enter for additional	ar wave is al modelin	genera	ted rather tha	an the specifi	ed 40°. To as	ssure examina	ation coverage		
	miner: Thomas Brown	Level: II	Date: 0	3/15/07	Examiner: Signature	N/A		Level: N/A	Date: N/A		
<u> </u>	VO DE LO										
	EVA Review Agem Continuature:	Level: III	Date: 4	/11/07					Page 7 of 11		



# Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet

Util	lity: TVA	Site: Browns	rns Ferry Nuclear Plant Unit: 2				Outage: Cycle 14 RFO		
Cal	libration Data Sheet Number:	N3BNV-CDS2	l	SI Repor	t Number:		R115		
Co	mponent ID: N3B-NV		С	ompone	nt Description: N3	Nozzle-to	o-Vessel Weld		
Exa	amination Procedure: 54-ISI-	850-06	Α	pplicable	SDCN(s): 30-90	44520-000	)		
	Ultrasonic Inst	rument			Tr	ansduce	r		
Ма	nufacture: Staveley		Manufad	cture: KB	Α	Mode	el: Benchmark 89	32-600	
Мо	del: Sonic 136		Serial N	umber: 0	111PM	Freq	Frequency: 2.25 MHz		
Sei	rial Number: 7031		Size: 0.	5" x 1.0"		Shap	e: Rectangle		
Lin	earity Sheet No.: LDS4		# of Ele	ments: 1		Conf	iguration: Single		
	Instrument Se	ettings	Refracte	ed Angle:	40°	Meas	sured Angle: 40°		
	Range: 15.0" Sound Pa	th Depth	Skew A	ngle: +11	5°	Meas	sured Skew Angl	e: *-115°	
RANGE	Delay: 1.27"		Mode: S	hear	us: 4.75"				
∞2	Velocity: 0.127 in / µS		Cable T	ype: RG	174 Length: 12'	mediate Connect	tors: 0		
	Display: Filt2	· · · · · · · · · · · · · · · · · · ·			Verifi	cation B	lock		
RCVR	Frequency: 2.25 MHz		Type: C	S Rompa	is	S/N: 99-	6251		
ď	Reject: Off		Refle	ector: 1" Radius			2" R	adius	
	Pulse Width: 222 nS	se Width: 222 nS Sweep:					1.3	div.	
	Damping: 500 Ω	Ampli	tude:	80 %FSH		65 %	FSH		
	Mode: ⊠Pulse Echo □[	(	Gain:	32.2 dB		32.2	2 dB		
PULSER	Rep Rate: 2kHz	· · · · · · · · · · · · · · · · · · ·		•	Basic Ca	alibration	Block	*	
PUL	Pulser:150V300V	(*Sonic 137 only)	Block ID	): BF-18		Material: Clad CS			
	*Pulser voltage adjustable with the	e Sonic 137 instrument only	Thickne	ss: 6.0" with 0.125" Clad		Diameter: Flat			
	The Sonic 136 has a fi	and the second s	Temper	ature: 76	°F	Therm.	SN: VH-9525		
			Couplar	nt: Ultrag	el II	Batch No	o.: 05325	·	
	<u> </u>	Referen	ce Sens	itivity I	nformation				
Re	flector: ID Notch	Sweep: 5.2 div		Amplitu	de: 80 %FSH	G	lain: 57.0 dB		
Cal	In: Date 3/15/07 Time 0909	Check: Date 3/15/07 Tin	ne 1249	Check:	Date N/A Time N/A	\ C	out: Date 03/15/07	Time 1412	
			Con	ments					
* T	he transducer wedge is incorr	ectly labeled -115° skew	by the ma	anufactu	er; however actua	al skew is	+115°.		
	aminer: Thomas Brown	Level: II Date:	03/15/07	Exami	ner: N/A ure		Level: N/A	Date: N/A	
AR	EVA Review Adam Continuature:	4/11/07	1/07				Page 8 of 11		



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# Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet 00312

Dui	ity: TVA	Site. Bro	wiis reily iv	uciear Pia	rit Ulin. Z		Outage. C	Sycie 14 KFO		
Cal	bration Data Sheet Number:	N3BNV-CDS3		ISI Repo	rt Number:		Ri	15		
Cor	nponent ID: N3B-NV			Compone	ent Description: N3	Nozzle-to	o-Vessel Weld			
Exa	mination Procedure: 54-ISI-8	350-06		Applicable	e SDCN(s): 30-90	44520-00	00			
	Ultrasonic Inst	rument			Tr	ansduce	er			
Mai	nufacture: Staveley	3,,	Manut	facture: Kl	3A	Mod	Model: Benchmark 892-600			
Mod	del: Sonic 136		Serial	Number:	00X1XB	Frequency: 2.25 MHz				
Ser	ial Number: 7031		Size: (	0.5" x 1.0"		Shape: Rectangle				
Line	earity Sheet No.: LDS4		# of E	lements: 1		Con	figuration: Single			
	Instrument Se	ttings	Refrac	ted Angle	e: 60°	Mea	sured Angle: 59°			
ш	Range: 20.0" Sound Pat	h Depth	Skew	Angle: ±5	2° to 7 <b>4</b> °	Mea	sured Skew Angl	e: N/A		
RANGE	Delay: 0.813"		Mode	Shear		Rad	ius: Flat			
α.	Velocity: 0.127 in / µS		Cable	Type: RG	-174 Length: 12'	Inter	rmediate Connect	ors: 0		
	Display: Filt2				Verifi	cation B	Block			
RCVR	Frequency: 2.25 MHz		Type:	CS Romp	as	S/N: 99	-6251			
"	Reject: Off		Re	flector:	1" Radius		2" Ra	adius		
	Pulse Width: 222 nS		3	Sweep:	0.6 div.	1.1	div.			
	Damping: 500 Ω	· · · · · · · · · · · · · · · · · · ·	Amı	olitude:	70 %FSH		80 %	FSH		
	Mode: ⊠Pulse Echo □□	Dual		Gain:	27.6 dB		27.6	3 dB		
SER	Rep Rate: 2kHz			Basic Ca			n Block			
PULSER	Pulser: ☐150V ☐300V (	'Sonic 137 only)	Block	Block ID: BF-18			Material: Clad CS			
	*Pulser voltage adjustable with the	Sonic 137 instrument	Only Thickr	ness: 6.0"	with 0.125" Clad	Diamete	er: Flat			
	The Sonic 136 has a fix		,	erature: 76	6°F	Therm.	SN: VH-9525			
			Coupl	ant: Ultrag	jel li	Batch N	lo.: 05325			
****	· · · ·	Refe	erence Sei	nsitivity	Information	<u> </u>				
Ref	lector: ID Notch	Sweep: 5.8 div		Amplite	ude: 80 %FSH		Gain: 60.8 dB			
Cal	In: Date 3/15/07 Time 0850	Check: Date 3/15/07	7 Time 1314	4 Check:	Date N/A Time N/A	A (	Out: Date 03/15/07	Time 1414		
		-	Co	omments						
						•	•			
	aminer: Thomas Brown	Level: II	Tata: 03/45#	17 Evam	iner: N/A		Level: N/A	Date: N/A		
	nature: O B	Level, II	Jaic. 03/13/0	ate: 03/15/07 Examiner: N/A Signature			LCVCI. IV/A	J410. 1971		
	EVA Review Adam Canti nature:	Level: III	Date: 04/11/0	ite: 04/11/07				Page 9 of 11		



# Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet

Utility: TVA Site: Brown			ns Ferry N	uclear	Plant	Unit: 2		Outage: Cycle 14 RFO		
Cal	ibration Data Sheet Number: N3NV-	-CDS4		IŞI Rej	ort Nur	nber:		RI	75	
Cor	nponent ID: N3B-NV			Compo	nent De	scription: N3	Nozzle-to-\	/essel Weld.		
Exa	mination Procedure: N-UT-78 Revis	sion 4		Applica	able SDO	CN(s): N/A				
	Ultrasonic Instrumer	nt	Many 1			Tr	ansducer	sducer		
Mai	nufacture: Staveley		Manuf	acture:	RTD		Model:	Model: TRL2-ST		
Мо	del: Sonic 136		Serial	Serial Number: 07-304				ency: 2 MHz		
Ser	ial Number: 7031		Angle:	Angle: 60°				red Angle: 61°		
Line	earity Sheet No.: LDS4		Mode:	Mode: Refracted Longitudinal				2(24x42)mm		
	Instrument Settings	<b>)</b>	Focus:	Focus: FS~125mm			Squint	Angle: 5°		
ш	Range: 8.00" Sound Path	]Depth	# of El	# of Elements: 2 Shape: Rect			t. Config	uration: Dual -	SBS	
RANGE	Delay: 1.38"		Cable	Type: F	RG-174	ediate Connec	tors: 0			
Velocity: 0.230 in / μS						Verifi	cation Blo	ck		
Display: Filt 2				CS Roi	mpas	-	S/N: 99-6251			
3CVR	Frequency: 2.25 MHz			lector:		1" Radius		2" Radius		
	Reject: Off			Sweep: 1.2				2.5	2.5 div.	
	Pulse Width: 222 nS		Amp	litude:		25 %FSH		80 %	6FSH	
	Damping: 500 Ω			Gain: 52.0 dB				52.	0 dB	
α.	Mode: □Pulse Echo ☑Dual			Basic Calib				Block		
PULSER	Rep Rate: 2kHz	• .	Block	D: BF-	18		Material: Clad CS			
۵	Pulser: ☐150V ☐300V (*Sonic 1	37 only)	Thickn	ess: 6.	0" with 0	.125" Clad	Diameter: Flat			
	*Probe voltage is adjustable with the Sonic		Tempe	erature	76 °F		Therm. SN: VH-9525			
	Sonic 136 has a fixed pulser v	oltage.	Couple	ant: Ult	ragel II		Batch No.: 05325			
		Refer	ence Sen	sitivit	y Infor	nation				
Ref	lector: 1/4-t SDH	weep: 3.8 div			Amplitud	de: 80 %FSH	I	Gain: 58.4 dE	3	
Cal	In: Date 3/15/07 Time 0929	heck: Date 3/15	5/07 Time	1141	Check: [	Date N/A Tim	e N/A	I/A Out: Date 3/15/07 Time 1416		
			Co	mmen	ts					
Zor	ne 1 - Near Surface calibration.									
		•								
-	miner: Ihomas Brown  nature  D Brown	te: 03/15/0	07 Examiner: N/A Signature				Level: N/A	Date: N/A		
	EVA Review Adem Copt 1	te: 4/11/07						Page 10 of 11		



## Reactor Pressure Vessel 000314 Manual Ultrasonic Calibration Data Sheet

اناك	ity: TVA	Browns Ferry	ns Ferry Nuclear Plant Unit: 2				Outage: Cycle 14 RFO				
Cal	ibration Data Sheet Number: N3BI	NV-CDS5		ISI Re	port Nur	mber:		R175			
Cor	mponent ID: N3B-NV			Comp	onent De	scription: N3	Nozzle-to-V	essel Weld			
Exa	mination Procedure: N-UT-78 Rev	vision 4		Applic	able SD0	CN(s): N/A					
	Ultrasonic instrume	ent :	ten e	-		Tra	ansducer	r			
Mai	nufacture: Staveley		Mar	nufacture	: RTD		Model:	Model: TRL2-ST			
Мо	del: Sonic 136	Thanks .	Seri	Serial Number: 07-304				Frequency: 2 MHz			
Ser	ial Number: 7031		Ang	Angle: 60°				Measured Angle: 61°			
Line	earity Sheet No.: LDS4		Mod	Mode: Refracted Longitudinal				(24x42)mm	··· "		
	Instrument Setting	js	Foc	Focus: FS~125mm			Squint	Angle: 5°			
111	Range: 18.0" Sound Path	□Depth	# of	# of Elements: 2 Shape: Rect.			t. Config	uration: Dual -	SBS		
RANGE	Delay: 1.38"		Cab	Cable Type: RG-174 Length: 12' Intermediate Connectors: 0							
<u>«</u>	Velocity: 0.230 in / µS				Verifi	cation Blo	ck				
Display: Filt 2				e: CS Ro	mpas		S/N: 99-62	S/N: 99-6251			
SCVR.	Frequency: 2.25 MHz			Reflector:		1" Radius		2" Radius			
	Reject: Off			Sweep: 0.5 div.			1.1 div.				
	Pulse Width: 222 nS		Aı	Amplitude: 25 %FSH				80 %	6FSH		
	Damping: 500 Ω			Gain:	Gain: 52.0 dB			52.	0 dB		
œ	Mode: □Pulse Echo  ☑Dual	-		Basic Calib				Block			
PULSER	Rep Rate: 2kHz	and order (Light Service)	Bloc	ck ID: BF	-18		Material: Clad CS				
₫	Pulser: 150V 300V (*Sonic	137 only)	Thic	kness: 6	.0" with 0	).125" Clad	Diameter: Flat				
	*Probe voltage is adjustable with the Soni	c 137 instrumer	<sub>nt. The</sub> Теп	nperature	e: 76 °F		Therm. SN: VH-9525				
	Sonic 136 has a fixed pulser	voltage.	Cou	ıplant: Ul	tragel II		Batch No.: 05325				
		R	eference S	ensitivi	ty Infor	mation					
Ref	lector: ID Notch	Sweep: 6.3	div		Amplitu	de: 80 %FSH		Gain: 73.2 d	3		
Cal	In: Date 3/15/07 Time 0927	Check: Date	3/15/07 Tim	e 1059	Check: [	Date N/A Time	e N/A	Out: Date 3/1	5/07 Time 1418		
			(	Comme	nts						
Zor	ne 2 - Full Volume calibration.										
		•									
	aminer: Thomas Brown	Date: 03/1	03/15/07 Examiner: N/A Signature			<u></u> . —	Level: N/A	Date: N/A			
	EVA Review Adam Continature:	Date: 4/11/	/07					Page 11 of 11			

### Examination Report, R-152 N3C-NV, RPV Nozzle-To-Head Weld



### RPV Nozzle Ultrasonic Examination

				Summa	ary Sneet	(	00020		
Utility: TVA	Site: Browns F	erry Nuclear Pl	ant l	Jnit: 2	Outage: Cycle 14	ISI Repor	t#: R152		
Component Number	: N3C-NV	Component [	Description: I	N3 Nozzle t	o Vessel Weld	System: F	RPV		
Code Category: B-D		Code Item: B	3.90		Code Class: 1	Material:	cs		
ISO / Drawing(s): 2-	CHM-2046-C-01	& 2-ISI-0222-C-	02						
Procedure Numb	er Proce	dure Revision	S	DCN	Pro	cedure Misc.	Info		
N-UT-78		4	m 1	NA	Revision 11 of the F	PDI-UT-6 qual	fied equipment table		
N-UT-79		. 1		NA	Revision 5 of the PDI-UT-7		led equipment table		
54-ISI-850		06	30-904	4520-000		eport: IR-2003 Letter dated			
Ca	libration Sheets			m Data neets	Indication Data Sheets	Ex	am Results		
N3CNV-CDS1				IV-EDS1	Oncolo		dable Indications le Flaw Indications		
N3CNV-CDS2						(acceptab	le flaw evaluation)		
N3CNV-CDS3						∏Reportabl	e Flaw Indications		
N3CNV-CDS4						(unaccept	able flaw evaluation)		
N3CNV-CDS5						1			
Summary:			· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · ·				
		hese examinat	ions resulte	ed in no re	VA / EPRI modeling portable indications.		nowing additional		
,	<u></u>		lozzle Mod						
		acted Angle	Probe Sk	ew	Scan Surface				
		)°S	-115°		Blend Radius				
		o°s	+115°		Blend Radius		*		
	61	o°s	±(52°-74	7 1	Vessel				
minimum coverage examination proces 50.55a. The 60°R obtained to 41%.	This ultrasonic examination was performed in accordance with the criteria of 10 CFR50.55a (b)(2)(xv)(G) and the minimum coverage requirements of 10 CFR50.55a (b)(2)(xv)(K) was achieved to the maximum extent possible. The examination procedure requires an additional circumferential scan of the outer 85%-t which is not addressed in 10CFR 50.55a. The 60°RL examinations were limited due to the nozzle configuration which reduced the examination volume obtained to 41%. Refer to coverage sketch(s) and worksheet for a description of the scanning volume, examination coverage, and scan limitations.								
This examination satisfies the requirements of ASME Section XI (2001 thru 2003 Addenda) and was performed using ASME Section XI, Appendix VIII qualified personnel, procedures, and equipment.									
Note: See TVA Request for Relief PDI-1 and PDI-2. Dockets No. 50-261/296, 50-327/328, and 50-0390. This relief request reduced the area to be examined per IWB-2500-7 (a) and (b) to the weld plus ½" on each side.									
Prepared by: Bret Signature:	16116	Date	3/22/07	Signatu	ed by: down Conti		Date: 3/23/07		
Customer: Matt We Signature:	Ich Hate Well	il Date	3/27/17	ANII: Signatu	re: Val 7	land	Date: 5/12/27		
					Page 1 of 11				

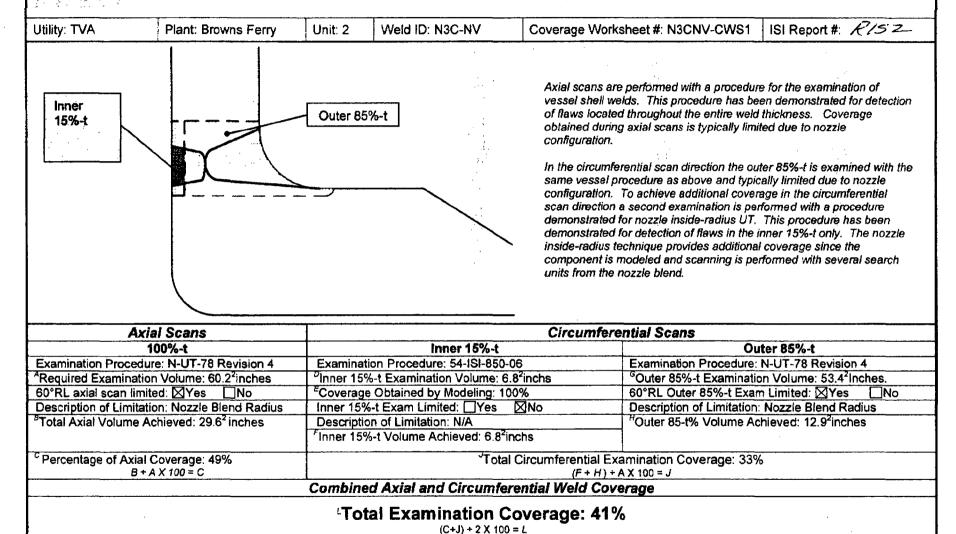


## Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

Utility: TVA Site: Browns Ferry Nuclear Plant Unit: 2 Outage: Cycle 14 RFO																
			et Number: N	3CNV-EDS1					ISI Report Number: K152							
Compon	ent ID: N	13C-	NV						Component Description: N3 Nozzle-to-Vessel Weld							
100 10	<del></del>		0.0011.007			Exa		Information			· · ·				1	
				6-C-01 & 2-ISI-02	222-C-02			cation: Nozzle Bo			Lo	Location	: Nozzle	IDC .		
Examina	tion Limite	ea: L	⊠Yes □No					age Sheet Number	er(s): N3U-U	W51		·		<u></u>	· · · · · · · · · · · · · · · · · · ·	
ļ			54 101 050 00		1			Omiadon				1		20 10 1	·	
	on Proced	ure: t	54-ISI-850-06		Applicable SD	CN's: 30-904	4520-000	T	· · · · · · · · · · · · · · · · · · ·					D Blend Radius		
Angle/ Skew Calibration Sheet #			ion Sheet#	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Li		Recor Indicat	ion(s)	Indication Data Sheet #	Examiner Initials		
*50°S -115° N3CNV-CDS1			IV-CDS1	03/22/07	1109	82° F	VH-8937	70.0 dB	∐Yes	⊠No	☐Yes	⊠No	N/A	GC		
40°S	40°S +115° N3CNV-CDS2			IV-CDS2	03/22/07	1132	82° F	VH-8937	70.0 db	∐Yes	⊠No	∐Yes	⊠No	N/A	GC	
N/A	N/A N/A N/A		N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A	N/A		
N/A N/A N/A			N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A	· N/A		
Examination Procedure: 54-ISI-850-06 Applicable S						CN's: 30-904	4520-000					Scan St	ırface: Ol	D Vessel Sheli		
Angle/ Mode	Skew		Calibrat	ion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	imited	Recor Indical		Indication Data Sheet #	Examiner Initials	
60°S ±52° to 74° N3CNV-CDS3			V-CDS3	03/22/07	1157	82° F	VH-8937	75.0 dB	□Yes	⊠No	□Yes		N/A	GC		
N/A	N/A			N/A	N/A	N/A	N/A	N/A	N/A	☐Yes	□No	Yes	□No	N/A	N/A	
N/A N/A N/A Examination Procedure: N-UT-78 rev.4				Applicable SDCN's: N/A					0. 0			·				
Examinat	ion Proced	ure: I	N-UT-78 rev.4		Applicable SD	CN's: N/A						Scan St	irface: Ol	D Vessel Shell		
Examinati Angle/ Mode	on Proced Zone	1	N-UT-78 rev.4 eam Direction	Calibration Sheet #	Applicable SD Date	CN's: N/A Time	Temp	Thermometer S/N:	Scan Gain	Scan L	imited	Recor Indical	dable	D Vessel Shell Indication Data Sheet #	Examiner Initials	
Angle/		Be				· · · · · · · · · · · · · · · · · · ·	Temp 82° F		Scan Gain 73.8 dB	Scan L ⊠Yes		Recor	dable tion(s)	Indication		
Angle/ Mode	Zone	Be	eam Direction	Sheet #	Date	Time		S/N:	<u> </u>	ļ	□No	Recor Indicat	dable tion(s)	Indication Data Sheet #	Initials	
Angle/ Mode 60°RL	Zone 1	Be ØI	eam Direction	Sheet # N3CNV-CDS4	Date 03/22/07	Time 1015	82° F	S/N: VH-8937	73.8 dB	⊠Yes	□No □No	Recor Indicat	dable tion(s) ⊠No	Indication Data Sheet # N/A	Initials BF	
Angle/ Mode 60°RL 60°RL	Zone 1 2	Be ⊠I ⊠I	eam Direction Radial Circ	Sheet # N3CNV-CDS4 N3CNV-CDS5	Date 03/22/07 03/22/07	Time 1015 1040	82° F	S/N: VH-8937 VH-8937	73.8 dB 84.0 dB	⊠Yes ⊠Yes	□No □No	Recor	dable tion(s) ⊠No ⊠No	Indication Data Sheet # N/A N/A	Initials BF BF	
Angle/ Mode 60°RL 60°RL 60°RL	Zone 1 2 1 2	Be ⊠I ⊠I	eam Direction  Radial □Circ  Radial □Circ  Radial □Circ	Sheet # N3CNV-CDS4 N3CNV-CDS5 N3CNV-CDS4	Date 03/22/07 03/22/07 03/22/07	Time 1015 1040 1015	82° F 82° F 82° F	S/N: VH-8937 VH-8937 VH-8937	73.8 dB 84.0 dB 73.8 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indical  Yes  Yes  Yes	dable tion(s)  No	Indication Data Sheet # N/A N/A N/A	BF BF	
Angle/ Mode 60°RL 60°RL 60°RL 60°RL	Zone 1 2 1 2 nts:		eam Direction  Radial □Circ  Radial □Circ  Radial □Circ  Radial □Circ	Sheet # N3CNV-CDS4 N3CNV-CDS5 N3CNV-CDS4 N3CNV-CDS5	Date 03/22/07 03/22/07 03/22/07 03/22/07	Time 1015 1040 1015 1040	82° F 82° F 82° F	S/N: VH-8937 VH-8937 VH-8937	73.8 dB 84.0 dB 73.8 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indical  Yes  Yes  Yes	dable tion(s)  No	Indication Data Sheet # N/A N/A N/A	BF BF	
Angle/ Mode 60°RL 60°RL 60°RL 60°RL	Zone 1 2 1 2 nts:		eam Direction  Radial □Circ  Radial □Circ  Radial □Circ  Radial □Circ	Sheet # N3CNV-CDS4 N3CNV-CDS5 N3CNV-CDS4	Date 03/22/07 03/22/07 03/22/07 03/22/07	Time 1015 1040 1015 1040	82° F 82° F 82° F	S/N: VH-8937 VH-8937 VH-8937	73.8 dB 84.0 dB 73.8 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indical  Yes  Yes  Yes	dable tion(s)  No	Indication Data Sheet # N/A N/A N/A	BF BF	
Angle/ Mode 60°RL 60°RL 60°RL 60°RL	Zone 1 2 1 2 nts:		eam Direction  Radial □Circ  Radial □Circ  Radial □Circ  Radial □Circ	Sheet # N3CNV-CDS4 N3CNV-CDS5 N3CNV-CDS4 N3CNV-CDS5	Date 03/22/07 03/22/07 03/22/07 03/22/07	Time 1015 1040 1015 1040	82° F 82° F 82° F	S/N: VH-8937 VH-8937 VH-8937	73.8 dB 84.0 dB 73.8 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indical  Yes  Yes  Yes	dable tion(s)  No	Indication Data Sheet # N/A N/A N/A	BF BF	
Angle/ Mode 60°RL 60°RL 60°RL Commer * See cali	Zone  1 2 1 2 nts: baration da	Be ⊠I	eam Direction  Radial □Circ  Radial □Circ  Radial □Circ  Radial □Circ	Sheet # N3CNV-CDS4 N3CNV-CDS5 N3CNV-CDS4 N3CNV-CDS5 all details on the 50	Date 03/22/07 03/22/07 03/22/07 03/22/07	Time 1015 1040 1015 1040	82° F 82° F 82° F 82° F	S/N: VH-8937 VH-8937 VH-8937 VH-8937	73.8 dB 84.0 dB 73.8 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indical  Yes  Yes  Yes	dable tion(s)  No	Indication Data Sheet # N/A N/A N/A N/A	BF BF	
Angle/ Mode 60°RL 60°RL 60°RL Commer * See cali	Zone  1 2 1 2 nts: baration da Bret Flesi	Bee Silver	eam Direction  Redial	Sheet # N3CNV-CDS4 N3CNV-CDS5 N3CNV-CDS4 N3CNV-CDS5	Date 03/22/07 03/22/07 03/22/07 03/22/07	Time 1015 1040 1015 1040 tion.	82° F 82° F 82° F 82° F	S/N: VH-8937 VH-8937 VH-8937 VH-8937	73.8 dB 84.0 dB 73.8 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indical  Yes  Yes  Yes	dable tion(s)  No No	Indication Data Sheet # N/A N/A N/A N/A N/A N/A	BF BF BF	
Angle/ Mode 60°RL 60°RL 60°RL Commer * See cali Examiner Signatu Examiner	Zone  1 2 1 2 nts: baration da Bret Flesi re: George Cre:	Bee Street	eam Direction  Radial	Sheet # N3CNV-CDS4 N3CNV-CDS5 N3CNV-CDS4 N3CNV-CDS5 all details on the 50	Date 03/22/07 03/22/07 03/22/07 03/22/07 shear examina	Time 1015 1040 1015 1040 tion.	82° F 82° F 82° F 82° F	S/N: VH-8937 VH-8937 VH-8937 VH-8937	73.8 dB 84.0 dB 73.8 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indical  Yes  Yes  Yes	dable tion(s)  No No No No	Indication Data Sheet # N/A N/A N/A N/A N/A N/A	BF BF BF	
Angle/ Mode 60°RL 60°RL 60°RL Commer • See cali Examiner Signatu Examiner Signatu	Zone  1 2 1 2 nts: baration da Bret Flesi re: George Cre: leview, Ada	Bee Street	eam Direction  Radial	Sheet # N3CNV-CDS4 N3CNV-CDS5 N3CNV-CDS4 N3CNV-CDS5 all details on the 50	Date 03/22/07 03/22/07 03/22/07 03/22/07 shear examina	Time 1015 1040 1015 1040 tion.	82° F 82° F 82° F 82° F	S/N: VH-8937 VH-8937 VH-8937 VH-8937 VH-8937 Examiner: N/A Gignature: Examiner: N/A	73.8 dB 84.0 dB 73.8 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recor Indical  Yes  Yes  Yes	dable tion(s)  No No No No	Indication Data Sheet # N/A N/A N/A N/A N/A N/A	BF BF BF	

### RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet

Date:03/23/07



Prepared by: Bret Flesner

SAT Floring

Date: 03/22/07

Page 3 of 11

DESCRIPTION R152 Browns Ferry N3 Nozzie-to-Shell Weld Coverage Plot DRAWN BY DATE TITLE N3CNV-CPS1 **Bret Flesner** 03/22/07 000318 Nozzle-to-Shell weld examination coverage for axial (radial) scan Total area of examination volume: 60.2 sq. in. (TVA supplied) Total area of examination volume achieved: 29.6 sq. in. Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned. 5.2in.

DESCRIPTION Browns Ferry N3 Nozzie-to-Shell Weld Coverage Plot DRAWN BY DATE 5 OF 11 Bret Flesner 03/22/07 N3CNV-CPS2 000319 Nozzle-to-Shell weld examination coverage for circumferential scan Total area of examination volume: 60.2 sq. in. (TVA Supplied) Total area of outer 85%-t exam volume achieved: 12.9 sq. in. Total area of inner 15%-t volume: 6.8 sq. in. Total area of inner 15%-t exam volume achieved: 6.8 sq. in. Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned. Inner 15%-t area examined from the blend with Supplement 5 techniques. 10.CFR.50.55a(b)(2)(xv)(K)(3)(i) & (ii) require radial examination of the full thickness but circumferential examination of the inner 15%-t only. 100% coverage of the inner 15%-t obtained with scans performed from the blend with Supplement 5 techniques. 100% of 10 CFR50.55a circumferential coverage obtained. ER. THAN

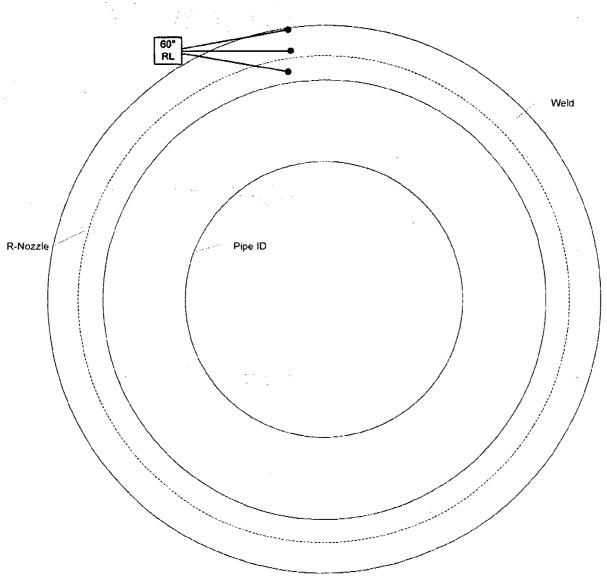


Browns Ferry N3 Nozzle-to-Shell Weld Coverage Plot
DRAWN BY DATE TITLE PAGE
Bret Flesner 03/22/07 N3CNV-CPS3 6 OF 11

R152-000320

#### Top View Measurements based on modeling report, design drawings, and as-found measurements.

/ Transducer showing - & + 10° skew angles





# Reactor Pressure Vessel 600321 Manual Ultrasonic Calibration Data Sheet

Ctill	LY. IVA	wiis rei	Ty Nuc	леа г	Idill	Uffit. Z			Outage. C	Sycie 14 KFO	
Cal	bration Data Sheet Number: N3CN\	V-CDS1		1	SI Rep	ort Nun	nber: $\mathcal{R}$	152			
Cor	nponent ID: N3C-NV			C	ompo	nent Des	scription: N3	Nozzle-t	o-Ves	sel Weld	
Exa	mination Procedure: 54-ISI-850-06	,		А	pplica	ble SDC	N(s): 30-904	4520-00	00		
	Ultrasonic Instrumen	ıt					Tra	nsduc	er		
Mar	nufacture: Staveley		М	Manufacture: KBA				Mod	Model: Benchmark 892-600		
Mod	tel: Sonic 136		S	erial N	umbei	: 0111P\	V /	Fre	Frequency: 2.25 MHz		
Ser	ial Number: 136P1200G081455	24.50	Si	ize: 0.	5" x 1.	0"		Sha	pe: R	ectangle	
Line	earity Sheet No.: LDS1	. " .	#	of Ele	ments	: 1		Cor	nfigura	tion: Single	
	Instrument Settings		R	efracte	ed Ang	le: 40°		Mea	asured	Angle: * 50	0 '
111	Range: 15.0" ⊠Sound Path □	Depth	SI	kew A	ngle: -	115°		Mea	asured	Skew Angl	e: * +115°
ANG	Delay: .604"			lode: S	hear			Rad	lius: 4	.75"	
Velocity: 0.127 in / μS				able T	ype: R	G-174	Length: 6'	Inte	medi	ate Connect	ors: 0
Display: Filt2							Verific	ation E	Block		
RCVR	Frequency: 2.25 MHz		Ty	ype: C	\$ Ron	npas		S/N: 99	-6251		
	Reject: Off		*	Refle	ector:	tor: 1" Radius			2" Radius		
	Pulse Width: 222 nS			Sw	/еер:		0.65 div.			1.3	div.
	Damping: 500 Ω			Amplitude:		75 %FSH			. 80 %	FSH	
	Mode: ⊠Pulse Echo □Dual			Gain:			29.0 dB			29.0	) dB
PULSER	Rep Rate: 2kHz						Basic Ca	libratio	n Blo	ock	
PUL	Pulser: 150V 300V (*Sonic 13	37 only)	ВІ	lock ID	): BF-1	8	,	Material: Clad CS			
	*Pulser voltage adjustable with the Sonic 1	137 instrument		hickne	ss: 6.0	)" with 0.	125" Clad	Diameter: Flat			
	The Sonic 136 has a fixed pulse			emper	ature:	74 °F		Therm. SN: VH-8937			
			C	ouplar	nt: Ultra	agel II		Batch No.: 05125			
		Ref	erence	Sens	itivity	/ Inform	nation				
Ref	lector: ID Notch Sweep	p: 6.1 div	,		Amp	itude: 80	%FSH		Gain:	58.6 dB	
Cal	In: Date 03/22/07 Time 0905 Check:	: Date 03/22/	07 Time	1041	Chec	k: Date N	I/A Time N/A		Out: D	ate 03/22/07	Time 1230
				Con	ment	s					
inci TV/	dent angle is cut such that a 50° refra	wave is	discovered with the TVA supplied 40° -115° skew is generated rather than the specified 40°. To as ing using the actual manufactured 50° angle. Add					To ass	ure examina	ation coverage	
	xaminer: George Chapman Level: II Date				7 Examiner: N/A Signature				Level: N/A	Date: N/A	
	REVA Review Adam Conti Level: III Date ignature:										Page 7 of 11



## Reactor Pressure Vessel 600322 Manual Ultrasonic Calibration Data Sheet

Utility: TVA Site: Browns				Ferry Nu	clear F	lant	Unit: 2		1	Outage: 0	Cycle 14 RFO	
Cal	ibration Data Sheet Number:	N3CNV-CDS2			ISI Rej	oort Nun	nber: 13	152		,		
Cor	mponent ID: N3C-NV			(	Compo	nent Des	scription: N3	Nozzle-	to-Vesse	el Weld	<u> </u>	
Exa	mination Procedure: 54-ISI-8	350-06		1	Applica	ble SDC	N(s): 30-904	1452 <b>0</b> -0	000	***************************************		
	Ultrasonic Inst	rument		•			Tra	ansdu	cer	<del> </del>		
Mai	nufacture: Staveley	· · · · · · · · · · · · · · · · · · ·		Manufacture: KBA				Mo	Model: Benchmark 892-600			
Мо	del: Sonic 136		·	Serial Number: 0111PM /				Fre	Frequency: 2.25 MHz			
Ser	ial Number: 136P1200G0814	55		Size: 0.5" x 1.0"				Sh	ape: Red	ctangle		
Line	Linearity Sheet No.: LDS1			# of Ele	ments	: 1		Co	nfiguration	on: Single		
	Instrument Se	ettings		Refract	ed Ang	jle: 40°		Me	asured /	Angle: 40°		
	Range: 15.0" Sound Pa	th Depth		Skew A	ngle: ⊦	+115°		Мє	easured S	Skew Angl	e: * -115°	
RANGE	Delay: .604"		•	Mode:	Shear			Ra	dius: 4.7	75"		
α×	Velocity: 0.127 in / μS				Гуре: Б	G-174	Length: 6'	Int	ermediat	te Connect	tors: 0	
Display: Filt2							Verific	cation	Block			
RCVR	Frequency: 2.25 MHz			Type: 0	S Ron	npas		S/N: 9	S/N: 99-6251			
	Reject: Off				ector:	ctor: 1" Raduis			2" Radius		adius	
	Pulse Width: 222 nS			SV	weep:	o: 0.65 div.		1.3 div.		div.		
	Damping: 500 Ω			Ampl	itude:	ude: 70 %FSH				80 %	FSH	
	Mode: ⊠Pulse Echo ☐	)uai			Gain:	eain: 27.8 dB				27.8	3 dB	
PULSER	Rep Rate: 2kHz			Basic Calibration Bloo					on Bloc	k		
PUL	Pulser: ☐150V ☐300V	*Sonic 137 only)		Block II	D: <b>BF-</b> 1	18		Material: Clad CS				
	*Pulser voltage adjustable with th	e Sonic 137 instrumen	it only.	Thickne	ess: 6.0	)" with 0.	125" Clad	Diameter: Flat				
	The Sonic 136 has a fix			Tempe	rature:	74°F		Therm. SN: VH-8937				
				Coupla	nt: Ultr	agel II		Batch	No.: 051	125		
		Re	feren	ce Sens	sitivity	/ Inform	nation					
Ref	lector: ID Notch	Sweep: 5.2 div			Amp	litude: 80	%FSH		Gain: 48	8.6 <b>d</b> B		
Cal	In: Date 03/22/07 Time 0908	Check: Date 03/22	2/07 Ti	me 1131	Chec	k: Date N	I/A Time N/A		Out: Dat	te 03/22/07	Time 1235	
	ikiri 1997 — pap <del>papangangangan dapat da 1997 da</del> n dan Malaksi satir dikir sa pendasa fun <sub>dan</sub> an sada sasanjarkan	de tiud turns i de tres de tre		Cor	nment	8					44.5	
*Transducer incorrectly labeled +115° skew by the manufa					housense	er actual	skow is 115	:0				
116	ansaucer incorrectly labeled +	manuia	aciurer, i	IOWEAR	er aciuai	2KGM 12 - 1 10	, .					
Eva	minar: George Channas	Data	eate: 03/22/07 Examiner: N/A				1.	evel: N/A	Date: N/A			
Sig	Examiner: George Chapman Level: II Date: Signature:				Signature		LGVGI. IVIA					
	REVA Review: Adam Com lignature: Level: III Date				7	Pa			Page 8 of 11			



## Reactor Pressure Vessel 000323 Manual Ultrasonic Calibration Data Sheet

Utility: TVA Site: Browns				Nuclear F	riant	Unit: 2		Outage	Cycle 14 RFO	
Cal	ibration Data Sheet Number: N30	CNV-CDS3		ISI Re	port Num	nber: $RI$	52			
Cor	nponent ID: N3C-NV			Compo	onent Des	cription: N3	Nozzle-t	o-Vessel Weld		
Exa	amination Procedure: 54-ISI-850-	06		Applica	able SDCI	N(s): 30-904	4520-00	00 .		
	Ultrasonic Instrum	nent				Tra	ansduc	er		
Mar	nufacture: Staveley		Manı	Manufacture: KBA				Model: Benchmark 892-600		
Мос	del: Sonic 136		Seria	Serial Number: 00X1XB /				quency: 2.25 Mi	łz	
Ser	ial Number: 136P1200G081455	*994 gas de B* 1 to * de a dégas legan	Size:	: 0.5" x 1.	.0"		Sha	pe: Rectangle		
Line	earity Sheet No.: LDS1		# of f	Elements	s: 1		Cor	figuration: Sing	е	
	Instrument Settin	ngs	Refra	acted Ang	gle: 60°		Mea	asured Angle: 60	)°	
trj	Range: 20.0" Sound Path	□Depth	Skev	v Angle:	±52° to 74	4°	Mea	asured Skew An	gle: N/A	
RANGE	Delay: 1.17"		Mode	e: Shear		·	Rac	lius: Flat		
Velocity: 0.127 in / μS			Cable	e Type: F	RG-174	Length: 6'	Inte	mediate Conne	ectors: 0	
Display: Filt2						Verific	cation E	Block		
RCVR	Frequency: 2.25 MHz		Туре	: CS Ror	mpas		S/N: 99-6251			
	Reject: Off			eflector:	1" Radius			2" Radius		
	Pulse Width: 222 nS			Sweep:		0.5 div.		1	0 div.	
	Damping: 500 Ω		Am	nplitude:		70 %FSH		80	%FSH	
	Mode: ⊠Pulse Echo □Dual		•	Gain:		21.4 dB		2	1.4dB	
PULSER	Rep Rate: 2kHz	the Contract of the Contract o		Basic Calibration Block						
PUL	Pulser: 150V 300V (*Soni	iic 137 only)	Block	k ID: BF-	18		Material: Clad CS			
	*Pulser voltage adjustable with the Sor	nic 137 instrument	only. Thick	(ness: 6.	0" with 0.	125" Clad	Diameter: Flat			
	The Sonic 136 has a fixed p	ulser voltage.	Tem	perature:	: 74 °F		Therm. SN: VH-8937			
			Cour	olant: Ultr	ragel II		Batch N	Batch No.: 05125		
		Refe	erence Se	nsitivit	y Inform	nation				
Ref	flector: ID Notch Sw	veep: 6.0 div		Amp	plitude: 80	)%FSH		Gain: 58.2 dB		
Cal	In: Date 03/22/07 Time 0915 Che	neck:Date 03/22/0	7 Time 115	6 Cher	ck: Date N	N/A Time N/A		Out: Date 03/22/	7 Time 1233	
		•	С	omment	ts					
	ixaminer: George Chapman Level: II Date			ate: 03/22/07 Examiner: N/A Signature			Level: N//	Date: N/A		
ARI	EVA Review: Adam conti	Date: 03/23						Page 9 of 11		



# Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet

Util	Utility: TVA Site: Brown			Ferry Nuclea	r Plant	Unit: 2		Outage:	Cycle 14 RFO	
Ca	ibration Data Sheet Number: N30	CNV-CDS4	ti est	ISI R	eport Nu	mber: Ri	52			
Со	mponent ID: N3C-NV	,		Com	ponent De	escription: N3	Nozzle-to-	Vessel Weld		
Exa	mination Procedure: N-UT-78 Re	evision 4		Appl	cable SD	CN(s): N/A	_			
	Ultrasonic Instrum	ent				Tr	ansduce		,	
Ma	nufacture: Staveley			Manufactur	e: RTD		Mode	Model: TRL2-ST		
Мо	del: Sonic 136			Serial Num	ber: 07-30	) <b>4</b> /	Frequ	Frequency: 2 MHz		
Se	ial Number: 136P1200G081456			Angle: 60°				ured Angle: 61	· · · · · · · · · · · · · · · · · · ·	
Lin	earity Sheet No.: LDS2	i Takuan ke	angle, ye ar	Mode: Refracted Longitudinal				2(24x42)mm		
	Instrument Settin	gs		Focus: FS~	125mm	•	Squin	t Angle: 5°		
m m	Range: 8.00" Sound Path	Depth		# of Elements: 2 Shape: Rect.			t. Confi	guration: Dual	- SBS	
RANGE	Delay: 1.34"			Cable Type	: RG-174	nediate Conne	ctors: 0			
u.	Velocity: 0.227 in / μS					Verifi	cation Bl	ock		
	Display: Filt 2			Type: N/A		,	S/N: N/A		1.1	
RCVR	Frequency: 2.25 MHz			Reflecto	r:	N/A		N/A		
	Reject: Off	<u> </u>		Sweet	Sweep: N/A			N/A		
	Pulse Width: 222 nS			Amplitude	9:	N/A			N/A	
	Damping: 500 $\Omega$			Gair	):	N/A			N/A	
14 14	Mode: ☐Pulse Echo   ☑Dual					Basic Ca	libration	bration Block		
PULSER	Rep Rate: 2kHz			Block ID: B	F-18		Material: Clad CS			
4	Pulser: 150V 300V (*Son	c 137 only)		Thickness:	6.0" with (	0.125" Clad	Diameter: Flat			
	*Probe voltage is adjustable with the So		ent. The	Temperatu	e: 74 °F		Therm. SN: VH-8937			
	Sonic 136 has a fixed puls	er voltage.		Couplant: U	litragel II		Batch No.: 05125			
		F	Referen	ce Sensitiv	ity Infor	mation				
Re	flector: 1/4-t SDH	Sweep: 3.7	7 div		Amplitu	de: 80 %FSH		Gain: 59.8 d	íB	
Cal	In: Date 03/22/07 Time 0850	Check: Date	e N/A Tii	me N/A	Check: I	Date N/A Tim	e N/A	Out: Date 03	/22/07 Time 1252	
		<u> </u>		Comme	ents					
Zoi	ne 1 - Near Surface calibration.									
	Examiner: Bret Flesner Level: II Date:				Examiner: N/A Signature			Level: N/A	Date: N/A	
	REVA Review: Adam Conti   Level: III Date:			03/23/07			-	Page 10 of 11		



# Reactor Pressure Vessel 000325 Manual Ultrasonic Calibration Data Sheet

Utility: TVA Site: Browns			Browns F	Ferry Nur	clear F	Plant	Unit: 2		Outage:	Cycle 14 RFO		
Cal	libration Data Sheet Number: N3C	NV-CDS5		l:	SI Rer	oort Nun	nber: R	152				
Cor	mponent ID: N3C-NV			C	Compc	nent De	scription: N3	Nozzle-to-	Vessel Weld.			
Exa	amination Procedure: N-UT-78 Re	vision 4		A	Applica	able SDC	CN(s): N/A					
	Ultrasonic Instrum	ent					Tra	ansducer	•			
Mar	nufacture: Staveley			Manufa	cture:	RTD		Mode	Model: TRL2-ST			
Mod	del: Sonic 136			Serial Number: 07-304				Frequ	Frequency: 2 MHz			
Ser	ial Number: 136P1200G081456			Angle: 60°				Meas	ured Angle: 61	0		
Line	earity Sheet No.: LDS2			Mode: F	Refrac	ted Long	gitudinal	Size:	2(24x42)mm			
	Instrument Setting	gs		Focus: FS~125mm				Squin	t Angle: 5°			
ш	Range: 18.0" Sound Path	☐Depth		# of Elements: 2 Shape: Rect.			. Config	guration: Dual	- SBS			
RANGE	Delay: 1.34"			Cable T	Cable Type: RG-174 Length: 12' Intermediate Connectors: 0							
а.	Velocity: 0.227 in / µS			Verification Bloc					ock			
Display: Filt 2				Type: N	I/A			S/N: N/A	N: N/A			
₹CVF	Frequency: 2.25 MHz			Refle	ector:	N/A				N/A		
	Reject: Off			Sweep: N/A					N/A			
	Pulse Width: 222 nS				itude.	ide. N/A				N/A		
	Damping: 500 Ω			Gain: N/A				N/A				
œ	Mode: ☐Pulse Echo   ☑Dual	28,12 mg					Basic Ca	libration	Block			
PULSER	Rep Rate: 2kHz			Block IC	): BF-	18		Material:	aterial: Clad CS			
ā.	Pulser: 150V 300V (*Sonic	: 137 only)		Thickne	:ss: 6.(	0" with 0	.125" Clad	Diameter	Diameter: Flat			
	*Probe voltage is adjustable with the Soni		ent. The	Temper	rature:	74 °F		Therm. SN: VH-8937				
	Sonic 136 has a fixed pulse	r voltage.		Couplar	nt: Ultr	ragel II		Batch No.: 05125				
		R	Referenc	ce Sens	sitivit	y Infor	mation					
Ref	flector: ID Notch	Sweep: 6.3	3 div			Amplitud	de: 80 %FSH		Gain: 74.6 dB			
Cal	In: Date 03/22/07 Time 0852	Check: Date	e N/A Tir	me N/A		Check: [	Date N/A Time	∍ N/A	Out: Date 03	/22/07 Time 1250		
				Con	nmen	ts	, t					
Zon	ne 2 - Full Volume calibration.								•			
	aminer: Bret Flesner nature:	Date: 0	03/22/07	- 1	aminer: N nature	N/A		Level: N/A	Date: N/A			
	EVA Review Adam Conti	Date: 0	03/27/07					,	Page 11 of 11			

# Examination Report, R-176 N4B-NV, RPV Nozzle-To-Head Weld

			<b>t</b>	
Δ	P	F	V	Δ

## RPV Nozzle Ultrasonic Examination Summary Sheet

000326

AREVA								
Utility: TVA	Site: Browns Fo	erry Nuclear Pl	ant	Unit: 2	Outage: Cycle 14	ISI Report #: R/76		
Component Number:	N4B-NV	Component I	Description	: N4 Nozzle t	o Vessel Weld	System: RPV		
Code Category: B-D		Code Item: B	3.90		Code Class: 1	Material: CS		
ISO / Drawing(s): 2-C	HM-2046-C-01 8	k 2-ISI-0269-C-	01					
Procedure Numbe	r Proced	lure Revision		SDCN	Pro	ocedure Misc. Info		
N-UT-78		4		NA	Revision 11 of the I	PDI-UT-6 qualified equipment table		
N-UT-79		1		NA	Revision 5 of the PDI-UT-7 qualified equipment			
54-ISI-850		06	30-90	044520-000	Modeling Report: IR-2003-19, Section 5			
Ca	ibration Sheets		1	am Data Sheets	Indication Data Sheets	Exam Results		
N4BNV-CDS1				BNV-EDS1		- ⊠No Recordable Indications		
111011110000			1445	7.14-LD31	-	Recordable Flaw Indications		
	<u> </u>	•			ļ	(acceptable flaw evaluation)		
N4BNV-CDS3	CDS3					Reportable Flaw Indications		
N4BNV-CDS4						(unacceptable flaw evaluation)		
N4BNV-CDS5	- 1		i i					
Summary:					1	<u></u>		
In accordance with examinations were						g report the following additional		
		N4 N	iozzle Mo	deling Par				
•	Probe Refra	acted Angle	Probe S	Skew	Scan Surface			
•	40		-120	)°	Blend Radius			
		°S	+120		Blend Radius			
		r'S	±(35°-6		Vessel			
This ultrasonic examination was performed in accordance with the criteria of 10 CFR50.55a (b)(2)(xv)(G) and the minimum coverage requirements of 10 CFR50.55a (b)(2)(xv)(K) was achieved to the maximum extent possible. The examination procedure requires an additional circumferential scan of the outer 85%-t which is not addressed in 10CFR 50.55a. The 60°RL examinations were limited due to the nozzle configuration which reduced the examination volume obtained to 44%. Refer to coverage sketch(s) and worksheet for a description of the scanning volume, examination coverage, and scan limitations.								
This examination s ASME Section XI,						da) and was performed using		
Note: See TVA Re request reduced th	quest for Relief e area to be ex	PDI-1 and PI amined per IV	DI-2. Doc VB-2500-	ckets No. 50 7 (a) and (b)	-261/296, 50-327/3 to the weld plus ½	28, and 50-0390. This relief " on each side.		
Prepared by: Bret F Signature:	- The min	Date	: 4/17/07	Signatu	ed by: Adam Conti	Date: 4/17/07		
1 = = = = =				7 ANII: Signatu	ire: / mul	Floor Date: S/2407		
						Page 1 of 11		



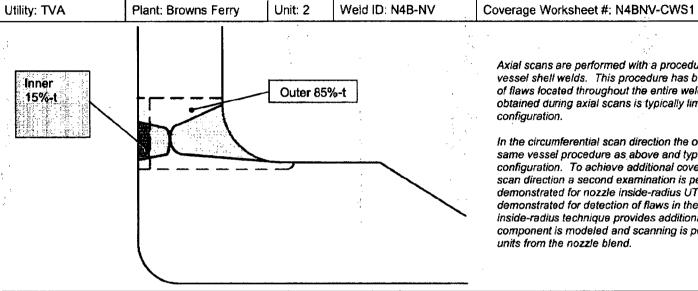
### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

									nit: 2		Outage	e: Cycle 1	4 RFC	)	
		Sheet Number: N	4BNV-EDS1				ISI Report N		176						
Compone	ent ID: N	4B-NV			etis j	1 .	Component	Description:	N4 Nozz	e-to-V	essel We	ld			21.4
					Exa		Information				<u> </u>		· .		
		ber: 2-CHM-204		9-C-01	'		cation: Nozzle Bo			<u>L</u> o	Location	: Nozzle	TDC		
Examina	tion Limite	ed:⊠Yes □No	<del>}</del>		<del> </del>		age Sheet Numb	er(s): <b>N</b> 4BN\	V-CWS1				····		
				·	<del></del>	Scan Info	ormation								
Examinati	on Procedu	ire: 54-ISI-850-06		Applicable SD	CN's: 30-904	4520-000	. •				Scan Su	rface: O	D Blend R	adius	
Angle/ <b>M</b> ode	Skew	Calibra	tion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Lin	Scan Limited		table ion(s)	Indica Data Sh		Examiner Initials
40°/s	-120 ° N4BNV-CDS1			03/21/07	1110	77°F	VH-8937	75.0 dB	□Yes	⊠No	☐Yes	⊠No	N/A		GC
40°/s	+120 °	N4BI	VV-CDS2	03/21/07	1127	77°F	VH-8937	75.0 dB	☐Yes	⊠No	. 🗆 Yes	⊠No	N/A		GC
N/A /	N/A		N/A	N/A	N/A	N/A	N/A	N/A	☐Yes	□No	☐Yes	□No	N/A		N/A
N/A /	N/A		N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A	(	N/A
Examination Procedure: 54-ISI-850-06 Applicable SDCN's: 30-9044520-000 Scan Surface: OD Vessel Shell															
Angle/ Mode	Skew	Calibra	tion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	mited	Record		Indica Data Sh		Examiner Initials
60°/s	±35° to 6	7° N4BI	NV-CDS3	03/21/07	1145	77°F	VH-8937	72.0 dB	□Yes	⊠No	□Yes	⊠No	N/A	(	GC
N/A /	N/A		N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A		N/A
Examinati	on Procedu	ire: N-UT-78 revisio	ก 4	Applicable SD	CN's: N/A						Scan Su	rface: O	D Vessel S	Shell	
Angle/ Mode	Zone	Beam Direction	Calibration Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	mited	Record Indicat		Indica Data Sh		Examiner Initials
60°/RL	1	⊠Radial □Circ	N4BNV-CDS4	03/21/07	1215	77°F	VH-8937	74.0 dB	⊠Yes	□No	☐Yes ⊠No		N/A		BF
60°/RL	2	⊠Radial □Circ	N4BNV-CDS5	03/21/07	1250	77°F	VH-8937	82.0 dB	⊠Yes	□No	∐Yes	⊠No	N/A		BF
60°/RL	1	☐Radial ⊠Circ	N4BNV-CDS4	03/21/07	1215	77°F	VH-8937	74.0 dB	⊠Yes	□No	□Yes	⊠No	N/A		BF
60°/RL	2	□Radial ⊠Circ	N4BNV-CDS5	03/21/07	1250	77°F	VH-8937	82.0 dB	⊠Yes	□No	□Yes	⊠No	N/A		C) BF
Commen	its:														$\circ$
															0
															<b>ر</b> ې
							•								1/5
															7
	Examiner: George Chapman Level: II Date: 03/21/07 Examiner: N/A Signature: Signature: Signature: Level: N/A Date: N/A Signature:														
	Bret Flesn	er Sal A	lionin	Level: II	Date: 03/	21/07	Examiner: N/A Signature:				****	Lev	el: N/A	Date:	N/A
AREVA R Signatu	eview: Ada	777		Level: Ili	Date: 03/	22/07				<del></del>	************		<del></del> _		
Olynatul		Jam				-		<del></del>		<del> </del>	-				Page 2 of 11
L															-90 - VI II



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#### **RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet**



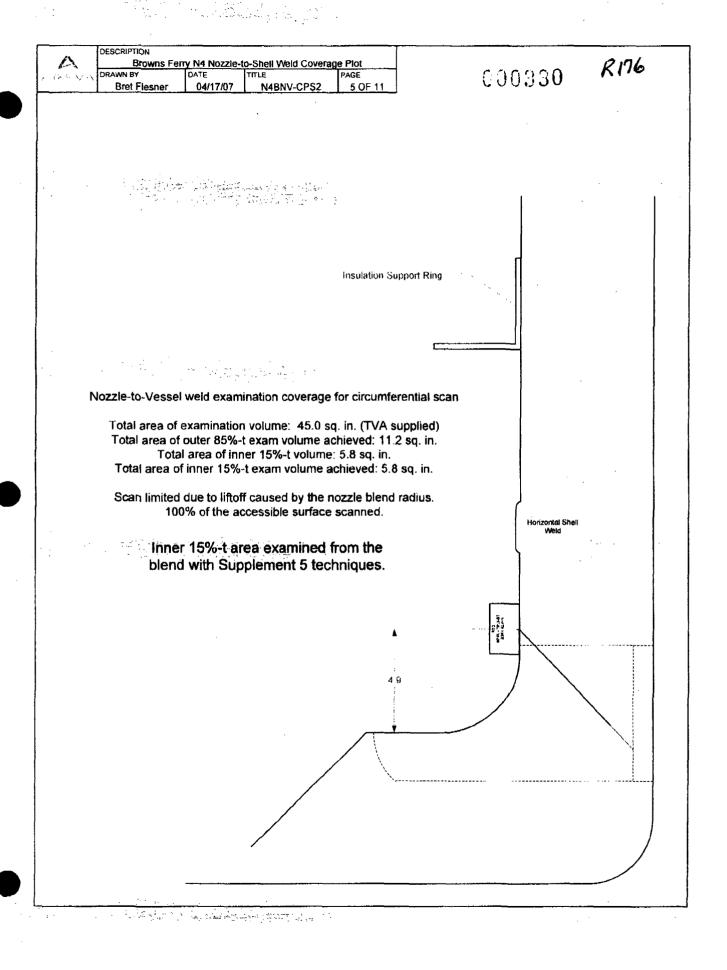
Axial scans are performed with a procedure for the examination of vessel shell welds. This procedure has been demonstrated for detection of flaws located throughout the entire weld thickness. Coverage obtained during axial scans is typically limited due to nozzle configuration.

ISI Report #:

In the circumferential scan direction the outer 85%-t is examined with the same vessel procedure as above and typically limited due to nozzle configuration. To achieve additional coverage in the circumferential scan direction a second examination is performed with a procedure demonstrated for nozzle inside-radius UT. This procedure has been demonstrated for detection of flaws in the inner 15%-t only. The nozzle inside-radius technique provides additional coverage since the component is modeled and scanning is performed with several search units from the nozzle blend.

Axial Scans	Circumfe	erential Scans
100%-t	Inner 15%-t	Outer 85%-t
Examination Procedure: N-UT-78 Revision 4	Examination Procedure: 54-ISI-850-06	Examination Procedure: N-UT-78 Revision 4
ARequired Examination Volume: 45.02 inches	<sup>D</sup> Inner 15%-t Examination Volume: 5.8 <sup>2</sup> inchs	<sup>6</sup> Outer 85%-t Examination Volume: 39.2 <sup>2</sup> Inches.
60°RL axial scan limited: ⊠Yes  □No	<sup>E</sup> Coverage Obtained by Modeling: 100%	60°RL Outer 85%-t Exam Limited: ⊠Yes ☐No
Description of Limitation: Nozzle Blend Radius	Inner 15%-t Exam Limited: ☐Yes ☒No	Description of Limitation: Nozzle Blend Radius
<sup>8</sup> Total Axial Volume Achieved: 24.3 <sup>2</sup> inches	Description of Limitation: N/A	"Outer 85-t% Volume Achieved: 11.22inches
	Finner 15%-t Volume Achieved: 5.82inchs	
<sup>C</sup> Percentage of Axial Coverage: 54% / (49%)*  B + A X 100 = C		Examination Coverage: 38%
	Combined Axial and Circumferential Weld Co	<u></u>
	'Total Examination Coverage: 44	4%
NOTE: *Axial scan coverage of 49% in	(C+J) + 2 X 100 = L cludes the insulation support ring limitation. "Total Examination Cov	
Prepared by: Bret Flesner Date: 04/17/0	7 Reviewed by: Adam Conti / Date:04/17/07	Page 3 of 11

*R116* 00032**9** 12 Browns Ferry N4 Nozzie-to-Shell Weld Coverage Plot DRAWN BY Bret Flesner Nozzle-to-Vessel weld-examination coverage for axial (radial) scan Total area of examination volume: 45.0 sq. in. (TVA supplied) Total area of examination volume achieved: 24.3 sq. in. Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned. Insulation Support Ring



000331

R176

Browns Ferry N4 Nozzle-to-Shell Weld Coverage Plot
DRAWN BY DATE TITLE PAGE
Bret Flesner 03/21/07 N4BNV-CPS3 6 OF

Contact can not be maintained on horizontal weld due to weld crown.

This area = 61 sq. in. of limitation.

Area to be scanned (yellow area): 1278 sq. in. 66sq. in. of limitation = 5% limitation of radial coverage. (66 / 1278 = 5%)

## **Insulation Support Ring** \*08 FL 16 00 Required scan area to achieve coverage shaded in yellow. 1278 sq. in. R-Nozzie/ Weld Pipe (0) (Rbote) 10° and 110° skews 14.50

#### Insulation

	A			
De		ş	د د کا	şn.

### Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	Site: Bro	owns Fe	erry Nuc	lear Plant	Unit: 2		Outage: 0	Cycle 14 RFO		
Cal	libration Data Sheet Number:	N4BNV-CDS1		18	SIReport Nu	ımber:					
Col	mponent ID: N4B-NV			C	omponent De	escription: N4	Nozzle-to	-Vessel Weld			
Exa	amination Procedure: 54-ISI-8	350-06		A	pplicable SD	CN(s): 30-904	44520-00	0			
	Ultrasonic Inst	rument				Tra	ansduce	r			
Ма	nufacture: Staveley		N	Manufac	ture: KBA		Mod	Model: Benchmark 892-600			
	del: Sonic 136			Serial N	umber: 00X1	хс	Freq	uency: 2.25 MHz			
Ser	ial Number: 136P1200G0814	55		Size: 0.5	5" x 1.0"		Shap	oe: Rectangle	***		
Lin	Linearity Sheet No.: LDS1				nents: 1		Conf	figuration: Single			
	Instrument Settings				d Angle: 40°		Mea	sured Angle: 40°	>		
ш	Range: 15.0" ⊠Sound Pa	th □Depth	5	Skew Ar	ngle: -120°		Меа	sured Skew Angl	e: -120°		
RANGE	Delay: 1.76"	٨	Mode: S	hear		Radi	us: 3.8"				
~	Velocity: 0.127 in / μS	C	Cable Ty	ype: RG-174	Length: 12'	inter	mediate Connect	tors: 0			
~	Display: Filt2				Verific	cation B	lock				
RCVR	Frequency: 2.25 MHz	, T	Type: CS	S Rompas		S/N: 99-	6251	51			
	Reject: Off			Reflector:		1" Radius	Radius		2" Radius		
	Pulse Width: 222 nS			Sweep: 0.6 div.			. 1.3	div.			
	Damping: 500 Ω			Amplitude:		70 %FSH		80 %	FSH		
	Mode: ⊠Pulse Echo □□	Dual		G	Bain:	28.6 dB		28.6	3 dB		
PULSER	Rep Rate: 2kHz			Basic Calibration Block							
7	Pulser: ☐150V ☐300V (	(*Sonic 137 only)	E	Block ID: BF-18				Material: Clad CS			
	*Pulser voltage adjustable with th	e Sonic 137 instrument	only.	Thicknes	ss: 6.0" with (	0.125" Clad	Diameter: Flat				
İ	The Sonic 136 has a fix			<b>Fempe</b> ra	ature: 74 °F		Therm. SN: VH-8937				
			C	Couplan	t: Ultragel II		Batch N	Batch No.: 05325			
		Ref	erence	e Sens	itivity Infor	mation					
Ref	flector: ID Notch	Sweep: 5.2 div			Amplitude: 8	30 %FSH	C	Sain: 51.4 dB			
Cal	In: Date 03/21/07 Time 0900	Check: Date 03/21/	07 Tim	e 1109	Check: Date	N/A Time N/A	, C	Out: Date 03/21/07	Time 1330		
		ments									
	ASAM CONTY FOR	GEORGE (	THAP	Parad							
Examiner: George Chapman / Free Level: II Date: 03					<del></del>			Date: N/A			
	AREVA Review: Adam Conti Level: III Date:				Page 7				Page 7 of 11		



#### Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet

Util	TY: IVA	Site: Bro	wns r	erry Nu	ciear f	riant	Unit: 2			Outage: C	ycle 14 KFU		
Cal	bration Data Sheet Number:	N4BNV-CDS2			ISI Re	SI Report Number: R176							
Cor	nponent ID: N4B-NV				Compo	nent Des	cription: N4	Nozzle-t	o-Vess	el weld			
Exa	mination Procedure: 54-ISI-8	350-06		1	Applicable SDCN(s): 30-9044520-000								
	Ultrasonic Inst	rument			Transducer								
Mai	nufacture: Staveley			Manufacture: KBA					Model: Benchmark 892-600				
Мо	del: Sonic 136			Serial N	lumbe	r: 0111P	K ·	Fre	quency	: 2.25 MHz			
Ser	ial Number: 136P1200G0814			Size: 0	.5 <b>*</b> x 1.	0"		Sha	pe: Re	ctangle			
Linearity Sheet No.: LDS1					ments	: 1		Сог	nfigurati	ion: Single			
	Instrument Se		Refract	ed Ang	jle: 40°		Mea	asured	Angle: 40°				
w	Range: 15.0" Sound Par	$\neg$	Skew A	ngle:	-120°		Mea	asured	Skew Angl	e: +120°			
RANGE	Delay: 1.76"		Mode:	Shear			Rac	dius: 3.8	3"				
œ	Velocity: 0.127 in / μS		Cable 1	Гуре: F	RG-174	Length: 12'	Inte	rmedia	te Connect	ors: 0			
	Display: Filt2		•, .			Verific	ation E	Block					
RCVR	Frequency: 2.25 MHz		Type: C	S Ror	npas		S/N: 99	9-6251					
	Reject: Off		Reflector: 1" Radius			2" Radius							
	Pulse Width: 222 nS				Sweep: 0.6 div.					1.3 div.			
	Damping: 500 Ω			Amplitude:			75 %FSH		80 %FSH				
	Mode: ⊠Pulse Echo □	)ual		Gain:			29.0 dB			29.0	) dB		
PULSER	Rep Rate: 2kHz			Basic Calibration Block									
PUL	Pulser: ☐150V ☐300V (	*Sonic 137 only)		Block ID: BF-18 M				Materia	Material: Clad CS				
	*Pulser voltage adjustable with the	e Sonic 137 instrument	only.	Thickne	ess: 6.0	)" with 0.	125" Clad	Diamet	Diameter: Flat				
	The Sonic 136 has a fix			Tempe	rature:	74 °F		Therm.	Therm. SN: VH-B937				
				Coupla	nt: Ultr	agel II		Batch f	Batch No.: 05325				
		Ref	erenc	e Sen	sitivit	y Inform	nation						
Ref	lector: ID Notch	Sweep: 5.2 div			Amp	litude: 80	%FSH		Gain: 4	9.0 dB			
Cal	In: Date 03/21/07 Time 0905	Check: Date 03/21/	07 Tin	ne 1126	Chec	k: Date N	I/A Time N/A		Out: Date 03/21/07 Time 1328				
		nment	3										
	Examiner: George Chapman Level: II Date:				D7 Examiner: N/A Level: N/A Date Signature			Date: N/A					
	REVA Review: Adam Contil Level: III Date:				,					Page 8 of 11			



#### Reactor Pressure Vessel 600334 Manual Ultrasonic Calibration Data Sheet

Site: Browns Ferry Nuclear Plant Unit: 2 Outage: Cycle 14 RFO Calibration Data Sheet Number: N4BNV-CDS3 ISI Report Number: R176 Component Description: N4 Nozzle-to-Vessel weld Component ID: N4B-NV Examination Procedure: 54-ISI-850-06 Applicable SDCN(s): 30-9044520-000 Transducer **Ultrasonic Instrument** Manufacture: Staveley Manufacture: KBA Model: Benchmark 892-600 Model: Sonic 136 Serial Number: 00X1XB Frequency: 2.25 MHz Size: 0.5" x 1.0" Serial Number: 136P1200G081455 Shape: Rectangle Linearity Sheet No.: LDS1 # of Elements: 1 Configuration: Single Refracted Angle: 60° Measured Angle: 60° Instrument Settings Range: 20.0" Sound Path Depth Skew Angle: ±35° to 67° Measured Skew Angle: N/A Delay: 1.17" Mode: Shear Radius: Flat Velocity: 0.127 in / µS Cable Type: RG-174 Length: 121 Intermediate Connectors: 0 Display: Filt2 **Verification Block** Frequency: 2.25 MHz S/N: 99-6251 Type: CS Rompas Reject: Off Reflector: 1" Radius 2" Radius Pulse Width: 222 nS Sweep: 0.5 div. 1.0 div. Damping: 500 Ω Amplitude: 70 %FSH 80 %FSH Mode: Pulse Echo 22.8 dB 22.8 dB ☐ Dual Gain: Rep Rate: 2kHz **Basic Calibration Block** Pulser: 150V 300V (\*Sonic 137 only) Block ID: BF-18 Material: Clad CS Thickness: 6.0" with 0.125" Clad Diameter: Flat \*Pulser voltage adjustable with the Sonic 137 instrument only. The Sonic 136 has a fixed pulser voltage. Temperature: 74 °F Therm, SN: VH-8937 Batch No.: 05325 Couplant: Ultragel II Reference Sensitivity Information Reflector: ID Notch Sweep: 6.0 div Amplitude: 80 %FSH Gain: 61.0 dB Out: Date 03/21/07 Time 1325 Cal In: Date 03/21/07 Time 0915 Check: Date 03/21/07 Time 1144 Check: Date N/A Time N/A Comments Level: N/A Date: N/A Examiner: N/A xaminer: George Chapmar Level: II Date: 03/21/07 Signature: Signature AREVA Review: Adam Conti Level: III Date: 03/22/07 Page 9 of 11 Signature:



### Reactor Pressure Vessel 000335 Manual Ultrasonic Calibration Data Sheet

l Our	ity: IVA	, гепу г	luciear	Plant	Ferry Nuclear Plant Unit: 2			Outage: Cycle 14 RFO			
Cal	libration Data Sheet Number: N4BN	NV-CDS4							176		
Cor	mponent ID: N4B-NV			Comp	onent De	escription: N4	Nozzle-to-	Vessel V	Weld		
Exa	amination Procedure: N-UT-78 Rev	vision 4		Applic	able SDC	CN(s): N/A				,	
	Ultrasonic Instrume	ent	Τ			Tri	ansducer	r			
Mai	nufacture: Staveley		Manu	Manufacture: RTD Model: TR					ST		
Мо	del: Sonic 136		Seria	Numb	er: 07-30	4	Frequ	uency: 2	MHz		
Ser	rial Number: 136P1200G081456		Angle	≥: 60°			Meas	ured Ang	gle: 61°	,	
Line	earity Sheet No.: LDS2		Mode	: Refrac	cted Long	gitudinal	Size:	2(24x42)	.)mm		
	Instrument Setting	js	Focus	s: FS~1	25mm		Squin	nt Angle:	5°		
w.	Range: 8.00" Sound Path	☐Depth	# of E	Element	ıs: 2	Shape: Rect	. Confi	guration:	: Dual	- SBS	
RANGE	Delay: 1.34"	· · · · · · · · · · · · · · · · · · ·	Cable	a Type:	RG-174	Length: 1	2' Intern	nediate (	Connec	tors: 0	
"	Velocity: 0.227 in / μS					Verific	cation Bl	ock			
	Display: Filt 2		Type:	: N/A			S/N: N/A				
RCVR	Frequency: 2.25 MHz		Re	eflector:	ctor: N/A			N/A			
	Reject: Off			Sweep: N/A				. 1	N/A		
	Pulse Width: 222 nS	Am	rplitude:		N/A				N/A		
	Damping: 500 Ω		Gain:		N/A				N/A		
ŭ,	Mode: □Pulse Echo ☑Dual			Basic Calibration Blo							
PULSER	Rep Rate: 2kHz	14	Block	Block ID: BF-18 Mate			Material:	cs			
ā.	Pulser: 150V 300V (*Sonic	137 only)	Thick	Thickness: 6.0" with 0.125" Clad			Diameter	: Flat			
	*Probe voltage is adjustable with the Sonic		Temr	perature	<sub></sub> : 73 °F		Therm. SN: VH-8937				
	Sonic 136 has a fixed pulser	voltage.	Coup	Couplant: Ultragel II			Batch No.: 05325				
		Referer	nce Se	nsitivi	ity Infor	mation					
Ref	flector: 1/4-t SDH	Sweep: 3.7 div			Amplitur	de: 80 %FSH		Gain:	59.8 dl	В	
Cal	In: Date 03/21/07 Time 1055	Check: Date N/A T	ime N/A		Check: [	Date N/A Time	) N/A	Out: Date 03/21/07 Time 1314			
			Cr	ommer	nts						
Zon	ne 1 - Near Surface calibration.										
	aminer: Bret Flesner II	03/21/0		Examiner: N/A Signature			Level	i: N/A	Date: N/A		
	EVA Review Adam Conti/ nature:	03/22/0	)7	Oignature				-	Page 10 of 11		



## Reactor Pressure Vessel 630336 Manual Ultrasonic Calibration Data Sheet

Utility: TVA Site: Brown				luclear	Plant	Unit: 2	Outage: Cycle 14 RFO				
Cal	ibration Data Sheet Number: N4B	NV-CDS5		ISI Re	port Nur	nber:		R176			
Cor	mponent ID: N4B-NV			Comp	onent De	escription: N4	Nozzle-to-\	/essel Weld.			
Exa	mination Procedure: N-UT-78 Re	vision 4		Applica	able SDC	CN(s): N/A					
	Ultrasonic Instrum	ent				Tra	ansducer				
Mai	nufacture: Staveley		Manu	Manufacture: RTD Model					el: TRL2-ST		
Мо	del: Sonic 136	,	Seria	Numbe	er: 07-30	4 V	Freque	ency: 2 MHz			
Ser	ial Number: 136P1200G081456		Angle	: 60°			Measu	red Angle: 61	o		
Line	earity Sheet No.: LDS2	Mode	: Refrac	ted Long	gitudinal	Size: 2	(24x42)mm				
	Instrument Setting	Focus	s: FS~1	25mm		Squint	Angle: 5°				
ш	Range: 18.0" Sound Path	Depth	# of E	lement	s: 2	Shape: Rec	. Config	uration: Dual	- SBS		
RANGE	Delay: 1.34"	Cable	Туре:	RG-174	Length: 1	2' Interm	ediate Conne	ctors: 0			
ur.	Velocity: 0.227 in / µS				Verifi	cation Blo	ck				
	Display: Filt 2	Туре	N/A			S/N: N/A					
RCVR	Frequency: 2.25 MHz		Re	eflector:		N/A		N/A			
	Reject: Off	eject: Off				weep: N/A			N/A		
	Pulse Width: 222 nS	Am	plitude:	de: N/A				<b>N/A</b>			
	Damping: 500 Ω		Gain:	ain: N/A				N/A			
œ	Mode: ☐Pulse Echo  ☑Dual					Basic Ca	libration	Block			
PULSER	Rep Rate: 2kHz	·	Block	Block ID: BF-18 Ma			Material: 0	aterial: CS			
σ.	Pulser: 150V 300V (*Sonic	137 only)	Thick	Thickness: 6.0" with 0.125" Clad Di			Diameter:	Diameter: Flat			
	*Probe voltage is adjustable with the Soni		Temp	erature	73 °F		Therm. SN: VH-8937				
	Sonic 136 has a fixed pulse	г voitage.	Coup	Couplant: Ultragel II B			Batch No.: 05325				
		Refere	nce Se	nsitivi	y Infon	mation					
Ref	lector: ID Notch	Sweep: 6.3 div			Amplitud	de: 80 %FSH		Gain: 74.6 d	В		
Cal	In: Date 03/21/07 Time 1054	Check: Date N/A	Time N/A		Check: [	Date N/A Time	N/A	Out: Date 03/21/07 Time 1315			
			Co	ommer	its						
Zon	e 2 - Full Volume calibration.										
				•		•					
					•		,				
Eva	miner: Bret Flesner	Level: II Date	: 03/21/0	7 50	Examiner: N/A			Level: N/A Date: N/A			
	nature: An Fusion	. 0312 1/0	Signature Ecvel. N/A			Date. N/A					
	EVA Review: Atlam Continature:	: 03/22/0	)7	Page 11 of 1							

# Examination Report, R-177 N4C-NV, RPV Nozzle-To-Head Weld

		<b>A</b>	ľ	
A	R	E	V	A

#### RPV Nozzle Ultrasonic Examination Summary Sheet

000337

Utility: TVA Site: Browns Ferry N		erry Nuclear Pla	nt Unit: 2	Outage: Cycle 14	ISI Report #: 12/77		
Component Number:	N4C-NV	Component D	escription: N4 Nozz	le to Vessel Weld	System: RPV		
Code Category: B-D		Code Item: B3	3.90	Code Class: 1	Material: CS		
ISO / Drawing(s): 2-0	:HM-2046-C-01	3 2-ISI-0269-C-0	)1				
Procedure Numbe	r Proced	dure Revision	SDCN	Pro	ocedure Misc. Info		
N-UT-78		4	NA	Revision 11 of the	PDI-UT-6 qualified equipment table		
N-UT-79		1	NA	Revision 5 of the F	PDI-UT-7 qualified equipment table		
54-ISI-850		06	30-9044520-00	00 Modeling R	eport: IR-2003-19, Section 5		
Ca	libration Sheets	-	Exam Data Sheets	Indication Data Sheets	Exam Results		
NIACNIV CDC1			N4CNV-EDS*		No Recordable Indications		
N4CNV-CDS1			N4CNV-EDS		Recordable Flaw Indications		
N4CNV-CDS2					(acceptable flaw evaluation)  Reportable Flaw Indications		
		**************************************			(unacceptable flaw evaluation)		
N4CNV-CDS4		, , , , , , , , , , , , , , , , , , , ,					
N4CNV-CDS5			<u></u>				
				al scan directions. The	ese examinations resulted in no		
from the vessel sur	face in both the			al scan directions. The	se examinations resulted in no		
from the vessel sur reportable indication In accordance with	face in both the ns.  UT procedure	e axial (radial) a 54-ISI-850-06 lese examination	and circumferentiand the reference	d TVA / EPRI modelin- reportable indications	g report the following additional		
from the vessel sur reportable indication In accordance with	face in both the ns.  UT procedure performed. The	e axial (radial) a 54-ISI-850-06 nese examinatio	and circumferentiand the reference ons resulted in no ozzle Modeling F	d TVA / EPRI modelin reportable indications Parameters	g report the following additional		
from the vessel sur reportable indication In accordance with	face in both the ns.  UT procedure performed. The Probe Refre	e axial (radial) a 54-ISI-850-06 a lese examinatio  N4 Na acted Angle	and circumferentiand the reference ons resulted in no ozzle Modeling F	d TVA / EPRI modelin reportable indications Parameters Scan Surface	g report the following additional		
from the vessel sur reportable indication In accordance with	face in both the ns.  UT procedure performed. The Probe Refr.	e axial (radial) a 54-ISI-850-06 a see examination  N4 No acted Angle	and the reference ons resulted in no ozzle Modeling F Probe Skew -120°	d TVA / EPRI modelin reportable indications Parameters Scan Surface Blend Radius	g report the following additional		
from the vessel sur reportable indication In accordance with	face in both the ns.  UT procedure performed. The Probe Refr. 40	e axial (radial) a 54-ISI-850-06 a lese examinatio  N4 Na acted Angle	and circumferentiand the reference ons resulted in no ozzle Modeling F	d TVA / EPRI modelin reportable indications Parameters Scan Surface	g report the following additional		
reportable indication in accordance with examinations were This ultrasonic examinimum coverage examination processor. The 60°RI obtained to 44%. If coverage, and scale This examination s	face in both the ns.  UT procedure performed. The Probe Refres 40 40 60 mination was perequirements at the requirements at examinations. Refer to coverant limitations.	e axial (radial) a 54-ISI-850-06 a sese examination  N4 Na acted Angle PS erformed in accomposition of 10 CFR50.55 an additional circumsted dige sketch(s) ar uirements of As	and circumferential and the reference ons resulted in no ozzle Modeling For Probe Skew -120° +120° ±(35°-67°)  cordance with the 5a (b)(2)(xv)(K) wounferential scan ue to the nozzle ond worksheet for a SME Section XI (2	d TVA / EPRI modeling reportable indications.  Parameters Scan Surface Blend Radius Blend Radius Vessel  Coriteria of 10 CFR50.5  as achieved to the material of the outer 85%-t who on figuration which reduce a description of the scan	g report the following additional		
reportable indication in accordance with examinations were This ultrasonic examinimum coverage examination processores. The 60°Rl obtained to 44% froverage, and scale This examination s ASME Section XI, Anote: See TVA Re	face in both the ns.  UT procedure performed. The Probe Refres 40 40 60 mination was perequirements at the requirements at examinations. Refer to coverant limitations. Appendix VIII quest for Relief	e axial (radial) a 54-ISI-850-06 alese examination  N4 Nacted Angle  PS erformed in accomposition of 10 CFR50.5 and ditional circumsted dige sketch(s) are uirements of Assualified person f PDI-1 and PD	and the reference ons resulted in no ozzle Modeling F Probe Skew -120° +120° ±(35°-67°)  cordance with the 5a (b)(2)(xv)(K) we cumferential scan ue to the nozzle ond worksheet for a SME Section XI (2) and, procedures, a ol-2. Dockets No. (B-2500-7 (a) and	d TVA / EPRI modeling reportable indications.  Parameters Scan Surface Blend Radius Blend Radius Vessel  Parameters Scan Surface Blend Radius Vessel  Parameters Scan Surface Blend Radius Vessel  Parameters Scan Surface Blend Radius Vessel  Parameters Sean Surface Blend Radius Vessel  Parameters Sean Surface Blend Radius Vessel  Parameters Sean Surface Blend Radius Vessel  Parameters Scan Surface Blend Radius Vessel  Parameters Sean Surface Blend Radius Vessel  Parameters Sean Surface Blend Radius Vessel  Parameters Sean Surface Blend Radius Vessel  Parameters Scan Surface Blend Radius Vessel  Parameters  Scan Surface	g report the following additional  55a (b)(2)(xv)(G) and the ximum extent possible. The ich is not addressed in 10CFR uced the examination volume inning volume, examination  da) and was performed using		
This ultrasonic examinations were examinations were examination processors. The 60°Rl obtained to 44% froverage, and scal This examination s ASME Section XI, Note: See TVA Rerequest reduced the Prepared by: Bret F Signature:	Probe Refreshed August for Relief e area to be experienced.	e axial (radial) a 54-ISI-850-06 alese examination  N4 Nacted Angle  PS  erformed in accompton for the content of the content	and circumferential and the reference ons resulted in no ozzle Modeling FProbe Skew -120° +120° ±(35°-67°)  cordance with the 5a (b)(2)(xv)(K) wounferential scan ue to the nozzle on worksheet for a SME Section XI (2) and worksheet so on SME Section XI (2) and SME Section XI (2) and SME Section XI (3) and SME Section XI (4) and SME Section XI (5) and SME Section XI (6) and SME Section XI (6) and SME Section XI (7) and SME Section XI (7) and SME Section XI (8) and SME Section XI	d TVA / EPRI modeling reportable indications.  Parameters Scan Surface Blend Radius Blend Radius Vessel  Parameters Scan Surface Blend Radius Vessel  Parameters Scan Surface Blend Radius Vessel  Parameters Scan Surface Blend Radius Vessel  Parameters Sean Surface Blend Radius Vessel  Parameters  Sean Sur	g report the following additional  55a (b)(2)(xv)(G) and the ximum extent possible. The ich is not addressed in 10CFR uced the examination volume inning volume, examination  da) and was performed using		
reportable indication reportable indication reportable indication in accordance with examinations were saminations were examination processor. The 60°RI obtained to 44% for coverage, and scale This examination is ASME Section XI, Note: See TVA Refrequest reduced the Prepared by: Bret Formation is processor.	Probe Refreshed August for Relief e area to be experienced.	e axial (radial) a 54-ISI-850-06 alese examination  N4 Nacted Angle  PS  erformed in accompton for the content of the content	and circumferential and the reference ons resulted in no ozzle Modeling For Probe Skew -120° +12	d TVA / EPRI modeling reportable indications.  Parameters Scan Surface Blend Radius Blend Radius Vessel  Parameters Scan Surface Blend Radius Vessel  Parameters Scan Surface Blend Radius Vessel  Parameters Scan Surface Blend Radius Vessel  Parameters Sean Surface Blend Radius Vessel  Parameters  Sean Sur	g report the following additional  55a (b)(2)(xv)(G) and the ximum extent possible. The ich is not addressed in 10CFR uced the examination volume anning volume, examination  da) and was performed using  28, and 50-0390. This relief  on each side.		



#### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

Unit: 2

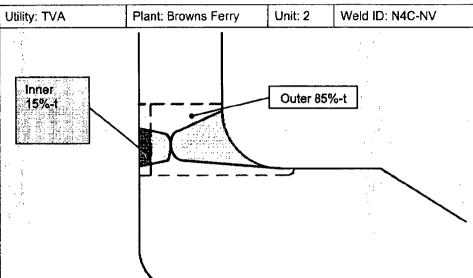
Outage: Cycle 14 RFO

	Component ID: N4C-NV Component Description: N4 Nozzle-to-Vessel Weld															
Compon	ent ID: N	I4C-NV				1.7.1		Description:	N4 Noz	zie-to-V	essel We	eld				
		,			Exe		Information					- <del></del>	· ·		.1	
		mber: 2-CHM-204		9-C-01			cation: Nozzle Bo			لر	Location	1: Nozzl	e TDC			
Examina	tion Limit	ed:⊠Yes □No	)				ige Sheet Numb	ег(s): N4CN\	V-CWS1			·	<del></del>		<del></del>	
	:					Scan Info	ormation						<u></u>			
Examinati	on Proced	ure: 54-ISI-850-06		Applicable SD	CN's: 30-904	4520-000						Scan Surface: OD Blend Radius				
Angle/ Mode	Skew	Calibral	tion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	Scan Limited		rdable tion(s)	Indication Data Sheet #		Examiner Initials	
40°/s	-120	N4CI	NV-CDS1	03/21/07	1247	77°F	VH-8937	75.0 dB	□Yes	⊠No	□Yes	⊠No	N/A		GC	
40°/s	+120	N4CI	NV-CD\$2	03/21/07	1304	77°F	VH-8937	75.0 dB	□Yes	⊠No	☐Yes	⊠No	N/A		GC	
NA/	N/A		N/A	N/A	N/A	N/A	N/A	N/A	☐Yes	□No	Yes	□No	N/A	,	N/A	
NA /	□ N/A		N/A	N/A	N/A	N/A	N/A	N/A	☐Yes	□No	☐Yes	□No	N/A		N/A	
Examination Procedure: 54-ISt-850-06 Applicable SDCN's: 30-9044520-000 Scan Surface: OD Vessel Shell																
Angle/ Skew Calibration Sheet # Date Time Temp Thermometer S/N: Scan Gain Scan Limited Recordable Indication Examiner Initials																
60°/s	±35° to 6	7° N4CI	NV-CDS3	03/21/07	1218	77°F	VH-8937	72.0 dB	☐Yes	⊠No	□Yes	⊠No	N/A		GC	
N/A /	N/A		N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A		N/A	
Examinati	ion Proced	ure: N-UT-78 revisio	on 4	Applicable SC	CN's: N/A			Scan Se	urface: O	D Vessel S	hell					
Angle/ Mode	Zone	Beam Direction	Calibration Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Limited				Recordable Indicati Indication(s) Data She		Examiner Initials	
60°/RL	1	⊠Radial □Circ	N4CNV-CDS4	03/21/07	1100	7 <b>7°F</b>	VH-8937	74.0 dB	⊠Yes	□No	□Yes	⊠No	N/A		BF	
60°/RL	2	⊠Radial □Circ	N4CNV-CDS5	03/21/07	1140	77°F	VH-8937	82.0 dB	⊠Yes	□No	□Yes	⊠No	N/A		BF	
60°/RL	1	☐Radial ⊠Circ	N4CNV-CDS4	03/21/07	1100	77°F	VH-8937	74.0 dB	⊠Yes	□No	□Yes	⊠No	N/A		BF	
60°/RL	2	□Radial ⊠Circ	N4CNV-CDS5	03/21/07	1140	77°F	VH-8937	82.0 dB	⊠Yes	□No	□Yes	⊠No	N/A		8F	
Commen	nts:														-	
	ž															
													_			
Signatu		1 Alf		Level; if	Date: 03		Examiner: N/A Signature:			,		Lev	el: N/A	Date:	N/A	
Signatu		DUT 1	Pone	Level: II	Date: 03		Examiner: N/A Signature:					Lev	rel: N/A	Date:	N/A	
	eview: Ad	in cont	/	Level: Ili	Date: 03	/22/07						· · · · · · · · · · · · · · · · · · ·	<del>-</del>			
Gignatu	Signature Signature															
															Page 2 of 11	

Site: Browns Ferry Nuclear Plant



#### RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet



Axial scans are performed with a procedure for the examination of vessel shell welds. This procedure has been demonstrated for detection of flaws located throughout the entire weld thickness. Coverage obtained during axial scans is typically limited due to nozzle configuration.

Coverage Worksheet #: N4CNV-CWS1

ISI Report #: 127

In the circumferential scan direction the outer 85%-t is examined with the same vessel procedure as above and typically limited due to nozzle configuration. To achieve additional coverage in the circumferential scan direction a second examination is performed with a procedure demonstrated for nozzle inside-radius UT. This procedure has been demonstrated for detection of flaws in the inner 15%-t only. The nozzle inside-radius technique provides additional coverage since the component is modeled and scanning is performed with several search units from the nozzle blend.

Axial Scans	Circumferential Scans								
100%-t	Inner 15%-t	Outer 85%-t							
Examination Procedure: N-UT-78 Revision 4	Examination Procedure: 54-ISI-850-06	Examination Procedure: N-UT-78 Revision 4							
ARequired Examination Volume: 45.02 inches	<sup>D</sup> Inner 15%-t Examination Volume: 5.8 <sup>2</sup> inchs	<sup>6</sup> Outer 85%-t Examination Volume: 39.2 <sup>2</sup> Inches.							
60°RL axial scan limited: ☑Yes ☐No	<sup>E</sup> Coverage Obtained by Modeling: 100%	60°RL Outer 85%-t Exam Limited:   ☐ Yes ☐ No							
Description of Limitation: Nozzle Blend Radius	Inner 15%-t Exam Limited: ☐Yes ☑No	Description of Limitation: Nozzle Blend Radius							
<sup>8</sup> Total Axial Volume Achieved: 24.3 <sup>2</sup> inches	Description of Limitation: N/A	"Outer 85-t% Volume Achieved: 11.22inches							
	Finner 15%-t Volume Achieved: 5.82inchs								
<sup>c</sup> Percentage of Axial Coverage: 54% / (49%)*	Total Circumferential Examination Coverage: 38%								
B + A X 100 = C	(F + H) + A X 100 = J								

Combined Axial and Circumferential Weld Coverage

'Total Examination Coverage: 44%

 $(C+J) + 2 \times 100 = L$ 

NOTE: "Axial scan coverage of 49% includes the insulation support ring limitation. "Total Examination Coverage" of 44% also takes into account this limitation.

Prepared by: Bret Flesner

Date: 04/17/07

Reviewed by: Adam Cont

Date:04/17/07

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RI11 000340 Browns Ferry N4 Nozzle-to-Shell Weld Coverage Plot DRAWN BY N4CNV-CPS1 Bret Flesner 04/17/07 Nozzle-to-Vessel weld examination coverage for axial (radial) scan Total area of examination volume: 45.0 sq. in. (TVA supplied) Total area of examination volume achieved: 24.3 sq. in. Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned. Insulation Support Ring Horizontal Shell Weld

DESCRIPTION Browns Ferry N4 Nozzle-to-Shell Weld Coverage Plot R177 Bret Flesner 000341 Insulation Support Ring Nozzle-to-Vessel weld examination coverage for circumferential scan Total area of examination volume: 45.0 sq. in. (TVA supplied) Total area of outer 85%-t exam volume achieved: 11.2 sq. in. Total area of inner 15%-t volume: 5.8 sq. in. Total area of inner 15%-t exam volume achieved: 5.8 sq. in. Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned. Inner 15%-t area examined from the blend with Supplement 5 techniques.

DESCRIPTION
Browns Ferry N4 Nozzle-to-Shell Weld Coverage Plot
DRAWN BY DATE TITLE PAGE
Bret Flesner 03/21/07 N4CNV-CPS3 6 OF 11

Contact can not be maintained on horizontal weld due to weld crown.

This area = 61 sq. in. of limitation.

Area to be scanned (yellow area): 1278 sq. in. 66sq. in. of limitation = 5% limitation of radial coverage.

(66 / 1278 = 5%)

#### **Insulation Support Ring** ЫТ 60. .60° .09 Required scan area to achieve coverage shaded in yellow. 1278 sq. in. R-Nozzle/ Weld Pipe io Rhore, Transducer with 0\*. 10° and +10° skews **3** % JA 50

#### Insulation



## Reactor Pressure Vessel 600343 Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	rowns f	Ferry Nu	clear F	lear Plant Unit: 2			Outage: Cycle 14 RFO					
Cal	ibration Data Sheet Number:	N4CNV-	CDS1			ISI Re	port Nun	nber:	RI	17			
Col	mponent ID: N4C-NV				. (	Compo	nent Des	scription: N4	Nozzle-1	to-Vess	el Weld		
Exa	nmination Procedure: 54-ISI-8	350-06			1	Applica	ble SDC	N(s): 30-904	14520-0	00			
	Ultrasonic Inst	rument			Transducer								
Ma	nufacture: Staveley				Manufacture: KBA					Model: Benchmark 892-600			
Мо	del: Sonic 136		,	-	Serial N	Numbe	r: 00X1X	C .	Fre	quency	: 2.25 MHz		
Ser	ial Number: 136P1200G0814	55			Size: 0.	.5" x 1.	0"		Sha	ape: Re	ctangle		
Lin	earity Sheet No.: LDS1		# of Ele	ements	: <b>1</b>		Cor	nfigurati	ion: Single				
	Instrument Se	ettings		1.54.5	Refract	ed Ang	gle: 40°		Mea	asured A	Angle: 40°	•	
111	Range: 15.0" Sound Par	th □De	epth		Skew A	ngle: -	·120°		Mea	asured :	Skew Angl	e: -120°	
RANGE	Delay: 1.76"		Mode: 8	Shear			Rac	dius: 3.8	3"				
22	Velocity: 0.127 in / μS		Cable 1	Гуре: F	RG-174	Length: 12'	Inte	rmedia	te Connect	ors: 0			
	Display: Fitt2			·				Verific	ation l	Block			
RCVR	Frequency: 2.25 MHz		Type: CS Rompas S			S/N: 99	S/N: 99-6251						
	Reject: Off		Reflector: 1" Radius			2" Radius			adius				
	Pulse Width: 222 nS				Sweep: 0.6 div.			1.3 div.					
	Damping: 500 Ω				Ampl	mplitude: 70 %FSH					80 %	FSH	
	Mode: ⊠Pulse Echo □	Dual				Gain:		28.6 dB			28.6	3 dB	
PULSER	Rep Rate: 2kHz	,			Basic Calibration					on Block			
ม	Pulser:150V300V (	(*Sonic 137 c	only)		Block II	D: BF-	18		Material: Clad CS				
	*Pulser voltage adjustable with th	e Sonic 137	' instrumer	nt only.	Thickne	ess: 6.0	0" with 0.	125" Clad	Diameter: Flat				
	The Sonic 136 has a fix	red pulser v	oltage.		Tempe	rature:	74 °F		Therm. SN: VH-8937				
					Coupla	nt: Ultr	aGel II		Batch f	No.: 05	325		
			Re	feren	ce Sens	sitivit	y Inform	nation					
Ref	lector: ID Notch	Sweep:	5.2 div			Amp	litude: 80	%FSH		Gain: 5	1.4 dB		
Cal	In: Date 03/21/07 Time 0900	Check: D	ate 03/21	1/07 Ti	me 1246	Chec	k: Date N	I/A Time N/A		Out: Da	te 03/21/07	Time 1330	
					Con	nment	<b>S</b>				/ 4		
Signature: ( A / / / /					03/21/07	Examiner: N/A Level: 1			.evel: N/A	Date: N/A			
AR	AREVA Review Adam Obnii Level: III Date:					+ -					Page 7 of 11		



## Reactor Pressure Vessel $_{000344}$ Manual Ultrasonic Calibration Data Sheet

	ity: IVA	Si	e: Browns	Ferry N	uclear P	lant	Unit: 2			Outage: C	Cycle 14 RFO
Ca	libration Data Sheet Number:	N4CNV-CDS	2		ISI Rep	ort Nun	nber:	ズ	2177		
Co	mponent ID: N4C-NV	<u> </u>			Compo	nent Des	scription: N4	Nozzie	to-Vess	sel weld	,
Exa	amination Procedure: 54-ISI-	350-06			Applica	ble SDC	N(s): 30-90-	44520-0	000		
	Ultrasonic Inst	rument					Tr	ansduc	cer		
Ma	nufacture: Staveley	******	**********	Manul	acture:	KBA		Мо	Model: Benchmark 892-600		
Мо	del: Sonic 136			Serial Number: 0111PK					Frequency: 2.25 MHz		
Sei	rial Number: 136P1200G0814	55		Size: 0.5" x 1.0"				Sh	ape: Re	ectangle	
Lin	earity Sheet No.: LDS1			# of El	lements:	1		Со	nfigurat	tion: Single	
	Instrument Se	ettings		Refrac	ted Ang	le: 40°		Ме	asured	Angle: 40°	
ш	Range: 15.0" Sound Par	th □Depth		Skew	Angle: +	120°		Ме	asured	Skew Angl	e: +120°
RANGE	Delay: 1.76"	n e nang		Mode:	Mode: Shear Radius:					8"	
Œ.	Velocity: 0.127 in / µS			Cable	Type: R	G-174	Length: 12'	Inte	ermedia	ite Connect	tors: 0
	Display: Filt2						Verific	cation	Block		
RCVR.	Frequency: 2.25 MHz			Type:	CS Ron	pas		S/N: 9	9-6251		
	Reject: Off			Ref	Reflector: 1" Radius				2" Radius		adius
	Pulse Width: 222 nS			Sweep: 0.6 div.					1.3	div.	
	Damping: 500 Ω			Amp	Amplitude: 75 %FSH					80 %	6FSH
	Mode: ⊠Pulse Echo □□	Dual			Gain:	Gain: 29.0 dB			29.0 dB		
PULSER	Rep Rate: 2kHz			Basic Calibration Block						•	
뒬	Pulser: 150V 300V	*Sonic 137 only)		Block ID: BF-18			Material: Clad CS				
	*Pulser voltage adjustable with th	e Sonic 137 inst	rument only.	Thickr	Thickness: 6.0" with 0.125" Clad			Diameter: Flat			
	The Sonic 136 has a fo	red pulser voltag	<b>e</b> .	Tempe	erature:	74 °F		Therm. SN: VH-8937			
				Couple	ant: Ultra	aGel II		Batch No.: 05325			
			Referen	ce Ser	sitivity	Inform	nation				
Re	Rector: ID Notch	Sweep: 5.2	div		Ampl	itude: 80	%FSH		Gain: 4	19.0 dB	
Cal	In: Date 03/21/07 Time 0905	Check: Date	03/21/07 T	ime 130	3 Chec	k: Date N	N/A Time N/A	\	Out: Da	ate 03/21/07	7 Time 1328
				Co	mment	8					
	Examiner: George Chapman Level: II Date: Signature:					Examiner: N/A Signature			ſ	Level: N/A	Date: N/A
	REVA Review: Adam Cont Level: III Dat				)7						Page 8 of 11



### Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet

000045

			BIUWIS	reny Nu	Iclear Plant	Unit: 2		Outage.	Cycle 14 RFO	
Cal	ibration Data Sheet Number:	N4CNV-CDS3			ISI Report N	umber:		R177		
Co	mponent ID: N4C-NV		. :		Component D	escription: N4	Nozzle-t	o-Vessel weld		
Exa	mination Procedure: 54-ISI-8	50-06	4		Applicable SD	CN(s): 30-90	44520-00	00		
	Ultrasonic Instr	rument				Tr	ansduc	er		
Ma	nufacture: Staveley			Manufa	acture: KBA		Mod	Model: Benchmark 892-600		
Мо	del: Sonic 136			Serial Number: 00X1XB				Frequency: 2.25 MHz		
Ser	ial Number: 136P1200G08145	55		Size: 0	.5" x 1.0"		pe: Rectangle			
Line	earity Sheet No.: LDS1			# of Ele	ements: 1		Cor	nfiguration: Single		
	Instrument Se	ttings		Refrac	ted Angle: 60°	)	Mea	asured Angle: 60°	,	
ш	Range: 20.0″ ⊠Sound Pat	h		Skew A	Angle: ±35° to	67°	Mea	asured Skew Ang	le: N/A	
RANGE	Delay: 1.17"			Mode:	Shear		Rac	lius: Flat		
L 2	Velocity: 0.127 in / µS			Cable	Type: RG-174	Length: 12'	Inte	rmediate Connec	tors: 0	
	Display: Fitt2					Verifi	cation E	Block		
Ş	Frequency: 2.25 MHz				CS Rompas		S/N: 99	-6251		
	Reject: Off			Refl	lector:	1" Radius	2"		adius	
	Pulse Width: 222 nS			Sweep: 0.5 div.			1.0 div.			
	Damping: 500 Ω			Amplitude: 70 %FSH			80 %	%FSH		
	Mode: ⊠Pulse Echo □D	uai			Gain: 22.8 dB			22.	8 dB	
PULSER	Rep Rate: 2kHz			Basic Calibration Block						
ฮ	Pulser: ☐150V ☐300V (*	Sonic 137 only)		Block ID: BF-18			Materia	Material: Clad CS		
	*Pulser voltage adjustable with the	Sonic 137 instru	ment only.	Thickness: 6.0" with 0.125" Clad Did			Diamet	Diameter: Flat		
	The Sonic 136 has a fixe		,	Tempe	rature: 74 °F		Therm.	Therm. SN: VH-8937		
				Coupla	nt: UltraGel II		Batch N	Batch No.: 05325		
			Referen	ce Sen	sitivity Info	mation				
Ref	lector: ID Notch	Sweep: 6.0 div	1		Amplitude:	80 %FSH		Gain: 61.0 dB		
Cal	In: Date 03/21/07 Time 0915	Check: Date 03	3/21/07 Ti	ime 1144	Check: Date	N/A Time N/A	1	Out: Date 03/21/0	7 Time 1325	
				Coi	mments					
	,									
	,									
xaminer: George Chapman Level: II Date: 03/21				∩3/21 <i>i</i> ∩	07 Examiner: N/A Level: N/A Dat			Date: N/A		
	Signature: Level. II Date. 0			JJ12 11U	Signature Level. N/A Date. N/A			Date. NA		
				03/22/0	/22/07 Page 9 of				Page 9 of 11	
Sig	ignature. Want								-	



# Reactor Pressure Vessel 630346 Manual Ultrasonic Calibration Data Sheet

Utili	ity: TVA	Site: Browns I	Ferry Nuc	lear Plant	Unit: 2		Outage:	Cycle 14 RFO	
Cal	ibration Data Sheet Number: N40	;NV-CDS4	IS	SI Report Nur	mber:	R/	177		
Cor	mponent ID: N4C-NV		C	omponent De	escription: N4	Nozzle-to-	Vessel Weld		
Exa	mination Procedure: N-UT-78 Re	vision 4	A	Applicable SDC	CN(s): N/A				
	Ultrasonic Instrum	ent	- ' ';		Tr	ansducer			
Mar	nufacture: Staveley		Manufac	cture: RTD		Model	Model: TRL2-ST		
	del: Sonic 136	· · · · · · · · · · · · · · · · · · ·	Serial N	lumber: 07-30	<b>4</b>	Freque	ency: 2 MHz		
Ser	ial Number: 136P1200G081456		Angle: 6	i0°		Measu	ured Angle: 61	0	
Line	earity Sheet No.: LDS2		Mode: R	Refracted Long	gitudinal	Size: 2	2(24x42)mm		
	Instrument Settin	gs	Focus: F	FS~125mm		Squint	t Angle: 5°		
<u>ب</u>	Range: 8.00" Sound Path	□Depth	# of Elen	ments: 2	Shape: Rect	t. Config	juration: Dual	- SBS	
RANGE	Delay: 1.34"		Cable Ty	ype: RG-174	Length: 1	2' Interm	ediate Connec	ctors: 0	
ir.	Velocity: 0.227 in / µS				Verifi	cation Bio	ock		
_	Display: Filt 2		Type: N/	/A		S/N: N/A			
RCVR	Frequency: 2.25 MHz		Reflec	ictor:	N/A		N/A		
	Reject: Off		Sw	Sweep: N/A			N/A		
	Pulse Width: 222 nS		Amplit	Amplitude: N/A				N/A	
	Damping: 500 Ω		G	Gain:	N/A		r	WA	
ŭ,	Mode: ☐Pulse Echo ☑Dual				Basic Ca	alibration	Block		
PULSER	Rep Rate: 2kHz		Block ID	Block ID: BF-18 M			Material: CS		
Q.	Pulser: ☐150V ☐300V (*Sonic	c 137 only)	Thicknes	Thickness: 6.0" with 0.125" Clad [			Diameter: Flat		
	*Probe voltage is adjustable with the Son		Tempera	Temperature: 73 °F			Therm. SN: VH-8937		
	Sonic 136 has a fixed pulse	r voltage.	Couplan	Couplant: Ultragel II			Batch No.: 05325		
		Referen	ice Sens	itivity Infon	mation				
Ref	lector: 1/4-t SDH	Sweep: 3.7 div		Amplitu	ide: 80 %FSH	1	Gain: 59.8 d	В	
Cal	In: Date 03/21/07 Time 1055	Check: Date N/A Tir	ime N/A	Check: [	Date N/A Time	e N/A	Out: Date 03/21/07 Time 1314		
			Com	nments					
Zon	ne 1 - Near Surface calibration.								
	nature: Suff All 2142	Level: II Date: 0	03/21/07	Examiner: f Signature	N/A		Level: N/A	Date: N/A	
	EVA Review: Adam Conti	Level: III Date: 0	03/22/07	Page				Page 10 of 11	



# Reactor Pressure Vessel Coloration Data Sheet

Utility: TVA		Site: Browns	3 Ferry r	Anciear	Plant	Unit: 2		Outage:	Cycle 14 RFO	
Cal	ibration Data Sheet Number: N4C	NV-CDS5		ISI Re	port Nun	nber:	Ŕ	177		
Cor	mponent ID: N4C-NV			Comp	onent De	escription: N4	Nozzle-to-\	/essel Weld.		
Exa	imination Procedure: N-UT-78 Rev	vision 4		Applic	able SDC	CN(s): N/A				
	Ultrasonic instrume	ent				Tra	ansducer			
Mai	nufacture: Staveley		Manu	ufacture:	: RTD		Model	TRL2-ST		
Мо	del: Sonic 136		Seria	Serial Number: 07-304 √ Freq				ency: 2 MHz		
Ser	ial Number: 136P1200G081456		Angle	e: 60°		يقي والمراجع	Measu	red Angle: 61	o .	
Line	earity Sheet No.: LDS2		Mode	: Refrac	cted Long	gitudinal	Size: 2	2(24x42)mm		
	Instrument Setting	js	Focu	s: FS~1	25mm		Squint	Angle: 5°		
ш	Range: 18.0" Sound Path	□Depth	# of E	Element	s: 2	Shape: Rect	. Config	uration: Dual	- SBS	
RANGE	Delay: 1.34"		Cable	a Type:	RG-174	Length: 1	2' Interm	ediate Conne	ctors: 0	
<b>L</b>	Velocity: 0.227 in / µS					Vertfle	cation Blo	ck		
	Display: Filt 2		Туре	: N/A	S/I		S/N: N/A			
RCVR	Frequency: 2.25 MHz		Re	eflector:		N/A			N/A	
	Reject: Off		]	Sweep: N/A				N/A		
	Pulse Width: 222 nS			plitude:	de: N/A				V/A	
	Damping: 500 Ω			Gain:		N/A			N/A	
E.	Mode: □Pulse Echo  ☑Dual			Basic Calibration Blo					MARIN INC.	
PULSER	Rep Rate: 2kHz			Block ID: BF-18 Ma			Material: (	CS		
Ω.	Pulser: 150V 300V (*Sonic	137 only)	Thick	Thickness: 6.0" with 0.125" Clad D			Diameter:	Flat .		
	*Probe voltage is adjustable with the Soni Sonic 136 has a fixed pulser	ic 137 instrument. The	Temp	Temperature: 73 °F			Therm. St	Therm. SN: VH-8937		
	Soliic 130 has a rixeo puiser		Coup	olant: Ult	tragel II		Batch No.: 05325			
		Refere	nce Se	nsitivi	ty Inforr	mation	_			
Ref	lector: ID Notch	Sweep: 6.3 div			Amplitud	de: 80 %FSH		Gain: 74.6 d	В	
Cal	In: Date 03/21/07 Time 1054	Check: Date N/A	Fime N/A	\	Check: D	Date N/A Time	N/A	Out: Date 03	/21/07 Time 1315	
			Cr	ommer	nts					
Zon	e 2 - Full Volume calibration.									
					~.					
	•									
	miner: Bret Flesner nature: Bust Fileman	Level: II Date:	: 03/21/0		Examiner: N/A Signature			Level: N/A	Date: N/A	
ARI Sigi		Level: III Date:	: 03/22/0	)7	***************************************				Page 11 of 11	

# Examination Report, R-178 N4E-NV, RPV Nozzle-To-Head Weld

			K	
A	R	E	V	Δ

#### RPV Nozzle Ultrasonic Examination Summary Sheet

000348

Jtility: TVA	Site:	Browns F	erry Nuclear Pl	ant Ur	nit: 2	Outage: Cycle 14	ISI Report	#: K178
Component Number	er: N4E-N	٧V	Component I	Description: N	4 Nozzle t	o Vessel Weld	System: RF	PV
Code Category: B-I	D		Code Item: B	3.90	·	Code Class: 1	Material: C	s
SO / Drawing(s): 2	-CHM-20	046-C-01 8	& 2-ISI-0269-C-	01			port: IR-2003-19, Section  Exam Results  No Recordable Indicated Recordable Flaw Indicated Reportable Flaw Indicated Repor	
Procedure Numb	per	Proced	dure Revision	SD	CN	Pro	ocedure Misc. In	nfo
N-UT-78			4	N	A	Revision 11 of the i	PDI-UT-6 qualifi	ed equipment tab
N-UT-79			1	. N	A	Revision 5 of the PDI-UT-7 qu		d equipment tabl
54-ISI-850		<del>,</del>	06	30-9044	520-000	Modeling Report: IR-200		9, Section 5
C	alibratio	n Sheets		Exam She		Indication Data Sheets	·	
N4ENV-CDS1				N4ENV		Sileets		
N4ENV-CDS1				1445140	-6001			
N4ENV-CDS2								
N4ENV-CDS4					· · · · · · · · · · · · · · · · · · ·	<u> </u>	1	
N4ENV-CDS5   Summary:						<u> </u>		
rom the vessel s eportable indicat n accordance wi	urface in ions. th UT pi	n both the	e axial (radial) 54-ISI-850-06	and circumforms and the reference	erential s erenced T	VA / EPRI modeling	g report the fol	
rom the vessel s eportable indicat n accordance wi	urface in ions. th UT pi	n both the	e axial (radial) 54-ISI-850-06 nese examinal	and circumforms and the reference to the contract of the contr	erential s erenced T I in no re	VA / EPRI modeling portable indications.	g report the fol	
om the vessel s eportable indicat n accordance wi	urface in ions. th UT properties the transfer of the transfer	n both the rocedure rmed. Th	e axial (radial) 54-ISI-850-06 nese examinal	and circumformand the reference and the referenc	erential s erenced T I in no re	VA / EPRI modeling portable indications. ameters	g report the fol	
om the vessel s eportable indicat n accordance wi	urface in ions. th UT properties the transfer of the transfer	rocedure rmed. Th	54-ISI-850-06 nese examinat  N4 Nacted Angle	and circumformand the reference in the resulted in the resulte	erential s erenced T I in no re	VA / EPRI modeling portable indications. ameters Scan Surface	g report the fol	
rom the vessel s eportable indicat n accordance wi	urface in ions. th UT properties the transfer of the transfer	rocedure rmed. Th	e axial (radial) 54-ISI-850-06 nese examinal N4 N acted Angle	and circumformand the reference ions resulted Probe Sker-120°	erential s erenced T I in no re	VA / EPRI modeling portable indications. ameters Scan Surface Blend Radius	g report the fol	
rom the vessel s eportable indicat n accordance wi	urface in ions. th UT properties the transfer of the transfer	rocedure rmed. The robe Refra 40	54-ISI-850-06 nese examinat  N4 Nacted Angle	and circumformand the reference in the resulted in the resulte	erential s erenced T I in no re ling Para	VA / EPRI modeling portable indications. ameters Scan Surface	g report the fol	
rom the vessel seportable indicate accordance with examinations well accordance with examinations well accordance examination processes accordance to the secondary accordance a	urface in ions.  th UT property performs a minating required required required regarder regar	rocedure rmed. The robe Refra 40 60 fon was p rements of equires at ninations to covera	e axial (radial)  54-ISI-850-06 nese examinal  N4 N acted Angle 0°S 0°S 0erformed in acted for 10 CFR50.6 n additional ciliwere limited co	and circumforman and circumforman and the reference with the control of the control of the circumforman and circumforman and the circumforman and circumforman	erential s erenced T if in no re ling Para w ith the cri )(K) was I scan of zzle conf	VA / EPRI modeling portable indications.  ameters Scan Surface Blend Radius Blend Radius Vessel  teria of 10 CFR50.5 achieved to the maximum achieved	Greport the fol	lowing addition  3) and the cossible. The essed in 10CFF ination volume
rom the vessel seportable indicate accordance with accordance with accordance with accordance with accordance	urface in ions.  th UT property performs a minating examinating ex	rocedure rmed. The robe Refra 40 40 60 for was prements dequires an inations to coveragations.	e axial (radial) 54-ISI-850-06 nese examinal N4 N acted Angle 0°S 0°S erformed in acted 10 CFR50.6 n additional citional	and circumforman and circumforman and the reference of the circumstance of the circums	erential serenced Terenced Ter	VA / EPRI modeling portable indications.  ameters Scan Surface Blend Radius Blend Radius Vessel  teria of 10 CFR50.5 achieved to the maximum the outer 85%-t whi iguration which redusescription of the scan	55a (b)(2)(xv)(0 kimum extent p ch is not addre uced the exam nning volume,	dowing addition and the cossible. The essed in 10CFF ination volume examination
rom the vessel seportable indicate a coordance with accordance with a coordance with a coordance with a coordance with a coordance coordance and a coordance to 44%. Coverage, and so this examination as ME Section XI lote: See TVA Filesportable indicates a coordance of the coord	urface in ions.  th UT properties perform Properties required an limital satisfier, Appertications.	rocedure rmed. The robe Refres 40 40 60 for was perements to equires an inations to coveragations.  In the required at the req	e axial (radial) 54-ISI-850-06 nese examinat  N4 N acted Angle 0°S 0°S erformed in acted 10 CFR50.6 n additional citional citiona	and circumforman and circumforman and the reference of the circumstance of the circums	erential serenced Tenenced Ten	VA / EPRI modeling portable indications.  ameters Scan Surface Blend Radius Blend Radius Vessel  teria of 10 CFR50.5 achieved to the maximum the outer 85%-t whi iguration which redusescription of the scan	Greport the folk  55a (b)(2)(xv)(0  kimum extent point is not addrest the examining volume,  da) and was perfected and was perfected.	lowing addition  3) and the possible. The possible of the possible of the possed in 10CFF ination volume examination erformed using  10. This relief
rom the vessel seportable indicate a coordance with accordance with a coordance with a coordance with a coordance with a coordance coordance and a coordance to 44%. Coverage, and so this examination as ME Section XI lote: See TVA Filesportable indicates a coordance of the coord	th UT present a minating required an limit satisfier, Apper Request the area	rocedure rmed. The robe Refres 40 40 60 for was prements to coveragations.  In the requires an inations to coveragations.  In the requires a require a to be expensed to be expensed to the requirements of the requirements.	e axial (radial)  54-ISI-850-06 nese examinal  N4 N acted Angle p'S p'S performed in acted for 10 CFR50.6 n additional citional c	and circumforman and circumforman and the reference of the circumstance of the circums	erential serenced Tenenced Ten	VA / EPRI modeling portable indications.  ameters Scan Surface Blend Radius Blend Radius Vessel  teria of 10 CFR50.5 achieved to the maximum achieved to the maximum achieved to the maximum achieved to the scale equipment.  261/296, 50-327/32 to the weld plus ½ achieved by: adm Canti	Greport the folk  55a (b)(2)(xv)(0  kimum extent point is not addrest the examining volume,  da) and was perfected and was perfected.	lowing additional and the cossible. The cossible of the cossib

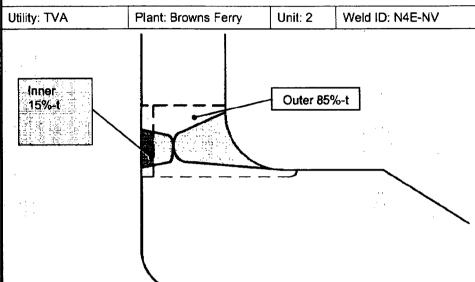


#### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

	tility: TVA Site: Browns Ferry Nuclear Plant Unit: 2 Outage: Cycle 14 RFO  xamination Data Sheet Number: N4ENV-EDS1 ISI Report Number: R178														
			4ENV-EDS1			·	ISI Report N			178					
Compone	ent ID: N	4E-NV			, , , , , , , , , , , , , , , , , , ,		Component	Description:	N4 Nozzle	-to-Ve	essel Wel	d			
100 ( Dec		-b 0 01 HA 0040	0.04.0.101.000	) C 04	Exa		Information	/Dl-			T 1:	Mala	TDC	<u> </u>	
Examinat		nber: 2-CHM-2046 d: ⊠Yes □No	3-6-01, 2-151-026	3-C-U1			ation: Nozzle Boss (Rnozzle) L <sub>c</sub> Location: Nozzle TDC ge Sheet Number(s): N4ENV-CWS1								
Examinat	ion Limite	u. Mies Lino		·		Scan Info		31(S). N4EN	V-CVV31				· · · · · · · · · · · · · · · · · · ·		
Examination	on Procedu	ire: 54-ISI-850-06		Applicable SDC			- <u>-</u>					rface: Oi	D Blend Ra	dius	
Angle/ Mode	Skew	Calibrat	ion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Limit	ted	Record Indicati		Indicat Data Sh		Examiner Initials
40°/s	s -120° N4ENV-CDS1			3/21/07	1535	78°F.	VH-9525	66.0 dB	∐Yes ⊠	No	□Yes	⊠No	N/A		ТВ
40°/s	+120°	N4EN	IV-CDS2	3/21/07	1555	78°F≀	VH-9525	66.0 dB	□Yes ⊠	No	□Yes	⊠No	N/A		ТВ
NA /	N/A		N/A	N/A	N/A	N/A	N/A	N/A	□Yes □	]No	□Yes	□No	/N/A		N/A
NA /	NA / N/A N/A			N/A	N/A	N/A	N/A	N/A	□Yes □	]No	□Yes	□No	N/A		N/A
Examination	on Procedu	ire: 54-ISI-850-06		Applicable SDC	N's: 30-904	4520-000					Scan Su	rface: Ol	O Vessel S	hell	
Angle/ Skew Calibration Sheet #			ion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Lim	ited	Record Indicati		Indicat Data She		Examiner Initials
60°/s	° / s   ±35° to 67°   N4ENV-CDS3		3/21/07	1615	78°F	VH-9525	71.0 <b>dB</b>	☐Yes 🛭	⊠No	□Yes	⊠No	N/A		ТВ	
N/A /	N/A		N/A	N/A	N/A	N/A	N/A	N/A	☐Yes [	□No	, ∐Yes	□No	N/A		N/A
Examination	on Procedu	ire: N-UT-78 revision	n 4	Applicable SDCN's: N/A					Scan Su	rface: Of	D Vessel S	hell			
Angle/ Mode	Zone	Beam Direction	Calibration Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	ain Scan Limited		Scan Limited Recordable Indication(s)		Indicat Data Sh		Examiner Initials
60°/RL	1	⊠Radial □Circ	N4ENV-CDS4	3/21/07	1645	78°F	VH-9525	76.0 dB	⊠Yes [	□No	□Yes	⊠No	N/A		ТВ
60°/RL	2	⊠Radia1 □Circ	N4ENV-CDS5	3/21/07	1722	78°F	VH-9525	78.0 dB	⊠Yes [	□No	∐Yes	⊠No	N/A		ТВ
60°/RL	1	□Radial ⊠Circ	N4ENV-CDS4	3/21/07	1645	78°F	VH-9525	76.0 dB	⊠Yes [	□No	□Yes	⊠No	N/A		ТВ
60°/RL	2	□Radial ⊠Circ	N4ENV-CDS5	3/21/07	1722	78°F	VH-9525	78.0 dB	⊠Yes [	□No	∐Yes	⊠No	N/A		тв
Commen	ts:														
Examiner	Thomas B	rown	<del></del>	Level: II	Date: 3/2	1/07	Examiner: N/A					Lev	el: N/A	Date:	N/A
Signatur	e Vo	JA Rum	<del></del>				Signature:							Date.	
Examiner: Signatur	e:			Level: N/A	Date: N/A	4	Examiner: N/A Signature:					Leve	el: N/A	Date:	N/A
AREVA R			7	Level: III	Date: 4/1	1/07									_
Jignatui	Page 2 of 11														



#### **RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet**



Axial scans are performed with a procedure for the examination of vessel shell welds. This procedure has been demonstrated for detection of flaws located throughout the entire weld thickness. Coverage obtained during axial scans is typically limited due to nozzle configuration.

Coverage Worksheet #: N4ENV-CWS1

ISI Report #: 12/78

In the circumferential scan direction the outer 85%-t is examined with the same vessel procedure as above and typically limited due to nozzle configuration. To achieve additional coverage in the circumferential scan direction a second examination is performed with a procedure demonstrated for nozzle inside-radius UT. This procedure has been demonstrated for detection of flaws in the inner 15%-t only. The nozzle inside-radius technique provides additional coverage since the component is modeled and scanning is performed with several search units from the nozzle blend.

Axial Scans	Circun	nferential Scans
100%-t	Inner 15%-t	Outer 85%-t
Examination Procedure: N-UT-78 Revision 4	Examination Procedure: 54-ISI-850-06	Examination Procedure: N-UT-78 Revision 4
ARequired Examination Volume: 45.02 inches	<sup>D</sup> Inner 15%-t Examination Volume: 5.8 <sup>2</sup> inchs	<sup>G</sup> Outer 85%-t Examination Volume: 39.2 <sup>2</sup> Inches.
60°RL axial scan limited: ⊠Yes □No	ECoverage Obtained by Modeling: 100%	60°RL Outer 85%-t Exam Limited:
Description of Limitation: Nozzle Blend Radius	Inner 15%-t Exam Limited: ☐Yes ☐No	Description of Limitation: Nozzle Blend Radius
<sup>B</sup> Total Axial Volume Achieved: 24.3 <sup>2</sup> inches	Description of Limitation: N/A	HOuter 85-t% Volume Achieved: 11.22inches
	Finner 15%-t Volume Achieved: 5.82inchs	
<sup>c</sup> Percentage of Axial Coverage: 54% / (49%)*  B + A X 100 = C		al Examination Coverage: 38% H) + A X 100 = J
,	Combined Axial and Circumferential Weld	Coverage

'Total Examination Coverage: 44%

 $(C+J) + 2 \times 100 = L$ NOTE: \*Axial scan coverage of 49% includes the insulation support ring limitation. "Total Examination Coverage" of 44% also takes into account this limitation.

Prepared by: Bret Flesner In Thismin

Date: 04/17/07

Reviewed by: Adam Gonti/

Date:04/17/07

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DESCRIPTION , \$\int\_{\bar{\chi}}^{\bar{\chi}}\chi\_{\bar{\chi}} Browns Ferry N4 Nozzle-to-Shell Weld Coverage Plot 178 C 00351 DRAWN BY N4ENV-CPS1 04/17/07 Bret Flesner Nozzle-to-Vessel weld examination coverage for axial (radial) scan Total area of examination volume: 45.0 sq. in. (TVA supplied) Total area of examination volume achieved: 24.3 sq. in. Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned. Insulation Support Ring

Browns Ferry N4 Nozzle-to-Shell Weld Coverage Plot R178 DRAWN BY DATE Bret Flesner 04/17/07 000352 Insulation Support Ring Nozzle-to-Vessel weld examination coverage for circumferential scan Total area of examination volume: 45.0 sq. in. (TVA supplied) Total area of outer 85%-t exam volume achieved: 11.2 sq. in. Total area of inner 15%-t volume: 5.8 sq. in. Total area of inner 15%-t exam volume achieved: 5.8 sq. in. Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned. Inner 15%-t area examined from the blend with Supplement 5 techniques.

	DESCRIPTION			
Α	Browns Ferry	N4 Nozzia-t	o-Shell World Covern	ge Plot
AREVA	DRAWN DY	DATE	TITLE	PACIC
	Grot Flouner	04/17/07	N4ENV-CP63	8 OF 11

Contact can not be maintained on horizontal weld due to weld crown.

This area = 61 eq. in of limitation.

Area to be acanned (yellow area): 1278 aq. in. C 0 0 353 86aq. in. of ilmination = 5% ilmination of redial coverage. (66 / 1278 = 5%)

### Insulation Support Ring Horizontal S 11 50 Regulard scan area to achieve coverage shaded in yellow. 7 25 1278 eq. In. R-Nozzin Wold Pipa IO (Rhore) -10" AND +10" BETWE 14 50

Insulation



### Reactor Pressure Vessel 000354 Manual Ultrasonic Calibration Data Sheet

Jtil	ity: TVA	Site: Brov	wns Ferry	Nuclear	Plant	Unit: 2		Outage: 0	Cycle 14 RFO
Cal	ibration Data Sheet Number:	N4ENV-CDS1		ISI Re	port Nur	mber:	R178	7	
Co	mponent ID: N4E-NV			Comp	onent Des	scription: N4	Nozzle-to-V	essel Weld	
Exa	amination Procedure: 54-ISI-8	350-06		Applica	able SDC	N(s): 30-90	44520-000		
	Ultrasonic Inst	rument				Tra	ansducer		
Ма	nufacture: Staveley		Man	ufacture:	KBA		Model:	Benchmark 89	92-600
Мо	del: Sonic 136		Seria	al Numbe	er: 00X1X	ic	Frequency; 2.25 MHz		
Ser	rial Number: 7031		Size	Size: 0.5" x 1.0"			Shape: Rectangle		
Lin	earity Sheet No.: LDS4	*	# of	# of Elements: 1				uration: Single	·
	Instrument Se	ettings	Refra	acted An	gle: 40°		Measu	red Angle: 40	······································
ш	Range: 15.0" Sound Pa	th □Depth	Skev	Skew Angle: -120° Meas				red Skew Angl	e: -120°
RANGE	Delay: 1.70"	Mode	e: Shear			Radius	: 3.8"		
<u></u>	Velocity: 0.127 in / μS	Cabl	е Туре:	RG-174	Length: 12'	Interme	ediate Connec	tors: 0	
~	Display: Filt2	Display: Filt2					cation Blo	ck	•
RCVR	Frequency: 2.25 MHz	Туре	: CS Ro	S Rompas		S/N: 791413			
	Reject: Off		R	eflector:		1" Radius		2" R	adius
	Pulse Width: 222 nS			Sweep: 0.6 div.		1.3 div		div.	
	Damping: 500 Ω		An	Amplitude: 70 %FSH			80 %	%FSH	
	Mode: ⊠Pulse Echo □□	Dual		Gain: 30.6 dB		30.6 dB			
PULSER	Rep Rate: 2kHz			Basic Calibration Block					
됩	Pulser: ☐150V ☐300V	(*Sonic 137 only)	Bloc	Block ID: BF-18			Material: Clad CS		
	*Pulser voltage adjustable with th	e Sonic 137 instrument of	Thick	Thickness: 6.0" with 0.125" Clad			Diameter: Flat		
	The Sonic 136 has a fix		· •	perature	: 75 °F		Therm. SN: VH-9525		
			Cou	plant: Ult	ragel II		Batch No.:	05325	
		Refe	erence Se	ensitivi	ty Inform	nation			
Ref	flector: ID Notch	Sweep: 5.2 div		Amı	olitude: 80	) %FSH	Gai	n: 58.0 dB	
Cal	In: Date 3/21/07 Time 1450	Check: Date 3/21/07	7 Time 15	34 Che	ck: Date N	N/A Time N/A	A Out	:: Date 03/21/07	Time 1952
			C	Commen	its				
		-							
	aminer: Thomas Brown	Date: 3/21/		Examiner: N/A Signature			Level: N/A	Date: N/A	
	EVA Review Adam Corninature:	)ate: 4/11/	07	Page 7				Page 7 of 11	



### Reactor Pressure Vessel 000355 Manual Ultrasonic Calibration Data Sheet

اtil	ity: +VA	Site: Browns	Ferry Nuc	clear P	lant Unit: 2		Outage: 0	Sycie 14 RFO	
Cal	ibration Data Sheet Number: N	I4ENV-CDS2	I	SI Rep	ort Number:	R/1	8		
Co	mponent ID: N4E-NV.		C	ompo	nent Description: N4	Nozzle-to-Ve	ssel Weld		
Exa	mination Procedure: 54-ISI-85	0-06	Δ	pplical	ole SDCN(s): 30-90	44520-000		<u> </u>	
	Ultrasonic Instr	ument			Tr	ansducer			
Ма	nufacture: Staveley		Manufa	cture: I	KBA	Model: B	enchmark 8	92-600	
Мо	del: Sonic 136		Serial Number: 0111PK			Frequency: 2.25 MHz			
Ser	ial Number: 7031		Size: 0.	5" x 1.0	)"	Shape: f	Rectangle		
Lin	earity Sheet No.: LDS4		# of Elements: 1 Configuration: Single						
	Instrument Set	tings	Refracte	ed Ang	le: 40°	Measure	d Angle: 40°		
ш	Range: 15.0" ⊠Sound Path	□Depth	Skew A	ngle: +	120°	Measure	d Skew Ang	le: +120°	
RANGE	Delay: 1.70"	· · · · · · · · · · · · · · · · · · ·	Mode: 5	Shear	hear Radius: 3.8		3.8"		
~	Velocity: 0.127 in / μS		Cable T	ype: R	G-174 Length: 12'	Intermed	liate Connec	tors: 0	
~	Display: Filt2				Verifi	cation Bloc	k		
RCVR	Frequency: 2.25 MHz		Type: C	S Ron	ıpas	S/N: 791413	3		
	Reject: Off		Refle	Reflector: 1" Radius				2" Radius	
	Pulse Width: 222 nS			Sweep: 0.6 div.			1.3	div.	
	Damping: 500 Ω		Amplitude: 70 %		70 %FSH		80 %	%FSH	
	Mode: ⊠Pulse Echo □Du	ıal	Gain: 30.6 dB		30.6 dB				
PULSER	Rep Rate: 2kHz		Basic Calibration Block						
PUL	Pulser: 150V 300V (*	Sonic 137 only)	Block ID: BF-18			Material: Clad CS			
	*Pulser voltage adjustable with the	Sonic 137 instrument only	Thickness: 6.0" with 0.125" Clad			Diameter: Flat			
	The Sonic 136 has a fixe	-	Temper	ature:	75 °F	Therm. SN: VH-9525			
			Couplar	nt: Ultra	agel II	Batch No.:	05325		
		Referen	ice Sens	itivity	Information				
Re	flector: ID Notch	Sweep: 5.2 div		Ampl	itude: 80 %FSH	Gain	58.0 dB		
Cal	In: Date 3/21/07 Time 1454	Check: Date 3/21/07 Tir	ne 1554	Chec	k: Date N/A Time N/A	A Out: I	Date 3/21/07	Time 1954	
			Con	nment	3				
	aminer: Thomas Brown nature	Level: II Date:	3/21/07	- 1	miner: N/A nature		Level: N/A	Date: N/A	
	EVA Review Adam Conti	Level: III Date:	4/11/07		,			Page 8 of 11	



### Reactor Pressure Vessel 000356 Manual Ultrasonic Calibration Data Sheet

اtili	ty: TVA	Site: Brov	wns Ferry I	Nuclear F	Plant Unit: 2		Outage: C	Cycle 14 RFO	
Cal	ibration Data Sheet Number:	N4ENV-CDS3		ISI Re	port Number:	RI	18		
Cor	nponent ID: N4E-NV			Compo	nent Description: N	4 Nozzle-to-\	essel Weld		
Exa	mination Procedure: 54-ISI-8	350-06		Applica	able SDCN(s): 30-9	044520-000	·-		
	Ultrasonic Inst	rument			Т	ransducer			
Mai	nufacture: Staveley		Mani	ufacture:	KBA	Model:	Benchmark 89	92-600	
Мо	del: Sonic 136		Seria	al Numbe	er: 00X1XB	Freque	Frequency: 2.25 MHz		
Ser	ial Number: 7031		Size	0.5" x 1	.0"	Shape	Shape: Rectangle		
Line	earity Sheet No.: LDS4		# of I	Elements	s: 1	Config	uration: Single		
	Instrument Se	ettings	Refra	acted An	gle: 60°	Measu	red Angle: 59°		
Ш	Range: 20.0" ⊠Sound Pa	th □Depth	Skev	v Angle:	±35° to 67°	Measu	red Skew Angl	e: N/A	
RANGE	Delay: 1.09"		Mode	e: Shear		Radius	s: Flat		
ď	Velocity: 0.127 in / μS			e Type: l	RG-174 Length: 12	' Interm	ediate Connect	ors: 0	
	Display: Filt2				Veri	ication Blo	ck		
RCVR	Frequency: 2.25 MHz		Туре	Type: CS Rompas			S/N: 791413		
	Reject: Off		R	eflector:	1" Radius	3	2" Radius		
	Pulse Width: 222 nS			Sweep: 0.5 div.			1.0	div,	
	Damping: 500 Ω			nplitude:	70 %FSF	ı	80 %	FSH	
	Mode: ⊠Pulse Echo □□	Dual		Gain:	24.6 dB		24.6 dB		
PULSER	Rep Rate: 2kHz			Basic Calibration Block					
PUL	Pulser:	(*Sonic 137 only)	Block	Block ID: BF-18			Material: Clad CS		
	*Pulser voltage adjustable with th	e Sonic 137 instrument o	only. Thick	Thickness: 6.0" with 0.125" Clad			Diameter: Flat		
	The Sonic 136 has a fix			perature:	75 °F	Therm. SN: VH-9525			
			Cour	olant: Ulti	ragel II	Batch No.	05325		
		Refe	rence Se	ensitivit	y Information				
Ref	lector: ID Notch	Sweep: 5.8 div		Amp	olitude: 80 %FSH	Ga	in: 64.6 dB		
Cal	In: Date 3/21/07 Time 1500	Check: Date 3/21/07	Time 16	14 Che	ck: Date N/A Time N	/A Ou	t: Date 3/21/07	Time 1956	
			C	ommen	ts				
	miner: Thomas Brown	 Pate: 3/21/0	II	Examiner: N/A Le Signature			Date: N/A		
	EVA Review Adam Continuature.	Level: III D	Pate: 4/11/0	07	Page 9				



## Reactor Pressure Vessel 000357 Manual Ultrasonic Calibration Data Sheet

	ity; IVA	and Browns	Ferry Nucl	<b>.</b>	Unit: 2		Outage.	Cycle 14 RFO	
Cal	ibration Data Sheet Number: N4EN	V-CDS4	. ISI	Report Nui	mber:	R/	78		
Col	mponent ID: N4E-NV		Component Description: N4 Nozzle-to-Vessel Weld						
Exa	amination Procedure: N-UT-78 Revi	ision 4	Ap	plicable SD	CN(s): N/A	· ·			
	Ultrasonic Instrume	nt	T	Transducer					
Manufacture: Staveley				Manufacture: RTD			Model: TRL2-ST		
Model: Sonic 136				Serial Number: 07-304			Frequency: 2 MHz		
Serial Number: 7031			Angle: 60°			Measur	Measured Angle: 61°		
Line	earity Sheet No.: LDS4		Mode: Re	Mode: Refracted Longitudinal			Size: 2(24x42)mm		
	Instrument Settings	<b>S</b>	Focus: F	3~125mm	-	Squint /	Squint Angle: 5°		
111	Range: 8.00" Sound Path	]Depth	# of Elements: 2 Shape: Rect.			t. Configu	ration: Dual	- SBS	
RANGE	Delay: 1.38"		Cable Type: RG-174 Length: 12'		2' Interme	diate Connec	tors: 0		
α.	Velocity: 0.230 in / μS	-			Verifi	cation Bloc	k		
	Display: Filt 2		Type: CS	ype: CS Rompas		S/N: 791413			
RCVR	Frequency: 2.25 MHz		Reflec	tor:	1" Radius	2" Radius		adius	
	Reject: Off		Swe	ер:	ep: 1.2 div.		2.5	div.	
	Pulse Width: 222 nS		Amplitu	Amplitude: 25 %FSH			80 %FSH		
ſ	Damping: 500 Ω		G	ain:	n: 52.0 dB		52.	52.0 dB	
œ	Mode: □Pulse Echo ☑Dual		Basic Calibration Block						
PULSER	Rep Rate: 2kHz		Block ID: BF-18			Material: Cl	Material: Clad CS		
颪	Pulser: 150V 300V (*Sonic t	37 only)	Thickness: 6.0" with 0.125" Clad			Diameter: Flat			
	*Probe voltage is adjustable with the Sonic		Temperature: 75 °F			Therm. SN: VH-9525			
	Sonic 136 has a fixed pulser v	voltage.	Couplant: Ultragel II			Batch No.: 05325			
		Referen	ce Sensit	ivity Infor	mation				
Ref	lector: 1/4-t SDH	Sweep: 3.8 div		Amplitud	de: 80 %FSH		Gain: 58.4 dl	3	
Cal	In: Date 3/21/07 Time 1505	Check: Date 3/21/07	7 Time 164	4 Check: [	Date N/A Time	e N/A	Out: Date 3/2	1/07 Time 1958	
Zon	e 1 - Near Surface calibration.		Comn	nents					
	miner: Thomas Brown	Level: II Date:	3/21/07	Examiner: N Signature	N/A		Level: N/A	Date: N/A	
	Telure 12 am Conti	Level: III Date:	4/11/07					Page 10 of 11	



### Reactor Pressure Vessel 000358 Manual Ultrasonic Calibration Data Sheet

til	ity: TVA	Site: Brow	ns Ferry N	uclear	Plant	Unit: 2		Outage: 0	Cycle 14 RFO	
Cal	ibration Data Sheet Number: N4E	NV-CD\$5		ISI Re	port Nur	mber:	R178	3	*	
Co	mponent ID: N4E-NV			Compo	onent De	escription: N4	Nozzle-to-V	/essel Weld.		
Exa	amination Procedure: N-UT-78 Re	vision 4		Applica	able SD0	CN(s): N/A				
	Ultrasonic Instrum	ent				Tra	ansducer			
Ма	nufacture: Staveley		Manut	acture:	RTD		Model	TRL2-ST		
Мо	del: Sonic 136		Serial	Numbe	er: 07-30	4	Freque	ency: 2 MHz		
Ser	ial Number: 7031		Angle	: 60°			Measu	red Angle: 61°		
Lin	earity Sheet No.: LDS4		Mode:	Refrac	ted Long	gitudinal	Size: 2	(24x42)mm		
	Instrument Setting	gs	Focus	: FS~1	25mm		Squint	Angle: 5°		
u u	Range: 18.0" Sound Path	Depth	# of E	lements	s: 2	Shape: Rec	. Config	uration: Dual -	SBS	
RANGE	Delay: 1.38"		Cable	Type: I	RG-174	Length: 1	2' Interm	ediate Connect	tors: 0	
ц.	Velocity: 0.230 in / µS					Verifi	cation Blo	ck		
	Display: Filt 2		Type:	CS Ro	mpas		S/N: 7914	13		
RCVR	Frequency: 2,25 MHz		Re	flector:		1" Radius		2" R	adius	
	Reject: Off		s	weep:		0.5 div.		1.1	div.	
	Pulse Width: 222 nS		Amp	olitude:		25 %FSH		80 %	FSH	
	Damping: 500 Ω			Gain:		52.0 dB		52.0	0 dB	
ď	Mode: □Pulse Echo □Dual					Basic Ca	libration	Block	A1"	
PULSER	Rep Rate: 2kHz		Block	Block ID: BF-18 M			Material: 0	faterial: Clad CS		
۵	Pulser: 150V 300V (*Sonic	: 137 only)	Thickr	ness: 6.	0" with 0	).125" Clad	Diameter:	Diameter: Flat		
	*Probe voltage is adjustable with the Son		Temp	Temperature: 75 °F T			Therm. SN	Therm. SN: VH-9525		
	Sonic 136 has a fixed pulse	r voltage.	Coupl	ant: Ult	ragel II		Batch No.	05325		
		Refer	ence Ser	rsitivit	y Infor	mation		,		
Re	flector: ID Notch	Sweep: 6.3 div			Amplitue	de: 80 %FSH		Gain: 73.2 dE	3	
Cal	In: Date 3/21/07 Time 1507	Check: Date 3/21	1/07 Time	1721	Check: [	Date N/A Time	e N/A	Out: Date 3/21	1/07 Time 2000	
			Co	mmer	ıts					
Zor	ne 2 - Full Volume calibration.									
			-							
L .	aminer: Thomas Brown	Level: II Da	ate: 3/21/07		aminer: I gnature	N/A		Level: N/A	Date: N/A	
	EVA Review Adam Conti h	Level: III Da	ate: 4/11/07	7					Page 11 of 11	

## Examination Report, R-179 N4F-NV, RPV Nozzle-To-Head Weld

			K
A	R	Ε	VA

#### RPV Nozzle Ultrasonic Examination Summary Sheet

0003**59** 

Jtility: TVA	Site	e: Browns F	erry Nuclear Pl	ant	Unit: 2	Outage: Cycle 14	ISI Report	#: <i>R179</i>
Component Num	ber: N4F-	NV	Component I	Component Description: N4 Nozzle to Vessel Weld			System: R	PV
Code Category: I	B-D	· · · · · · · · · · · · · · · · · · ·	Code Item: B3.90			Code Class: 1	Material: C	S
SO / Drawing(s)	: 2-CHM-2	2046-C-01 8	\$ 2-ISI-0269-C-	-01				
Procedure Nu	mber	Proced	dure Revision		SDCN	Pro	ocedure Misc. I	Info
N-UT-78			4 NA		Revision 11 of the PDI-UT-6 qualified equipment table			
N-UT-79	-, ·		1 06 30-90		NA 044520-000	Revision 5 of the PDI-UT-7 qualified equipment table		
54-ISI-85	0					Modeling Report: IR-2003-19, Section 5		
	Calibrati	on Sheets		•	am Data	Indication Data	Exa	m Results
N4FNV-CDS1					Sheets NV-EDS1	Sheets		able Indications
N4FNV-CDS1	<del> </del>			1141	INV-LUO!			e Flaw Indications
					··· •	-		e flaw evaluation) e Flaw Indications
N4FNV-CDS3								ble flaw evaluation)
N4FNV-CDS4 N4FNV-CDS5							<u> </u>	•
Summary:	I				<del></del>			
rom the vessel eportable indicent accordance v	surface ations.	in both the	e axial (radial) 54-ISI-850-06	and circuit	mferential s eferenced T	can directions. The	g report the fo	
eportable indic	surface ations.	in both the	e axial (radial) 54-ISI-850-06 ese examinal	and circuit and the retions resul	mferential s eferenced T ted in no re	van directions. The	g report the fo	
rom the vessel reportable indic n accordance v	surface cations. with UT presented	in both the procedure to prmed. Th	e axial (radial) 54-ISI-850-06 lese examinal	and circuit and the retions result	mferential s eferenced T ted in no re	van directions. The VA / EPRI modeling portable indications.	g report the fo	
rom the vessel reportable indic n accordance v	surface cations. with UT presented	in both the procedure to crimed. The Probe Refra	e axial (radial) 54-ISI-850-06 nese examinat N4 N acted Angle	and circuit and the retions resultions Probe S	mferential s eferenced T ted in no re deling Para	VA / EPRI modeling cortable indications.  ameters Scan Surface	g report the fo	
rom the vessel reportable indic n accordance v	surface cations. with UT presented	orocedure to comed. The Probe Refra	e axial (radial) 54-ISI-850-06 lese examinal N4 N acted Angle	and circuit and the reliions result Nozzle Mo Probe S -120°	eferential s eferenced T ted in no re deling Para	VA / EPRI modeling cortable indications.  ameters Scan Surface Blend Radius	g report the fo	
rom the vessel reportable indic n accordance v	surface cations. with UT presented	in both the procedure to crimed. The Probe Refra	e axial (radial) 54-ISI-850-06 lese examinal  N4 N acted Angle "S	and circuit and the retions resultions Probe S	eferential s eferenced T ted in no re deling Para kew	VA / EPRI modeling cortable indications.  ameters Scan Surface	g report the fo	
rom the vessel eportable indices of accordance was a minations with the control of the control o	examinarage requocedure por RL exam.	procedure to probe Refra 40 40 60 tion was puirements or requires arminations to coverage	e axial (radial) 54-ISI-850-06 nese examinate N4 Nacted Angle 1°S 1°S 1°S 1°S 1°S 10 CFR50.5 11 additional ci were limited of	and circuitions resultions resultions resultions resulting the second resulting	eferenced T ted in no re  deling Para kew  7°)  with the cri xv)(K) was tial scan of nozzle conf	VA / EPRI modeling cortable indications.  ameters Scan Surface Blend Radius Blend Radius	g report the fo	llowing additional  G) and the possible. The ressed in 10CFR hination volume
rom the vessel eportable indices of accordance was a minations with the coverage, and severage, and	examina rage requocedure or RL examina scan limiton satisfic	procedure to procedure to coverage tations.	e axial (radial)  54-ISI-850-06 hese examinat  N4 N acted Angle PS PS erformed in acted 10 CFR50.9 n additional city were limited to ge sketch(s) actions of A	and circuitions resultions resultions resultions resulting resulti	referential s referenced T ted in no referenced T ted in no referenced T deling Para kew 7°) with the cri xv)(K) was tial scan of nozzle confineet for a det	VA / EPRI modeling portable indications.  The Scan Surface Blend Radius Blend Radius Vessel  teria of 10 CFR50.5 achieved to the matthe outer 85%-t which iguration which redusescription of the scan 1 thru 2003 Addender.	g report the fo	G) and the possible. The essed in 10CFR hination volume, examination
This ultrasonic minimum cover examination processes and state of the coverage, and state of the coverage, and state of the coverage of the cov	examina rage requocedure or Scan limiton satisfic XI, Appe	procedure to procedure to coverage tations.  es the request for Relief to Relief	e axial (radial)  54-ISI-850-06 hese examinate  N4 N acted Angle PS PS erformed in acted 10 CFR50.9 n additional city were limited to ge sketch(s) actional properties of Aualified persons of PDI-1 and Pi	and circuitions resultions resultions resultions resulting the second resulting the second resulting the second resulting to the second resulting to the second resulting to the second resulting the second resulting resulting the second resulting resulting the second resulting	referential s referenced T ted in no referenced T ted in no referenced T deling Para kew 7°) with the cri xv)(K) was tial scan of nozzle confineet for a delication XI (200 edures, and kets No. 50	VA / EPRI modeling portable indications.  The Scan Surface Blend Radius Blend Radius Vessel  teria of 10 CFR50.5 achieved to the matthe outer 85%-t which iguration which redusescription of the scan 1 thru 2003 Addender.	g report the fo	G) and the possible. The essed in 10CFR hination volume, examination erformed using
This ultrasonic minimum cover examination processes and state of the coverage, and state of the coverage, and state of the coverage of the cov	examina rage requocedure scan limiton satisfic XI, Apped the are	procedure to procedure to coverage tations.  es the request to to Relief to the extendity of the extendity o	e axial (radial) 54-ISI-850-06 hese examinat  N4 N acted Angle PS PS erformed in acted 10 CFR50.9 n additional city were limited to ge sketch(s) actional personal in the control of the c	and circuitions resultions resultions resultions resulting the second resulting the second resulting the second resulting to the second resulting to the second resulting to the second resulting the second resulting resulting the second resulting resulting the second resulting	referential s referenced T ted in no referenced T ted in no referenced T ted in no referenced T deling Para kew 7°)  with the cri xv)(K) was tial scan of nozzle confineet for a delication XI (200 edures, and kets No. 50- (a) and (b)	VA / EPRI modeling portable indications.  The Scan Surface Blend Radius Blend Radius Vessel  teria of 10 CFR50.5 achieved to the main the outer 85%-t which iguration which reduscription of the scan equipment.  261/296, 50-327/32 to the weld plus ½ and by: Astern Continued to the weld plus ½ and by: Astern Continued to the weld plus ½ and by: Astern Continued to the weld plus ½ and by: Astern Continued to the weld plus ½ and by: Astern Continued to the weld plus ½ and by: Astern Continued to the weld plus ½ and by: Astern Continued to the weld plus ½ and by: Astern Continued to the weld plus ½ and by: Astern Continued to the weld plus ½ and by: Astern Continued to the weld plus ½ and by: Astern Continued to the weld b	g report the fo	G) and the possible. The essed in 10CFR hination volume, examination erformed using

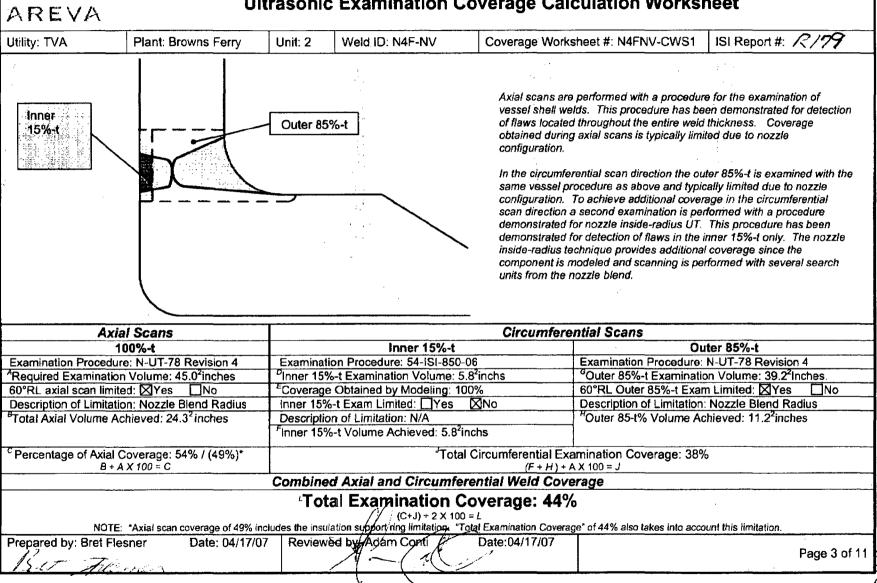


### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

Utility: T\						Plant										
	ramination Data Sheet Number: N4FNV-EDS1							ISI Report Number: R/79 Component Description: N4 Nozzle-to-Vessel Weld								
Compone	ent ID: N	14F-N	<u>//</u>				11.		Description:	N4 Noz	zle-to-Ve	essei We	ld			
						Exa		Information	<del></del>			<del> </del>		<del></del>	_	
				-C-01, 2-ISI-02	69-C-01	······································	W <sub>2</sub> Loc	cation: Nozzle Bo	ss (Rnozzie)	( 0) ( ( )	Lo	Location	: Nozzle	IDC		
Examinat	tion Limite	ea: 🗵	∐Yes □No					ige Sheet Numbe	er(s): N4FNV	r-CVV51						
					<del></del>		Scan Info	ormation				<sub>1</sub>		- 2		
	on Proced	ure: 5	4-ISI-850-06		Applicable SD0	CN's: 30-904	4520-000					Scan Su	rface: O[	D Blend Ra		
Angle/ Mode	Skew	:	Calibrati	on Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	imited	Recon Indicat		Indicat Data Sh		Examiner Initials
40°/s	-120°		N4FN	V-CDS1	3/21/07	1755	, 78°F	VH-9525	66.0 dB	□Yes	⊠No	□Yes	⊠No	N/A	A.	тв
40°/s	+120°		N4FN	V-CDS2	3/21/07	1814	78°F	VH-9525	66.0 dB	□Yes	⊠No	☐Yes	⊠No	, N/A	1	ТВ
NA /	N/A	-	ŀ	N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A	1	N/A
NA/	N/A	- 1	ì	N/A	N/A	N/A	.N/A	N/A	N/A	·∐Yes	□No	□Yes	□No	N/A	4	N/A
Examinati	on Proced	ure: 5	54-ISI-850-06		Applicable SD	CN's: 30-904	4520-000					Scan Su	ırface: Oi	O Vessel S	Shell	
Angle/ Mode	Skew	Ì	Calibrati	on Sheet#	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan I	imited	Recor Indicat		Indicat Data Sh		Examiner Initials
60°/s	±35° to 6	57°	N4FN	V-CDS3	3/21/07	1832	78°F	VH-9525	71.0 dB	□Yes	⊠No	□Yes	⊠No	N/A	1	TB
N/A /	N/A		<u>.</u>	N/A	N/A	N/A	N/A	N/A	N/A	⊡Yes	□No	□Yes	□No	N/A	+	N/A
	on Proced	lure: N	N-UT-78 revision	1 4	Applicable SD	CN's: N/A						Scan Su	ırface: Ol	O Vessel S	Shell	
	on Proced Zone	<del>.</del>	N-UT-78 revision	Calibration Sheet #	Applicable SD	CN's: N/A Time	Temp	Thermometer S/N:	Scan Gain	Scan I	Limited	Scan Su Recor Indicat	dable	O Vessel S Indica Data Sh	tion :	Examiner Initials
Examinati Angle/	i	Ве		Calibration	· · · · · · · · · · · · · · · · · · ·		Temp 78°F		Scan Gain 76.0 dB	Scan I ⊠Yes		Recor	dable ion(s)	Indica	tion neet #	
Examinati Angle/ Mode	Zone	Be	am Direction	Calibration Sheet #	Date	Time	<u>,                                      </u>	S/N:			□No	Recor Indicat	dable ion(s) ⊠No	Indica Data Sh	tion neet #	Initials
Examinati Angle/ Mode 60°/RL	Zone 1	Be ⊠F	eam Direction	Calibration Sheet # N4FNV-CDS4	Date 3/21/07	Time 1903	78°F	S/N: VH-9525	76.0 dB	⊠Yes	□No	Recor Indicat	dable tion(s) ⊠No ⊠No	Indica Data Sh N/A	tion neet #	tnitials TB
Examinati Angle/ Mode 60°/RL 60°/RL	Zone 1 2	Be ⊠F	eam Direction  Radial □Circ  Radial □Circ	Calibration Sheet # N4FNV-CDS4 N4FNV-CDS5	Date 3/21/07 3/21/07	Time 1903 1936	78°F	S/N: VH-9525 VH-9525	76.0 dB 78.0 dB	⊠Yes ⊠Yes	□No □No □No	Recording Indicated Press Pres	dable ion(s)  No  No	Indica Data Sh N/A	tion neet #	tnitials TB TB
Examinati Angle/ Mode 60°/RL 60°/RL	Zone 1 2 1 2	Be ⊠F	eam Direction Radial □Circ Radial □Circ Radial □Circ	Calibration Sheet # N4FNV-CDS4 N4FNV-CDS5 N4FNV-CDS4	3/21/07 3/21/07 3/21/07	Time 1903 1936 1903	78°F 78°F 78°F	S/N: VH-9525 VH-9525 VH-9525	76.0 dB 78.0 dB 76.0 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recording Indicated Press Pres	dable ion(s)  No  No	Indica Data Sh N/A N/A	tion neet #	Initials TB TB TB
Examinati Angle/ Mode 60°/RL 60°/RL 60°/RL	Zone 1 2 1 2	Be ⊠F	eam Direction Radial □Circ Radial □Circ Radial □Circ	Calibration Sheet # N4FNV-CDS4 N4FNV-CDS5 N4FNV-CDS4	3/21/07 3/21/07 3/21/07	Time 1903 1936 1903	78°F 78°F 78°F	S/N: VH-9525 VH-9525 VH-9525	76.0 dB 78.0 dB 76.0 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recording Indicated Press Pres	dable ion(s)  No  No	Indica Data Sh N/A N/A	tion neet #	Initials TB TB TB
Examinati Angle/ Mode 60°/RL 60°/RL 60°/RL	Zone 1 2 1 2	Be ⊠F	eam Direction Radial □Circ Radial □Circ Radial □Circ	Calibration Sheet # N4FNV-CDS4 N4FNV-CDS5 N4FNV-CDS4	3/21/07 3/21/07 3/21/07	Time 1903 1936 1903	78°F 78°F 78°F	S/N: VH-9525 VH-9525 VH-9525	76.0 dB 78.0 dB 76.0 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recording Indicated Press Pres	dable ion(s)  No  No	Indica Data Sh N/A N/A	tion neet #	Initials TB TB TB
Examinati Angle/ Mode 60°/RL 60°/RL 60°/RL	Zone 1 2 1 2	Be ⊠F	eam Direction Radial □Circ Radial □Circ Radial □Circ	Calibration Sheet # N4FNV-CDS4 N4FNV-CDS5 N4FNV-CDS4	3/21/07 3/21/07 3/21/07	Time 1903 1936 1903	78°F 78°F 78°F	S/N: VH-9525 VH-9525 VH-9525	76.0 dB 78.0 dB 76.0 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recording Indicated Press Pres	dable ion(s)  No  No	Indica Data Sh N/A N/A	tion neet #	Initials TB TB TB
Examinati Angle/ Mode 60°/RL 60°/RL 60°/RL	Zone 1 2 1 2	Be ⊠F	eam Direction Radial □Circ Radial □Circ Radial □Circ	Calibration Sheet # N4FNV-CDS4 N4FNV-CDS5 N4FNV-CDS4	3/21/07 3/21/07 3/21/07	Time 1903 1936 1903 1936	78°F 78°F 78°F 78°F	S/N: VH-9525 VH-9525 VH-9525	76.0 dB 78.0 dB 76.0 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recording Indicated Press Pres	dable ion(s)  No  No	Indica Data Sh N/A N/A	tion neet #	Initials TB TB TB
Examinati Angle/ Mode 60°/RL 60°/RL 60°/RL Commen	Zone  1 2 1 2 nts:	Be SF	eam Direction Radial □Circ Radial □Circ Radial ⊠Circ Radial ⊠Circ	Calibration Sheet # N4FNV-CDS4 N4FNV-CDS5 N4FNV-CDS4	3/21/07 3/21/07 3/21/07	Time 1903 1936 1903	78°F 78°F 78°F 78°F	S/N: VH-9525 VH-9525 VH-9525 VH-9525	76.0 dB 78.0 dB 76.0 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recording Indicated Press Pres	dable ion(s)  No No	Indica Data Sh N/A N/A	tion neet #	TB TB TB
Examinati Angle/ Mode 60°/RL 60°/RL 60°/RL Commen	Zone  1 2 1 2 nts:	Be SF	eam Direction Radial □Circ Radial □Circ Radial ⊠Circ Radial ⊠Circ	Calibration Sheet # N4FNV-CDS4 N4FNV-CDS5 N4FNV-CDS4	Date 3/21/07 3/21/07 3/21/07 3/21/07	Time 1903 1936 1903 1936 Date: 3/4	78°F 78°F 78°F 78°F	S/N: VH-9525 VH-9525 VH-9525 VH-9525 Examiner: N/A Signature:	76.0 dB 78.0 dB 76.0 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recording Indicated Press Pres	dable ion(s)  No No No No Levi	Indica Data Sh N/A N/A N/A	tion neet #	TB TB TB TB
Examinati Angle/ Mode 60°/RL 60°/RL 60°/RL Commen	Zone  1 2 1 2 nts:	Be SF	eam Direction Radial □Circ Radial □Circ Radial ⊠Circ Radial ⊠Circ	Calibration Sheet # N4FNV-CDS4 N4FNV-CDS5 N4FNV-CDS4	Date 3/21/07 3/21/07 3/21/07 3/21/07	Time 1903 1936 1903 1936	78°F 78°F 78°F 78°F	S/N: VH-9525 VH-9525 VH-9525 VH-9525  VH-9525  Examiner: N/A Signature: Examiner: N/A	76.0 dB 78.0 dB 76.0 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recording Indicated Press Pres	dable ion(s)  No No No No Levi	Indica Data Sh N/A N/A N/A	tion neet #	TB TB TB TB
Examinati Angle/ Mode 60°/RL 60°/RL 60°/RL Commen	Zone  1 2 1 2 nts:	Be SF	eam Direction Radial □Circ Radial □Circ Radial □Circ Radial □Circ	Calibration Sheet # N4FNV-CDS4 N4FNV-CDS5 N4FNV-CDS4	Date  3/21/07  3/21/07  3/21/07  3/21/07  Level: II  Level: N/A	Time 1903 1936 1903 1936 Date: 3/2	78°F 78°F 78°F 78°F	S/N: VH-9525 VH-9525 VH-9525 VH-9525 Examiner: N/A Signature:	76.0 dB 78.0 dB 76.0 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recording Indicated Press Pres	dable ion(s)  No No No No Levi	Indica Data Sh N/A N/A N/A	tion neet #	TB TB TB TB
Examinati Angle/ Mode 60°/RL 60°/RL 60°/RL Comment Examiner: Signatur Examiner: Signatur AREVA R	Zone  1 2 1 2 nts:	Be SF	eam Direction Radial □Circ Radial □Circ Radial □Circ Radial □Circ	Calibration Sheet # N4FNV-CDS4 N4FNV-CDS5 N4FNV-CDS4	Date 3/21/07 3/21/07 3/21/07 3/21/07	Time 1903 1936 1903 1936 Date: 3/4	78°F 78°F 78°F 78°F	S/N: VH-9525 VH-9525 VH-9525 VH-9525  VH-9525  Examiner: N/A Signature: Examiner: N/A	76.0 dB 78.0 dB 76.0 dB	⊠Yes ⊠Yes ⊠Yes	□No □No □No	Recording Indicated Press Pres	dable ion(s)  No No No No Levi	Indica Data Sh N/A N/A N/A	tion neet #	TB TB TB TB



## RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet



Browns Ferry N4 Nozzie-to-Shell Weld Coverage Plot DRAWN BY N4FNV-CPS1 04/17/07 **Bret Flesner** 000362 Nozzle-to-Vessel weld examination coverage for axial (radial) scan Total area of examination volume: 45.0 sq. in. (TVA supplied) . Total area of examination volume achieved: 24.3 sq. in. Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned. Insulation Support Ring

DESCRIPTION A AREVA Browns Ferry N4 Nozzjo-to-Shall Wold Coverage Plat R179 DREWH BY 04/17/07 Brat Flagner 000363 Insulation Support Ring Nozzle-to-Vessel weld examination coverage for circumferential scan Total area of examination volume: 45.0 sq. in, (TVA supplied) Total area of outer 65%-t exam volume achieved: 11,2 sq. in. Total area of Inner 15%-t volume: 5.8 aq. in. Total area of inner 15%-t exam volume achieved; 5.8 sq. in. Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accossible surface scanned. Inner 15%-t area examined from the blend with Supplement 5 techniques.

DESCRIPTION
Browns Ferry N4 Nozzle-to-Shell Weld Coverage Plot
DRAWN BY
DATE TITLE PAGE
Bret Flesner 04/17/07 N4FNV-CPS3 6 0F 11

Contact can not be maintained on horizontal weld due to weld crown. This area  $\approx$  61 sq. in. of limitation.

Area to be scanned (yellow area): 1278 sq. in. 66sq. in. of limitation = 5% limitation of radial coverage. (66 / 1278 = 5%)

## Insulation Support Ring .09 **RPV Horizontal Shell Weld** 11.50 Required scan area to achieve 7.25 coverage shaded in yellow. 1278 sq. in. 14.90 R-Nozzle Weld Pipe ID (Rhore) Transducer with 0" -10" and +10" skews 14.50

#### Insulation

60° RL



# Reactor Pressure Vessel 600365 Manual Ultrasonic Calibration Data Sheet

Jtil	ity: TVA	Site: Brov	vns Ferr	y Nucle	ear Plant	Unit: 2		Outag	e: (	Cycle 14 RFO
Calibration Data Sheet Number: N4FNV-CDS1				ISI Report Number: RIM  Component Description: N4 Nozzle-to-Vessel Weld						
Co	nponent ID: N4F-NV			Co	mponent Des	scription: N4	Nozzle-	to-Vessel Weld	l	
Exa	mination Procedure: 54-ISI-	850-06		Ар	plicable SDC	N(s): 30-90	44520-0	00		
	Ultrasonic Insi	trument				Tr	ansduc	er		
Ма	nufacture: Staveley		Ма	anufact	ure: KBA		Мо	del: Benchmar	k 89	92-600
Мо	del: Sonic 136		Se	rial Nu	mber: 00X1X	.c	Fre	quency: 2.25	ЛΗ2	<u></u>
Ser	ial Number: 7031		Siz	ze: 0.5"	' x 1.0"		Sha	ape: Rectangle		
Line	earity Sheet No.: LDS4	# c	of Elem	ents: 1		Cor	nfiguration: Sin	gle		
	Instrument So	ettings	Re	fracted	l Angle: 40°		Me	asured Angle:	40	0
	Range: 15.0" Sound Pa	th Depth	Sk	ew Ang	gle: -120°		Ме	asured Skew A	ng	le: -120°
RANGE	Delay: 1.70"		Мо	ode: Sh	near ·		Rad	dius: 3.8"	• • • •	
α	Velocity: 0.127 in / µS		Ca	ble Ty	pe: RG-174	Length: 12'	Inte	ermediate Con	nec	tors: 0
	Display: Filt2	-				Verifi	cation I	Block		
RCVR	Frequency: 2.25 MHz		Ту	pe: CS	Rompas	<u></u>	S/N: 79	91413		
	Reject: Off			Reflèc	tor:	1" Radius		2	"R	adius
	Pulse Width: 222 nS			Swe	ер:	0.6 div.	<del></del>		1.3	div.
	Damping: 500 Ω		7	Amplitu	ide:	70 %FSH		8	0 %	6FSH
	Mode: ⊠Pulse Echo □[	Dual		G	ain:	30.6 dB			30.0	6 dB
PULSER	Rep Rate: 2kHz					Basic Ca	libratio	on Block		
PUL	Pulser: ☐150V ☐300V	(*Sonic 137 only)	Bic	ock ID:	BF-18		Materia	al: Clad CS		
	*Pulser voltage adjustable with th	e Sonic 137 instrument o	nly. Thi	icknes	s: 6.0" with 0.	125" Clad	Diamet	ter: Flat		
	The Sonic 136 has a fix	ked pulser voltage.	Te	mperat	ture: 75 °F		Therm.	. SN: VH-9525		
			Co	uplant:	Ultragel II		Batch I	No.: 05325		
		Refe	rence \$	Sensit	tivity Inform	nation				
Ref	lector: ID Notch	Sweep: 5.2 div			Amplitude: 80	) %F\$H		Gain: 58.0 dB		
Cal	In: Date 3/21/07 Time 1450	Check: Date 3/21/07	Time 17	754	Check: Date N	N/A Time N/A	١	Out: Date 03/2	1/07	7 Time 1952
				Com	nents					
					•					
Examiner: Thomas Brown Signature: 1  Date:				1/07	/07 Examiner: N/A Signature			Level: N	/A	Date: N/A
AR	Signature: 1 D Bus				Signature 4/11/07			Page 7 of 11		



# Reactor Pressure Vessel 000366 Manual Ultrasonic Calibration Data Sheet

Utii	ity: TVA	Site: Bro	wns Ferry	Nuclear	Plant Unit: 2		Outage: C	cycle 14 RFO
Ca	ibration Data Sheet Number:	N4FNV-CD\$2		ISI Re	port Number:	R179		
Co	mponent ID: N4F-NV			Compo	onent Description: N4	Nozzle-to-	Vessel Weld	
Exa	amination Procedure: 54-ISI-8	350-06		Applic	able SDCN(s): 30-90	44520-000		
	Ultrasonic Inst	rument			Tr	ansducer	,	<u> </u>
Ma	nufacture: Staveley		Man	ufacture:	KBA	Mode	l: Benchmark 89	92-600
Мо	del: Sonic 136		Seria	al Numbe	er: 0111PK	Frequ	ency: 2.25 MHz	
Sei	ial Number: 7031		Size	: 0.5" x 1	.0"	Shape	e: Rectangle	
Lin	earity Sheet No.: LDS4		# of	Element	s: 1	Config	guration: Single	
	Instrument Se	ettings	Refr	acted An	gle: 40°	Meas	ured Angle: 40°	
ш	Range: 15.0" ⊠Sound Pa	th □Depth	Skev	v Angle:	+120°	Meas	ured Skew Angl	e: +120°
RANGE	Delay: 1.70"	the second	Mode	e: Shear		Radiu	s: 3.8"	
<u> </u>	Velocity: 0.127 in / μS		Cabl	е Туре:	RG-174 Length: 12'	Intern	nediate Connect	tors: 0
	Display: Filt2				Verifi	cation Bk	ock	
RCVR	Frequency: 2.25 MHz		Туре	: CS Ro	mpas	S/N: 7914	413	
_	Reject: Off		R	eflector:	1" Radius		2" R	adius
	Pulse Width: 222 nS			Sweep:	0.6 div.		1.3	div.
	Damping: 500 Ω		An	nplitude:	70 %FSH		80 %	FSH
	Mode: ⊠Pulse Echo □□	Dual		Gain:	30.6 dB		30.6	3 dB
PULSER	Rep Rate: 2kHz				Basic C	alibration	Block	
ĭ	Pulser: 150V 300V	(*Sonic 137 only)	Bloc	k ID: BF-	18	Material:	Clad CS	
	*Pulser voltage adjustable with th	e Sonic 137 instrument	Thick	kness: 6	0" with 0.125" Clad	Diameter	: Flat	
	The Sonic 136 has a fix			perature	: 75 °F	Therm. S	N: VH-9525	
			Cou	plant: Ult	ragel II	Batch No	.: 05325	
		Ref	erence Se	ensitivi	ty Information			
₹e	flector: ID Notch	Sweep: 5.2 div		Amı	olitude: 80 %FSH	Ga	ain: 58.0 dB	
Cal	In: Date 3/21/07 Time 1454	Check: Date 3/21/0	7 Time 18	13 Che	ck: Date N/A Time N/A	A OI	ut: Date 3/21/07	Time 1954
		··	C	ommen	ts		- <del></del>	
								I _
	aminer: Thomas Brown nature: Vorlar D. B.	Level: II	Date: 3/21/0		aminer: N/A gnature		Level: N/A	Date: N/A
AR Sig	EVA Review Adam Cordi nature: Law (2011)	Level: III	Date: 4/11/0	07				Page 8 of



# Reactor Pressure Vessel 000367 Manual Ultrasonic Calibration Data Sheet

⊅til	ity: ⊤VA	Site: E	Browns Fern	y Nuclear	Plant	Unit: 2		Outage: 0	Cycle 14 RFO		
Cal	ibration Data Sheet Number:	N4FNV-CDS3		ISI R	eport Nur	nber:	R179	1			
Cor	mponent ID: N4F-NV			Comp	onent Des	scription: N4	Nozzle-to-V	essel Weld			
Exa	amination Procedure: 54-ISI-	350-06		Applic	able SDC	N(s): 30-90	44520-000				
	Ultrasonic Inst	rument				Tr	ansducer				
Mai	nufacture: Staveley		Ма	nufacture	: KBA		Model:	Benchmark 89	92-600		
Мо	del: Sonic 136		Se	Serial Number: 00X1XB				Frequency: 2.25 MHz			
Ser	rial Number: 7031	Siz	Size: 0.5" x 1.0"				Rectangle				
Line	earity Sheet No.: LDS4	# 0	f Elemen	s: 1		Configu	ıration: Single				
	Instrument Se	ettings	Re	fracted A	ngle: 60°	·	Measu	ed Angle: 59°	·		
111	Range: 20.0" Sound Pa	th Depth	Ske	ew Angle:	±35° to 6	7°	Measu	ed Skew Angl	e: N/A		
RANGE	Delay: 1.09"		Мо	de: Shea	r		Radius	Flat			
œ	Velocity: 0.127 in / μS		Ca	ble Type:	RG-174	Length: 12'	Interme	ediate Connec	tors: 0		
	Display: Filt2					Verifi	cation Blo	ck			
RCVR	Frequency: 2.25 MHz		Тур	oe: CS Ro	mpas		S/N: 79141	3			
	Reject: Off			Reflector		1" Radius		2" R	adius		
	Pulse Width: 222 nS			Sweep		0.6 div.		1.1	div.		
	Damping: 500 Ω		A	Amplitude		70 %FSH		80 %	FSH		
	Mode: ⊠Pulse Echo □□	Dual		Gain		24.6 dB		24.6	6 dB		
PULSER	Rep Rate: 2kHz				11 15 177	Basic Ca	libration E	Block			
PUL	Pulser: ☐150V ☐300V	*Sonic 137 only)	Blo	ck ID: BF	-18		Material: C	lad CS			
	*Pulser voltage adjustable with th	e Sonic 137 instrume	Thi	ickness: 6	.0" with 0.	125" Clad	Diameter:	-lat			
	The Sonic 136 has a fix		,	mperature	:: 75 °F		Therm. SN	: VH-9525			
			Со	uplant: Ul	tragel II		Batch No.:	05325			
		R	eference S	Sensitivi	ty Inforn	nation					
Ref	lector: ID Notch	Sweep: 5.8 div		Am	plitude: 80	%FSH	Gai	n: <b>64.6 dB</b>			
Cal	In: Date 3/21/07 Time 1500	Check: Date 3/21	1/07 Time 1	831 Che	ck: Date N	N/A Time N/A	Out	Date 3/21/07	Time 1956		
				Comme	nts						
S: 7				3/21/07 Examiner: N/A Signature				Level: N/A	Date: N/A		
ARi	EVA Review Adam Conti	Review Adam Conti / Level: III Date: 4/11/07					Page 9 of 11				



# Reactor Pressure Vessel 600368 Manual Ultrasonic Calibration Data Sheet

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Jtil	ity: TVA	wns Ferry	vns Ferry Nuclear Plant Unit: 2			Outage: Cycle 14 RFO					
Cal	ibration Data Sheet Number: N4F	NV-CDS4		ISI Re	port Nur	mber:	R179		s		
Cor	mponent ID: N4F-NV			Comp	onent De	scription: N4	Nozzle-to-\	Vessel Weld.	_		
Exa	mination Procedure: N-UT-78 Re	vision 4		Applic	able SD0	CN(s): N/A					
	Ultrasonic Instrum	ent				Tr	ansducer				
Mai	nufacture: Staveley		Man	ufacture:	RTD		Model	: TRL2-ST			
Мо	del: Sonic 136		Seria	Serial Number: 07-304				Frequency: 2 MHz			
Ser	ial Number: 7031	Angl	e: 60°			Measu	red Angle: 61°				
Line	earity Sheet No.: LDS4	Mode	e: Refrac	ted Long	gitudinal	Size: 2	2(24x42)mm				
	Instrument Settin	Focu	ıs: FS~1	25mm		Squint	Angle: 5°				
	Range: 8.00" Sound Path	# of	Element	s: 2	Shape: Rec	t. Config	uration: Dual -	SBS			
RANGE	Delay: 1.38"	Cabl	е Туре:	RG-174	Length: 1	2' Interm	ediate Connec	tors: 0			
α.	Velocity: 0.230 in / μS	****			Verifi	cation Blo	ock				
	Display: Filt 2		Туре	: CS Ro	mpas		S/N: 7914	13			
RCVR	Frequency: 2.25 MHz	,	R	eflector:		1" Radius		2" R	adius		
	Reject: Off			Sweep:		1.2 div.		2.5	div.		
	Pulse Width: 222 nS		An	nplitude:		25 %FSH		80 %	6FSH		
	Damping: 500 Ω	-		Gain:		52.0 dB	_	52.0 dB			
œ	Mode: □Pulse Echo  ⊠Dual					Basic Ca	libration	Block			
PULSER	Rep Rate: 2kHz		Block	k ID: BF-	18		Material: 0	Material: Clad CS			
₫.	Pulser: 150V 300V (*Soni	: 137 only)	Thicl	kness: 6	0" with 0	).125" Clad	Diameter:	Flat			
	*Probe voltage is adjustable with the Sor	ic 137 instrument.	The Tem	perature	: 75 °F		Therm. SI	N: VH-9525			
	Sonic 136 has a fixed pulse	r voltage.	f ·	olant: Ult	ragel II		Batch No.	: 05325			
		Ref	erence Se	ensitivit	y Infor	mation	V				
Ref	flector: 1/4-t SDH	Sweep: 3.8 di	v		Amplitue	de: 80 %FSH		Gain: 58.4 dB	3		
Cal	In: Date 3/21/07 Time 1505	Check: Date 3/	/21/07 Time	1902	Check: [	Date N/A Tim	e N/A	Out: Date 3/2	1/07 Time 1958		
			С	ommer	its						
Zor	ne 1 - Near Surface calibration.										
	aminer: Thomas Brown nature:	Date: 3/21/0	/07 Examiner: N/A Signature			Level: N/A	Date: N/A				
	EVA Review: Adam Conti	Date: 4/11/0	14/07					Page 10 of 11			



# Reactor Pressure Vessel 600369 Manual Ultrasonic Calibration Data Sheet

Jtil	ity: TVA	owns Ferry N	luclear	Plant	Unit: 2		Outage: (	Cycle 14 RFO			
Cal	ibration Data Sheet Number: N4FN	V-CDS5		ISI Report Number:  Component Description: N4 No				79			
Cor	mponent ID: N4F-NV			Comp	onent De	scription: N4					
Exa	mination Procedure: N-UT-78 Rev	ision 4		Applic	able SDC	CN(s): N/A	_	<u></u> , <u></u>	:		
	Ultrasonic Instrume	ent .				Tr	ansduce	r			
Ma	nufacture: Staveley		Manu	facture	: RTD		Mode	Model: TRL2-ST			
Мо	del: Sonic 136		Seria	Numbe	er: 07-30	4	Frequ	Frequency: 2 MHz			
Ser	ial Number: 703I		Angle	Angle: 60°				ured Angle: 61°			
Line	earity Sheet No.: LDS4	Mode	Mode: Refracted Longitudinal				2(24x42)mm				
	Instrument Setting	s	Focu	Focus: FS~125mm			Squir	nt Angle: 5°			
· · · ·	Range: 18.0" Sound Path	# of E	lement	s: 2	Shape: Rec	t. Confi	guration: Dual -	SBS			
RANGE	Delay: 1.38"	Cable	туре:	RG-174	Length: 1	2' Interr	nediate Connec	tors: 0			
ar.	Velocity: 0.230 in / μS				Verifi	cation BI	ock	,			
	Display: Filt 2		Туре	CS Ro	mpas		S/N: 791	413			
RCVR	Frequency: 2.25 MHz		Re	eflector:		1" Radius		2" R	adius		
_	Reject: Off			Sweep:		0.5 div.		1.1	div.		
	Pulse Width: 222 nS		Am	plitude:	<u>.</u>	25 %FSH		80 %	%FSH		
	Damping: 500 Ω			Gain:		52.0 dB	52.0 dB				
œ	Mode: □Pulse Echo  ☑Dual					Basic Ca	alibration	bration Block			
PULSER	Rep Rate: 2kHz		Block	ID: BF	-18		Material: Clad CS				
ā	Pulser: 150V 300V (*Sonic	137 only)	Thick	ness: 6	.0" with 0	.125" Clad	Diameter: Flat				
	'Probe voltage is adjustable with the Sonic		The Temp	erature	: 75 °F		Therm. SN: VH-9525				
	Sonic 136 has a fixed pulser	voltagė.	Coup	lant: Ult	tragel II		Batch No	o.: 05325			
		Ref	ference Se	nsitivi	ty Infor	nation					
Ref	lector: ID Notch	Sweep: 6.3 d	iv		Amplitud	de: 80 %FSH		Gain: 73.2 dE	3		
Cal	In: Date 3/21/07 Time 1507	Check: Date 3	1/21/07 Time	1935	Check: [	Date N/A Time	e N/A	Out: Date 3/2	1/07 Time 2000		
			Co	ommer	nts						
Zor	ne 2 - Full Volume calibration.										
Examiner: Thomas Brown Level: II Date:				/07 Examiner: N/A Signature Level: N/A Date: N			Date: N/A				
	EVA Review Adam Confinature: Review (m)	Date: 4/11/0	7					Page 11 of 11			

# Examination Report, R-156 N5A-NV, RPV Nozzle-To-Head Weld



A second			RF	'V Noz		asonic Exami	nation $600370$		
	A .				Summ	ary Sheet			
Utility: TVA		Site: Browns Fo	erry Nuclear Pl	ant	Unit: 2	Outage: Cycle 14	ISI Report#: R156		
Component Num	Component Number: N5A-NV			Description	n: N5 Nozzle	to Vessel Weld	System: RPV		
Code Category: B-D			Code Item: B3.90			Code Class: 1	Material: CS		
ISO / Drawing(s): 2-CHM-2046-C-0			\$ 2-ISI-0271-C-01						
Procedure Nu	mber	Proced	lure Revision		SDCN	Procedure Misc. Info			
N-UT-78			4		NA	Revision 11 of the PDI-UT-6 qualified equipment table			
N-UT-79			1		NA	Revision 5 of the F	PDI-UT-7 qualified equipment table		
54-181-850	)		06	30-9	044520-000	Modeling Report: IF	R-2003-19 Section 6		
	Calibr	ation Sheets			xam Data Sheets	Indication Data Sheets	Exam Results  No Recordable Indications		
N5ANV-CDS1			-1 - 1 - 1 - 1 - 1	N5/	ANV-EDS1	NA	Recordable Flaw Indications		
N5ANV-CDS2							(acceptable flaw evaluation)		
N5ANV-CDS3							Reportable Flaw Indications (unacceptable flaw evaluation)		
N5ANV-CDS4	4						(unacceptable naw evaluation)		
N5ANV-CDS5							1		
Summary:									
Summary: In accordance with UT procedure N-UT-78 I from the vessel surface in both the axial (rad reportable indications.									
						TVA / EPRI modeling eportable indications	g report the following additional		
			NS N	lozzla M	odeling Pa	rameters	·		
	-	Probe Refra		Probe \$		Scan Surface			
	.	35		-68		Blend Radius			
	· H	35		+68		Blend Radius	the state of the s		
	60'		±30° to		Vessel Shell				
ļ.	L.								

This ultrasonic examination was performed in accordance with the criteria of 10 CFR50.55a (b)(2)(xv)(G) and the minimum coverage requirements of 10 CFR50.55a (b)(2)(xv)(K) was achieved to the maximum extent possible. The examination procedure requires an additional circumferential scan of the outer 85%-t which is not addressed in 10CFR 50.55a. The 60°RL and 60°S examinations were limited due to the nozzle configuration, mirror insulation, and an insulation support ring which reduced the examination volume obtained to 27%. Refer to coverage sketch(s) and worksheet for a description of the scanning volume, examination coverage, and scan limitations.

This examination satisfies the requirements of ASME Section XI (2001 thru 2003 Addenda) and was performed using ASME Section XI, Appendix VIII qualified personnel, procedures, and equipment.

Note: See TVA Request for Relief PDI-1 and PDI-2. Dockets No. 50-261/296, 50-327/328, and 50-0390. This relief request reduced the area to be examined per IWB-2500-7 (a) and (b) to the weld plus 1/2" on each side.

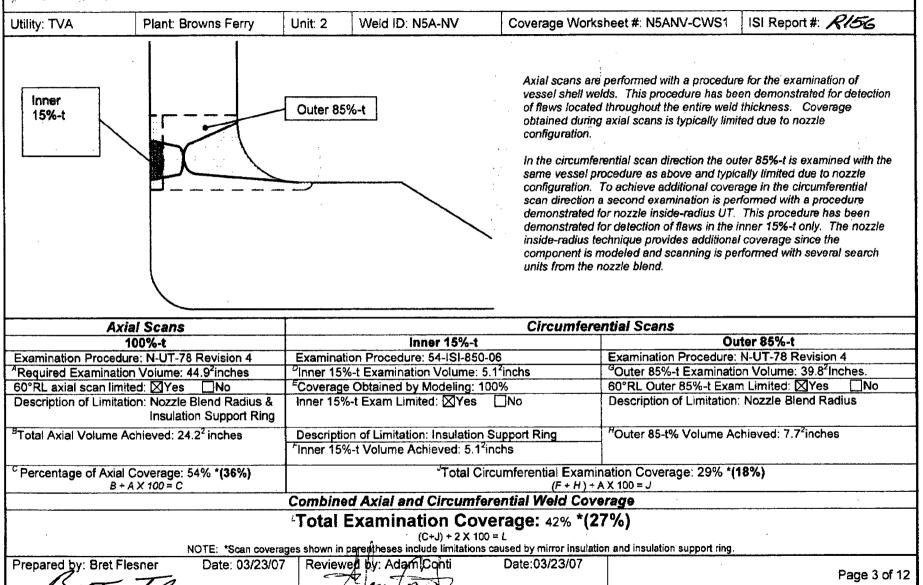
Prepared by: George Chapman Signature:	Date: 3/23/07	Reviewed by: At Signature:	lam Cont	Date: 3/	23/07
Customer: Mate Welch	Date: 3/5/67	ANII: Signature:	Polen	Date:	122127
	arīju savies.			- Pag	e 1 of 12



## Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

	tility: TVA Site: Browns Ferry Nuclear Plant Unit: 2 Outage: Cycle 14 RFO															
Examination Data Sheet Number: N5ANV-EDS1    ISI Report Number: R156   Component ID: N5A-NV   Component Description: Nozzle-to-Vessel W													11.			
Compone	ent ID: N	15A-N	<u>IV</u>			<u> </u>			Description:	Nozzle-	to-Vesse	el Weld				
						Exa		Information								
				-C-01, 2-ISI-027	1-C-01			ation: Nozzle Bo			Lo	Location	: Nozzle	TDC		
Examina	tion Limite	ea: 🔼	Yes □No	<u></u>		<del> </del>		ge Sheet Number	er(s): N5ANV	-CWS1						····
					· · · · · · · · · · · · · · · · · · ·		Scan Info	rmation								
Examinati	Examination Procedure: 54-ISI-850-06 Applicable SDCN's: 30-9044520-000 Scan Surface: OD Blend Radius															
Angle/ Mode	Skew		Calibrati	on Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Li	mited	Record Indicat		Indicatio Data Shee		Examiner Initials
35°S	-68°		N5AN	V-CDS1	03/14/07	1807	80° F	VH-9525	65.0 dB	□Yes	⊠No	□Yes	⊠No	N/A		GC
35°S	+68°		N5AN	V-CDS2	03/14/07	1752	80° F	VH-9525	65.0 dB	□Yes	⊠No	□Yes	⊠No	N/A		GC
NA	N/A			N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A		N/A
NA	N/A	1		N/A	N/A	N/A	N/A	N/A	N/A	Yes	□No	□Yes	□No	N/A		N/A
Examinati	on Procedi	ure: 54	4-ISI-850-06		Applicable SD	CN's: 30-904	4520-000		l					O Vessel Sh	ell	
Angle/ Mode	Skew		Calibrati	on Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	imited	Record		Indicatio Data Shee		Examiner Initials
60°S	±30° to 6	4°	N5AN	IV-CDS3	03/14/07	1725	80° F	VH-9525	70.0 dB	⊠Yes	□No			N/A		GC
N/A	N/A			N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A		N/A
N/A N/A N/A																
ļ		ure: N	-UT-78 revision	1 4	Applicable SD	CN's: N/A						Scan Su	rface: Ol	O Vessel Sh	ell	
ļ			-UT-78 revision am Direction	Calibration Sheet #	Applicable SD Date	CN's: N/A Time	Temp	Thermometer S/N:	Scan Gain	Scan L	imited	Scan Su Record Indicat	dable	O Vessel Shi Indicatio Data Shee	n E	Examiner Initials
Examinati Angle/	on Proced	Bea		Calibration			Temp 80° F		Scan Gain 78.0 dB	Scan L ⊠Yes		Recor Indicat	dable ion(s)	Indicatio	n E	
Examinati Angle/ Mode	on Proced	Bea	m Direction	Calibration Sheet #	Date	Time	<del> </del>	S/N:				Recor Indicat	dable ion(s)	Indicatio Data Shee	n E	Initials
Examinati Angle/ Mode 60°/RL	on Procedi Zone	Bea ⊠R ⊠R	am Direction	Calibration Sheet # N5ANV-CDS4	Date 03/14/07	Time 1638	80° F	S/N: VH-9525	78.0 dB	⊠Yes	□No	Record Indicate	dable ion(s) ⊠No	Indicatio Data Shee N/A	n E	Initials TB
Examinati Angle/ Mode 60°/RL	zone 1 2	Bea ⊠R ⊠R □R	am Direction adial Circ adial Circ	Calibration Sheet # N5ANV-CDS4 N5ANV-CDS5	Date 03/14/07 03/14/07	Time 1638 1715	80° F	S/N: VH-9525 VH-9525	78.0 dB 76.0 dB	⊠Yes ⊠Yes	□No	Reconduction Indicate	dable ion(s) ⊠No ⊠No	Indicatio Data Shee N/A N/A	n E	Initials TB TB
Examinati Angle/ Mode 60°/RL 60°/RL 60°/RL 50°/RL Commen 60°RI	Zone 1 2 1 2 ts:	Bea ⊠R ⊠R □R	am Direction adial Circ adial Circ adial Circ adial Circ adial Circ	Calibration Sheet # N5ANV-CDS4 N5ANV-CDS5 N5ANV-CDS4	03/14/07 03/14/07 03/14/07 03/14/07 minations limit	Time 1638 1715 1638 1715 ed due to in	80° F 80° F 80° F 80° F	S/N: VH-9525 VH-9525 VH-9525 VH-9525	78.0 dB 76.0 dB 78.0 dB 76.0 dB	⊠Yes  ⊠Yes  ⊠Yes  ⊠Yes  Expended the content of th	□No □No □No □No □No	Reconindicate  Yes Yes Yes Yes And work	dable ion(s)  No No No	Indication Data Sheet N/A N/A N/A N/A N/A	et#	TB TB TB TB
Examinati Angle/ Mode 60°/RL 60°/RL 60°/RL 50°/RL Commen 60°RI In-ves	Zone 1 2 1 2 radial, 66 sel feedw	Bea ⊠R ⊠R □R □R	am Direction  adial Circ  adial Circ  adial Circ  adial Circ  circumferent  biping end bra	Calibration Sheet # N5ANV-CDS4 N5ANV-CDS5 N5ANV-CDS4 N5ANV-CDS5	03/14/07 03/14/07 03/14/07 03/14/07 minations limit	Time 1638 1715 1638 1715 ed due to in	80° F 80° F 80° F 80° F sulation su	S/N: VH-9525 VH-9525 VH-9525 VH-9525 upport ring below face during the 6	78.0 dB 76.0 dB 78.0 dB 76.0 dB	⊠Yes  ⊠Yes  ⊠Yes  ⊠Yes  Expended the content of th	□No □No □No □No □No	Reconindicate  Yes Yes Yes Yes And work	dable ion(s)  No No No No	Indication Data Shed N/A N/A N/A N/A N/A N/A	et#	TB TB TB TB TS
Examinati Angle/ Mode 60°/RL 60°/RL 50°/RL Commen 60°/RL In-ves	Zone 1 2 1 2 its: radial, 66 sel feedw	Bea ⊠R ⊠R □R □R o°RL atter p	am Direction  adial Circ  adial Circ  adial Circ  adial Circ  adial Circ  circumferenticiping end bra	Calibration Sheet # N5ANV-CDS4 N5ANV-CDS5 N5ANV-CDS4 N5ANV-CDS5	Date 03/14/07 03/14/07 03/14/07 03/14/07 minations limit welds observe	Time 1638 1715 1638 1715 ed due to ineed on the ve	80° F 80° F 80° F 80° F sulation su ssel ID sui	S/N: VH-9525 VH-9525 VH-9525 VH-9525 upport ring below face during the 6 Examiner: N/A Signature:	78.0 dB 76.0 dB 78.0 dB 76.0 dB	⊠Yes  ⊠Yes  ⊠Yes  ⊠Yes  Expended the content of th	□No □No □No □No □No	Reconindicate  Yes Yes Yes Yes And work	dable ion(s)  No No No No Levi	Indication Data Shed N/A N/A N/A N/A N/A or additional	on Eet#	TB TB TB TB TB A
Examinati Angle/ Mode 60°/RL 60°/RL 50°/RL Commen 60°RL In-ves Examiner: Signatui Examiner:	Zone  1  2  1  2  its: radial, 6  sel feedw  George Core:	Bea ⊠R ⊠R □R	am Direction  adial Circ  adial Circ  adial Circ  adial Circ  adial Circ  circumferenticiping end bra	Calibration Sheet # N5ANV-CDS4 N5ANV-CDS5 N5ANV-CDS4 N5ANV-CDS5	03/14/07 03/14/07 03/14/07 03/14/07 minations limit	Time 1638 1715 1638 1715 ed due to ineed on the ve	80° F 80° F 80° F 80° F sulation su ssel ID sui	S/N: VH-9525 VH-9525 VH-9525 VH-9525 upport ring below face during the 6 Examiner: N/A Signature: Examiner: N/A	78.0 dB 76.0 dB 78.0 dB 76.0 dB	⊠Yes  ⊠Yes  ⊠Yes  ⊠Yes  Expended the content of th	□No □No □No □No □No	Reconindicate  Yes Yes Yes Yes And work	dable ion(s)  No No No No Levi	Indication Data Shed N/A N/A N/A N/A N/A or additional	et#	TB TB TB TB TB A
Examinati Angle/ Mode 60°/RL 60°/RL 50°/RL Commen 60°RL In-ves Examiner: Signatur Examiner: Signatur	Zone  1  2  1  2  its: radial, 6  sel feedw  George Core: Thomas E	Beas Brown	am Direction  adial Circ  adial Circ  adial Circ  adial Circ  adial Circ  circumferenticiping end bra	Calibration Sheet # N5ANV-CDS4 N5ANV-CDS5 N5ANV-CDS4 N5ANV-CDS5	Date 03/14/07 03/14/07 03/14/07 03/14/07 minations limit welds observe	Time 1638 1715 1638 1715 ed due to ineed on the ve	80° F 80° F 80° F 80° F sulation su ssel ID sul	S/N: VH-9525 VH-9525 VH-9525 VH-9525 upport ring below face during the 6 Examiner: N/A Signature:	78.0 dB 76.0 dB 78.0 dB 76.0 dB	⊠Yes  ⊠Yes  ⊠Yes  ⊠Yes  Expended the content of th	□No □No □No □No □No	Reconindicate  Yes Yes Yes Yes And work	dable ion(s)  No No No No Levi	Indication Data Shed N/A N/A N/A N/A N/A or additional	on Eet#	TB TB TB TB TB TB
Examinati Angle/ Mode 60°/RL 60°/RL 60°/RL 50°/RL Commen 60°RL In-ves Examiner: Signatur Examiner: Signatur	zone 1 2 1 2 tts: radial, 6 sel feedw George C re: Thomas E	Beaa RR R	am Direction  adial Circ  adial Circ  adial Circ  adial Circ  adial Circ  circumferenticiping end bra	Calibration Sheet # N5ANV-CDS4 N5ANV-CDS5 N5ANV-CDS4 N5ANV-CDS5 ial, and 60°S exa	Date  03/14/07  03/14/07  03/14/07  minations limit welds observe  Level: II  Level: II	Time 1638 1715 1638 1715 ed due to in ed on the ve	80° F 80° F 80° F 80° F sulation su ssel ID sul	S/N: VH-9525 VH-9525 VH-9525 VH-9525 upport ring below face during the 6 Examiner: N/A Signature: Examiner: N/A	78.0 dB 76.0 dB 78.0 dB 76.0 dB	⊠Yes  ⊠Yes  ⊠Yes  ⊠Yes  Expended the content of th	□No □No □No □No □No	Reconindicate  Yes Yes Yes Yes And work	dable ion(s)  No No No No Levi	Indication Data Shed N/A N/A N/A N/A N/A or additional	on Eet#	TB TB TB TB TB A

## RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet



	DESCRIPTION			
Call	Browns Ferr	y N5 Nozzle-t	o-Shell Weld Coverag	e Plot
10 55 m W. O.	DRAWN BY	DATE	TITLE	PAGE
	Bret Flesner	03/23/07	N5ANV-CPS1	4 OF 12

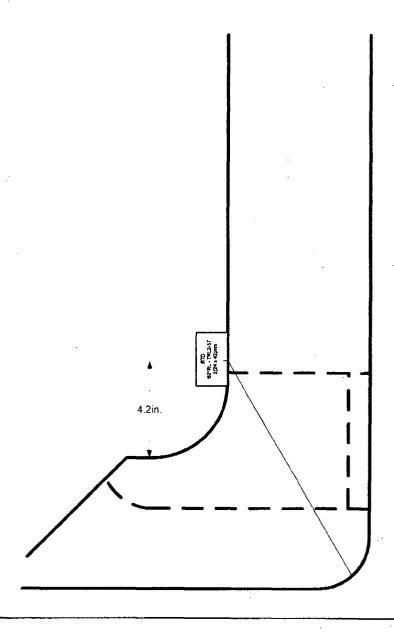
*RIS* 0003**73** 

Nozzle-to-Vessel weld examination coverage for axial (radial) scan

Total area of examination volume: 44.9 sq. in. (TVA supplied) Total area of examination volume achieved: 24.2 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius.

100% of the accessible surface scanned.



DESCRIPTION
Browns Ferry N5 Nozzle-to-Shell Weld Coverage Plot
DRAWN BY DATE TITLE PAGE
Bret Flesner 03/23/07 N5ANV-CPS2 5 OF 12

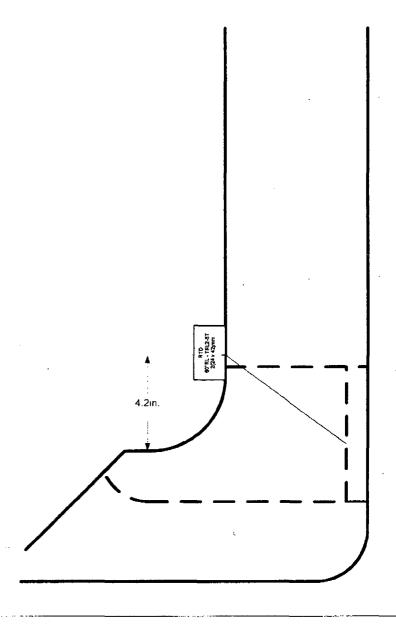
*R156* 030374

Nozzle-to-Vessel weld examination coverage for circumferential scan

Total area of examination volume: 44.9 sq. in. (TVA supplied)
Total area of outer 85%-t exam volume achieved: 7.7 sq. in.
Total area of inner 15%-t volume: 5.1 sq. in.
Total area of inner 15%-t exam volume achieved: 5.1 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned.

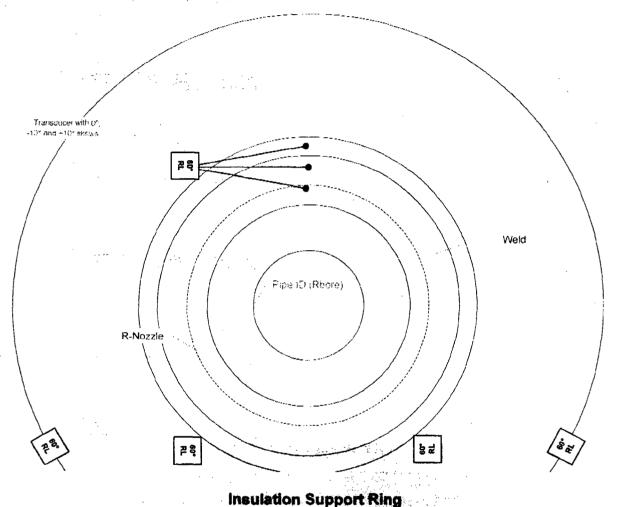
Inner 15%-t area examined from the blend with Supplement 5 techniques.



DESCRIPTION
Browns Ferry N5 Nozzle-to-Shell Weld Coverage Plot
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DATE
TITLE
PAGE
Bret Flesner
03/23/07
N5ANV-CPS3
6 OF 12

R156

60°RL Scan Limitations
Radial Scan Area (Yellow) = 1365 sq. in.
Area of radial scan limitation (Red) = 438 sq. in.
Circ Scan Area = 229 sq. in.
Area of circ scan limitation = 69 sq. in.
438 / 1365 = 32% radial scan limitation
69 / 229 = 30% circumferential scan limitation
\*above percentages do not include the limitation caused by the nozzle configuration. The total examination coverage achieved combining all limitations is shown on the Coverage Calculation Worksheet.



**Mirror Insulation** 



DESCRIPTION
Browns Ferry N5 Nozzle-to-Shell Weld Coverage Plot
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Bret Flesner 03/23/07 N5ANV-CPS4 7 OF 12

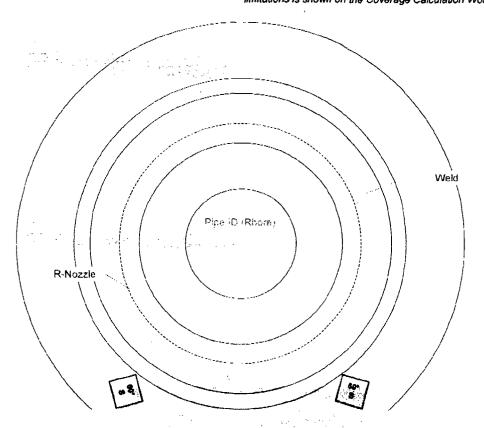
*R156* 00037**6** 

60°S Scan Limitation
60°S Scan area (Yellow) = 527 sq. in.
60°S Scan limitation (Red) = 141 sq. in.
141 / 527 = \*27% 60°S scan limitation
Figures 6-3 & 6-4 of the modeling report it is estimated the

Using Figures 6-3 & 6-4 of the modeling report it is estimated that the 60°S makes up 62% of the inner 15%-t coverage. The 35°S examination was not limited since scanning is performed from the blend.

27 x 62%= \*17% combined 60°S and 35°S scan limitation.

\*above percentages do not include the limitation caused by the nozzle configuration. The total examination coverage achieved combining all limitations is shown on the Coverage Calculation Worksheet.



**Insulation Support Ring** 

**Mirror Insulation** 



# Reactor Pressure Vessel 000377 Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA		Site: Brow	ns Ferry N	luclear	Plant	Unit: 2			Outage: 0	Cycle 14 RFC	)
Cal	ibration Data Sheet Number:		ISI Re	port Nu	mber:			RIS	ib			
Cor	mponent ID: N5A-NV	s a Maria Ma		Compo	onent De	scription: N5	Nozzle	to-Ve	ssel Weld			
Exa	mination Procedure: 54-ISI-	350-06			Applica	able SDC	N(s): 30-90-	44520-0	000		`*	
	Ultrasonic Inst	rument					Tra	ansdu	ucer			
Ма	nufacture: Staveley			Manut	acture:	KBA		Mo	del: B	enchmark 89	92-600	
Мо	Model: Sonic 136				Serial Number: 0111PV				Frequency: 2.25 MHz			
Ser	ial Number: 136P1200G0814	Size: (	Size: 0.5" x 1.0"				ape: F	Rectangle				
Line	earity Sheet No.: LDS1		•	# of E	lements	s: 1		Co	nfigur	ation: Single		
	Instrument Se	ettings		Refrac	cted An	gle: 35°		Me	easure	d Angle: 35°		
	Range: 15.0" Sound Pa	pth	Skew	Angle:	-68°		Me	asure	d Skew Angl	e: -68°		
RANGE	Delay: 1.27"			Mode:	Shear			Ra	dius: :	3.1"		
2	Velocity: 0.127 in / μS			Cable	Type: I	RG-174	Length: 12'	Int	ermed	liate Connect	tors: 0	
	Display: Filt2	1 1111				,	Verific	cation	Bloci	k		
RCVR.	Frequency: 2.25 MHz			Туре:	CS Ro	mpas		S/N: 9	9-625	1		
ų.	Reject: Off			Re	flector:		1" Radius			2" R	adius	
	Pulse Width: 222 nS			8	weep:		0.65 div.			1.3	div.	
	Damping: 500 Ω	ensile in ent		Amp	olitude:		80 %FSH		65 %FSH			
	Mode: ⊠Pulse Echo ☐□				Gain:		32.4 dB		32.4 dB			
PULSER	Rep Rate: 2kHz						Basic Ca	librati	libration Block			
P.	Pulser: ☐150V ☐300V	(*Sonic 137 o	nly)	Block	ID: BF-	18		Material: Clad CS				
	*Pulser voltage adjustable with th	e Sonic 137	instrument on	Thickr	ness: 6.	0" with 0.	.125" Clad	Diame	ter: Fl	at		
	The Sonic 136 has a fix				erature:	75 °F		Therm	. SN:	VH-9525		
				Coupl	ant: Ulti	ragel II		Batch	No.: (	05325		
			Refer	ence Ser	nsitivit	y inform	nation					
Ref	lector: ID Notch	Sweep: 5	5.0 div	,	Amp	olitude: 8	0 %FSH		Gain:	48.2 dB		
Cal	In: Date 3/14/07 Time 1435	Check: D	ate 3/14/07	Time 1806	Che	ck: Date I	N/A Time N/A	\	Out: [	Date 03/14/07	Time 1830	
				Co	mmen	ts						
Examiner: George Chapman Level: II Date: Signature:				te: 03/14/07 Examiner: N/A Signature					Level: N/A	Date: N/A		
	Signature:  AREVA Review Adam Conti   Level: III Dat Signature:				)7						Page 8 o	f 12



# Reactor Pressure Vessel 000378 Manual Ultrasonic Calibration Data Sheet

Utili	ty: TVA	Site:	Browns	Ferry N	uclear	Plant	Unit: 2		Outage: 0	Cycle 14 RFO		
Calibration Data Sheet Number: N5ANV-CDS2				ISI Report Number:  Component Description: N5 Nozzle-to-Ves				R156	,			
Cor	nponent ID: N5A-NV				Compo	nent De	scription: N5	Nozzle-t	o-Vessel Weld			
Exa	mination Procedure: 54-ISI-8	150-06			Applica	ıble SDC	N(s): 30-904	<b>14520</b> -00	00			
	Ultrasonic Inst	rument					Tra	Transducer				
Mai	nufacture: Staveley			Manufa	acture:	KBA		Mod	del: Benchmark 8	92-600		
Mod	del: Sonic 136			Serial Number: 0111PM /				Free	Frequency: 2.25 MHz			
Serial Number: 136P1200G081455				Size: 0	).5" x 1.	0"		Sha	pe: Rectangle			
Line	earity Sheet No.: LDS1		# of Ele	ements	: 1		Соп	ifiguration: Single				
Instrument Settings				Refrac	ted Ang	gle: 35°		Mea	asured Angle: 35°			
Range: 15.0° ⊠Sound Path □Depth				Skew A	Angle:	+68° ✓		Mea	asured Skew Angl	e: +68°		
ANG	Delay: 1.27"				Shear			Rad	lius: 3.1"			
O.	Velocity: 0.127 in / μS			Cable	Type: F	RG-174	Length: 12'	inte	rmediate Connec	tors: 0		
4	Display: Filt2						Verific	ation E	Block			
RCVR	Frequency: 2.25 MHz			Type: (	CS Ror	npas		S/N: 99	-6251			
	Reject: Off			Ref	lector:		1" Radius		2" R	adius		
	Pulse Width: 222 nS			S	weep:		0.65 div.		1.3	div.		
	Damping: 500 Ω			Amp	litude:		80 %FSH		65 %	FSH		
	Mode: ⊠Pulse Echo □ □	ual			Gain:		32.2 dB		32.2	2 dB		
PULSER	Rep Rate: 2kHz		2 1				Basic Ca	libration Block				
PUL	Pulser: ☐150V ☐300V (	*Sonic 137 only)		Block I	D: BF-	18		Materia	I: Clad CS			
	*Pulser voltage adjustable with the	e Sonic 137 instrum	ent only.	Thickn	ess: 6.0	0" with 0.	125" Clad	Diamet	er: Flat	***************************************		
	The Sonic 136 has a fix	ed pulser voltage.	-	Tempe	erature:	75 °F		Therm.	SN: VH-9525			
				Coupla	ant: Ultr	agel II		Batch N	lo.: 05325			
		R	leferen	ce Sen	sitivit	y Inform	nation					
Ref	lector: ID Notch	Sweep: 5.0 div			Amp	litude: 80	) %FSH		Gain: 48.0 dB			
Cal	In: Date 3/14/07 Time 1440	Check: Date 3/1	4/07 Tim	ne 1751	Chec	k: Date N	N/A Time N/A	. •	Out: Date 03/14/07	Time 1835		
				Con	mment	es .						
Examiner: George Chapman Level: II Date:				03/14/0	8/14/07 Examiner: N/A Level: N/A Date Signature			Date: N/A				
				03/23/0	2/2/07			Page 9 of 12				



# Reactor Pressure Vessel (200379) Manual Ultrasonic Calibration Data Sheet

Site. Browns Felly Nuclear Flant. Onit. 2 Cutage. Cycle 1411 C											
Cal	libration Data Sheet Number: N5			ISI Re	port Number:			R	156		
Cor	mponent ID: N5A-NV			(	Compo	onent Description: N5	Nozzie-	to-Vessel	Weld		
Exa	amination Procedure: 54-ISI-850	)-06		1	Applica	able SDCN(s): 30-90-	44520-0	000			
	Ültrasonic İnstrui	ment				Tra	ansduc	cer			
Mai	nufacture: Staveley	MANAGEMENT SECTION OF		Manufa	acture:	КВА	Мо	del: Benc	hmark 89	92-600	
Mod	del: Sonic 136			Serial 1	Numbe	er: 00X1XB	Fre	requency: 2.25 MHz			
Ser	rial Number: 136P1200G081455			Size: 0.5" x 1.0"				ape: Recta	angle.		
Line	earity Sheet No.: LDS1			# of Ele	ements	s: 1	Со	nfiguration	n: Single		
	Instrument Setti	ings		Refracted Angle: 60°				easured Ar	ngle: 59°		
ш	Range: 20.0" Sound Path	□Depth		Skew A	Angle: :	± 30-64°	Ме	easured Sk	kew Angl	e: N/A	
RANGE	Delay: 0.813"			Mode: Shear Radius: 1							
œ	Velocity: 0.127 in / μS			Cable 7	Type: F	RG-174 Length: 12'	Inte	ermediate	Connect	tors: 0	
~	Display: Filt2				Verific	cation	Block				
RCVR	Frequency: 2.25 MHz		Type: CS Rompas S/N			S/N: 9	N: 99-6251				
	Reject: Off			Refl	lector:	etor: 1" Radius				2" Radius	
	Pulse Width: 222 nS	Pulse Width: 222 nS		Sv	weep:	0.6 div.			1.1	div.	
	Damping: 500 Ω	g: 500 Ω		Ampl	litude:	70 %FSH			80 %	FSH	
	Mode: ⊠Pulse Echo □Dua	al .			Gain:	27.6 dB			27.6	6 dB	
PULSER	Rep Rate: 2kHz					Basic Ca	librati	on Block	ζ		
ฐ	Pulser: 150V 300V (*Sor	mic 137 only)		Block ID: BF-18 Ma				al: Clad C	S		
	*Pulser voltage adjustable with the So	Sonic 137 instrumer	nt only.	Thickness: 6.0" with 0.125" Clad Di				Diameter: Flat			
	The Sonic 136 has a fixed p			Tempe	rature:	75 °F	Therm	Therm. SN: VH-9525			
				Coupla	int: Ulti	ragel II	Batch	No.: 0532	25		
		Re	feren	ce Sen	sitivit	y Information					
Ref	flector: ID Notch Sv	weep: 5.8 div			Amp	olitude: 80 %FSH		Gain: 62.	2 dB		
Caí	In: Date 3/14/07 Time 1430 Cf	heck: Date 3/14/	/07 Tim	ne 1724	Chec	ck: Date N/A Time N/A		Out: Date	3/14/07	Time 1840	
				Cor	mmen	ts					
Signatura:						Examiner: N/A Level: N/A Date: N/A Signature			Date: N/A		
ARI	EVA Review Adam Conti	Level: III	Date:	03/23/07							



# Reactor Pressure Vessel (30380) Manual Ultrasonic Calibration Data Sheet

Uti	lity: TVA	Site: B	rowns F	erry Nu	clear F	Plant	Unit: 2		C	outage: (	Cycle 14 RFO
Ca	libration Data Sheet Number: N5A	NV-CDS4		IS	SI Rep	ort Nur	mber:			R15	le e
Co	mponent ID: N5A-NV			С	ompor	nent De	scription: N5	Nozzle-to-	Vessel	Weld	
Exa	amination Procedure: N-UT-78 Re	vision 4		A	pplical	ble SDC	CN(s): N/A	,			
	Ultrasonic Instrum	ent		<u>-</u>			Tra	ansduce	r		
Ма	nufacture: Staveley			Manufac	cture: f	RTD		Mode	Model: TRL2-ST		
Мо	del: Sonic 136			Serial N	umber	: 07-30	4	Frequ	Frequency: 2 MHz		
Se	rial Number: 703l		1	Angle: 6	0°		•	Meas	ured An	ngle: 61°	
Lin	earity Sheet No.: LDS4			Mode: Refracted Longitudinal Size:					2(24x42	2)mm	
	Instrument Setting	gs		Focus: FS~125mm				Squir	nt Angle:	: 5°	
Ш	Range: 8.00" Sound Path	☐Depth	;	# of Elements: 2 Shape: Rect. Con				Confi	guration	: Dual -	SBS
RANGE	Delay: 1.38"	.,.		Cable Type: RG-174 Length: 12' Intermediate Co						Connec	tors: 0
۳	Velocity: 0.230 in / μS						Verifi	cation BI	ock		
	Display: Filt 2		Type: C	S Rom	pas		S/N: 99-6	3251			
RC/R	Frequency: 2.25 MHz			Refle	ctor:	: 1" Radius				2" Radius	
	Reject: Off			Sweep: 1.2 div.			2.5 div.			div.	
	Pulse Width: 222 nS			Amplit	tude:		25 %FSH			80 %	6FSH
	Damping: 500 Ω			G	Bain:		52.0 dB			52.0	0 dB
ıκ	Mode: ☐Pulse Echo   ☑Dual						Basic Ca	libration	Block		
PULSER	Rep Rate: 2kHz		1	Block ID: BF-18			Material:	Clad CS	S		
-	Pulser: 150V 300V (*Sonic	c 137 only)	-	Thickness: 6.0" with 0.125" Clad				Diameter	Diameter: Flat		
	*Probe voltage is adjustable with the Son		. The	Temperature: 75 °F			Therm. SN: VH-9525				
	Sonic 136 has a fixed pulse	er vonage.		Couplan	t: Ultra	agel II		Batch No.: 05325			
		Re	ferenc	e Sens	itivity	Infor	mation			·	_Mm.
Re	flector: 1/4-t SDH	Sweep: 3.8 c	fiv'		F	Amplitue	de: 80 %FSH	······································	Gain:	58.0 dE	3
Cal	In: Date 3/14/07 Time 1400	Check: Date :	3/14/07	Time 16	37 (	Check: [	Date N/A Time	N/A	Out: I	Date 3/14	4/07 Time 1850
				Com	ment	s					
Zoi	ne 1 - Near Surface calibration.										
								,			
	aminer: Thomas Brown	Level: II	Date: 0	3/14/07	/07 Examiner: N/A Signature				Lev	rel: N/A	Date: N/A
•	EVA Review Agam Conti inature:	Level: III	Date: 0	3/23/07					•		Page 11 of 12



# Reactor Pressure Vessel 600381 Manual Ultrasonic Calibration Data Sheet

Util	lity: TVA	Site: E	Browns Fe	erry Nucl	ear Plant	Unit: 2		Outage: 0	Cycle 14 RFO	
Са	libration Data Sheet Number: N5A	NV-CDS5		ISI	Report Nur	nber:		R156		
Со	mponent ID: N5A-NV			Co	mponent De	scription: N5	A Nozzle-to	≻Vessel Weld		
Exa	amination Procedure: N-UT-78 Re	vision 4		App	plicable SD0	CN(s): N/A				
	Ultrasonic Instrum	ent				Tra	ansducer			
Ма	nufacture: Staveley		M	lanufacti	ure: RTD		Model	: TRL2-ST		
Мо	del: Sonic 136		s	erial Nur	mber: 07-30	4	Frequ	Frequency: 2 MHz		
Sei	rial Number: 703I		А	ngle: 60	0		Meası	ured Angle: 61°		
Lin	earity Sheet No.: LDS4		М	lode: Re	fracted Long	gitudinal	Size: 2	2(24x42)mm		
	Instrument Settin	gs	F	Focus: FS~125mm			Squin	t Angle: 5°		
ш	Range: 18.0" Sound Path	□Depth	#	# of Elements: 2 Shape: Rect. C			Config	guration: Dual -	SBS	
RANGE	Delay: 1.38"		С	able Typ	oe: RG-174	Length: 1	2' Interm	ediate Connec	tors: 0	
<u> </u>	Velocity: 0.230 in / μS					Verific	cation Blo	ock		
	Display: Filt 2	T	ype: CS	Rompas		S/N: 99-6	251			
RC/R	Frequency: 2.25 MHz			Reflect	tor:	1" Radius		2" Radius		
	Reject: Off			Sweep: 0.5 div.			1,1 div.			
	Pulse Width: 222 nS			Amplitue	de:	25 %FSH		80 %	6FSH	
	Damping: 500 Ω			Ga	ain:	52.0 dB		52.	0 dB	
æ	Mode: ☐Pulse Echo   ☑Dual					Basic Ca	libration	Block		
PULSER	Rep Rate: 2kHz		В	Block ID: BF-18 Ma			Material: (	Material: Clad CS		
•	Pulser: 150V 300V (*Sonic	c 137 only)	TI	Thickness: 6.0" with 0.125" Clad			Diameter:	Flat		
	*Probe voltage is adjustable with the Son		t. The	Temperature: 75 °F			Therm. SN: VH-9525			
	Sonic 136 has a fixed pulse	er voltage.	С	ouplant:	Ultragel II		Batch No.: 05325			
		Re	eference	Sensit	ivity Infon	nation				
Re	flector: ID Notch	Sweep: 6.3	div		Amplitue	de: 80 %FSH		Gain: 73.0 dE	3	
Cal	In: Date 3/14/07 Time 1345	Check: Date	3/14/07 T	ime 1714	4 Check: [	Date N/A Time	: N/A	Out: Date 3/14/07 Time 1845		
				Comm	nents					
Zor	ne 2 - Full Volume calibration.									
							•			
·										
	aminer: Thomas Brown	Level: II	Date: 03	03/14/07 Examiner: N/A Signature			<del></del>	Level: N/A	Date: N/A	
	EVA Review Adam Conti nature: 724, 12	Level: III	Date: 03	3/23/07					Page 12 of 12	

## Examination Report, R-157 N5B-NV, RPV Nozzle-To-Head Weld



Summary Sheet										
Utility: TVA	Site: Browns F	erry Nuclear P	lant	Unit: 2	Outage: Cycle 14	ISI Report #: R/57				
Component Number:	N5B-NV	Component	Description	: N5 Nozzle	to Vessel Weld	System: RPV				
Code Category: B-D		Code Item: E	33.90		Code Class: 1	Material: CS				
ISO / Drawing(s): 2-Cl	HM-2046-C-01 8	& 2-ISI-0271-C	-01							
Procedure Number	Proces	lure Revision		SDCN	Pro	ocedure Misc. Info				
N-UT-78	4		NA	Revision 11 of the I	PDI-UT-6 qualified equipment table					
N-UT-79	1		NA	Revision 5 of the P	PDI-UT-7 qualified equipment table					
54-1\$1-850		06	30-90	044520-000	Modeling Report: IR	2-2003-19 Section 6				
Cali	bration Sheets			am Data Sheets	Indication Data Sheets	Exam Results  No Recordable Indications				
N5ANV-CDS1			N5A	NV-EDS1	NA	Recordable Flaw Indications				
N5ANV-CDS2						(acceptable flaw evaluation)				
N5ANV-CDS3	*					Reportable Flaw Indications (unacceptable flaw evaluation)				
N5ANV-CDS4	· · · · · · · · · · · · · · · · · · ·					,				
N5ANV-CDS5						A.P. WASHER				
Summary: In accordance with UT procedure N-UT-78 Revision 4, 60° refracted longitudinal wave examinations were performed from the vessel surface in both the axial (radial) and circumferential scan directions. These examinations resulted in no reportable indications.										
	In accordance with UT procedure 54-ISI-850-06 and the referenced TVA / EPRI modeling report the following additional examinations were performed. These examinations resulted in no reportable indications.									
N5 Nozzle Modeling Parameters										
	Probe Refra		Probe S		Scan Surface					
	35		-68°		Blend Radius					
	35		+68		Blend Radius					
	60	°S	±30° to	64°	Vessel Shell					

This ultrasonic examination was performed in accordance with the criteria of 10 CFR50.55a (b)(2)(xv)(G) and the minimum coverage requirements of 10 CFR50.55a (b)(2)(xv)(K) was achieved to the maximum extent possible. The examination procedure requires an additional circumferential scan of the outer 85%-t which is not addressed in 10CFR 50.55a. The 60°RL and 60°S examinations were limited due to the nozzle configuration, mirror insulation, and an insulation support ring which reduced the examination volume obtained to 27%. Refer to coverage sketch(s) and worksheet for a description of the scanning volume, examination coverage, and scan limitations.

This examination satisfies the requirements of ASME Section XI (2001 thru 2003 Addenda) and was performed using ASME Section XI, Appendix VIII qualified personnel, procedures, and equipment.

Note: See TVA Request for Relief PDI-1 and PDI-2. Dockets No. 50-261/296, 50-327/328, and 50-0390. This relief request reduced the area to be examined per IWB-2500-7 (a) and (b) to the weld plus 1/2" on each side.

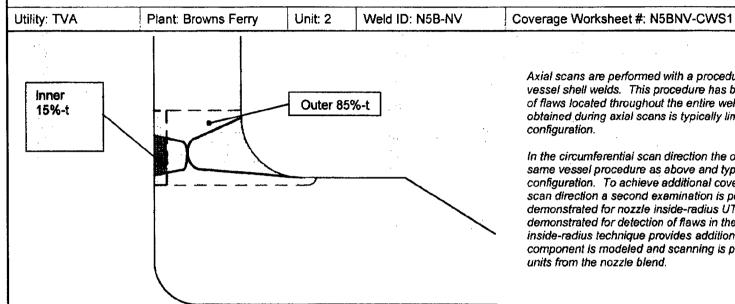
		1/1:	
Prepared by: George Chapman	Date: 3/23/07	Reviewed by: Adam Cont	Date: 3/23/07
Signature: Jean & Chapan	2010: 0:20:01	Signature:	
Customer: Matt Welch	Date: 3/3//17	ANII:	Data:
Signature: Marthilet	Date. 3/31/6 1	Signature: Sand Thri	Date: 5(21/97
			Page 1 of 12



### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

	ள்ள சிரி													
Utility: T				ite: Browns Fe	ry Nuclear I	Plant				nit: 2		Outage	e: Cycle 14 R	FO
		Sheet Number: N	5BNV-EDS1				ISI Report N		7157					
Compon	ent ID: N	5B-NV			."			Description:	Nozzle-I	o-Vess	el Weld			
					Exe		nformation							
		nber: 2-CHM-2046		71-C-01			ation: Nozzle Bo			Lo	Location:	Nozzle	TDC	
Examina	tion Limite	ed:⊠Yes ⊟No					e Sheet Number	er(s): N5BN\	/-CWS1					
		<u> </u>				Scan Infor	mation							
Examinat	on Procede	ure: 54-ISI-850-06		Applicable SD	CN's: 30-904	's: 30-9044520-000					Scan Surface: OD Blend Radius			
Angle/ Mode	Skew	Calibrat	tion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Li		Recordable Indication(s)		Indication Data Sheet	Examiner Initials
35°S	-6 <b>8°</b>	N5BN	VV-CDS1	03/14/07	1637	80° F	VH-9525	65.0 dB	□Yes	⊠No	□Yes	⊠No	N/A	GC
35°S	+68°	N5BI	NV-CDS2	03/14/07	1620	80° F	VH-9525	65.0 dB	☐Yes	⊠No	□Yes	⊠No	N/A	GC
NA	N/A		N/A	N/A	· N/A	N/A	N/A	N/A		□No	□Yes		N/A	N/A
NA	N/A		N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A	N/A
Examination Procedure: 54-ISI-850-06 Applicable SDCN's: 30-9044520-000								_			Scan Sur	face: Ol	D Vessel Shell	
Angle/ Mode	ode Skew Cambration Sheet #			Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	Scan Limited Recordabl Indication(		1		Examiner Initials
60°S	±30° to 6	4° N5BI	NV-CDS3	03/14/07	1653	80° F	VH-9525	70.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	GC
N/A N/A N/A N/A					N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A	N/A	
Examinat	ion Proced	ure: N-UT-78 revisio	n 4	Applicable SD	CN's: N/A						Scan Sui	face: Ol	D Vessel Shell	
Angle/ Mode	Zone	Beam Direction	Calibration Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	imited	Recordable Indication(s)		Indication Data Sheet	Examiner Initials
60°/RL	1	⊠Radial □Circ	N5BNV-CDS4	03/14/07	1551	80° F	VH-9525	78.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	ТВ
60°/RL	2	⊠Radial □Circ	N5BNV-CDS5	03/14/07	1616	80° F	VH-9525	76.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	TB
60°/RL	1	☐Radial ⊠Circ	N5BNV-CDS4	03/14/07	1551	80° F	VH-9525	78.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	ТВ
60°/RL	2	☐Radial ⊠Circ				80° F	VH-9525	76.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	ТВ
Comments: 60°RL circumferential, and 60°S examinations limited due to insulation support ring below nozzle. See coverage plots and worksheet for additional details.  In-vessel feedwater piping end bracket attachment welds observed on the vessel ID surface during the 60°RL Zone 2 circumferential scans.														
60°RI	L radial, 6	0°RL circumferent	tial, and 60°S exa		•	sulation su	pport ring below	v nozzle. Se	e coveraç	ge plots	and work	sheet fo	or additional	details.
60°Ri In-ver Examiner Signatu	L radial, 6 ssel feedw : George C re:	0°RL circumferent vater piping end bi	tial, and 60°S exa		ed on the ve	essel ID sur	pport ring below	v nozzle. Se	e coveraç	ge plots	and work			details.
60°RI In-ver Examiner Signatu Examiner Signatu	L radial, 6 ssel feedw George C re: Thomas E	o°RL circumferent vater piping end bi bepman	tial, and 60°S exa	nt welds observ	ed on the ve	essel ID sur	pport ring below face during the Examiner: N/A	v nozzle. Se	e coveraç	ge plots	and work	Lev	el: N/A Da	
60°RI In-ver Examiner Signatu Examiner Signatu	Capacita Cap	o°RL circumferent vater piping end bi bepman	tial, and 60°S exa	t welds observ	ed on the ve	essel ID sur /14/07	pport ring below face during the Examiner: N/A Signature: Examiner: N/A	v nozzle. Se	e coveraç	ge plots	and work	Lev	el: N/A Da	te: N/A

#### **RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet**



Date: 03/23/07

Prepared by: Bret Flesner

Axial scans are performed with a procedure for the examination of vessel shell welds. This procedure has been demonstrated for detection of flaws located throughout the entire weld thickness. Coverage obtained during axial scans is typically limited due to nozzle configuration.

!SI Report #: **R157** 

In the circumferential scan direction the outer 85%-t is examined with the same vessel procedure as above and typically limited due to nozzle configuration. To achieve additional coverage in the circumferential scan direction a second examination is performed with a procedure demonstrated for nozzle inside-radius UT. This procedure has been demonstrated for detection of flaws in the inner 15%-t only. The nozzle inside-radius technique provides additional coverage since the component is modeled and scanning is performed with several search units from the nozzle blend.

Axial Scans	Circumfe	erential Scans
100%-t	Inner 15%-t	Outer 85%-t
Examination Procedure: N-UT-78 Revision 4	Examination Procedure: 54-ISI-850-06	Examination Procedure: N-UT-78 Revision 4
ARequired Examination Volume: 44.92inches	<sup>D</sup> Inner 15%-t Examination Volume: 5.1 <sup>2</sup> inchs	<sup>G</sup> Outer 85%-t Examination Volume: 39.8 <sup>2</sup> Inches.
60°RL axial scan limited: ⊠Yes  □No	<sup>E</sup> Coverage Obtained by Modeling: 100%	60°RL Outer 85%-t Exam Limited: ⊠Yes □No
Description of Limitation: Nozzle Blend Radius & Insulation Support Ring	Inner 15%-t Exam Limited: ⊠Yes ☐No	Description of Limitation: Nozzle Blend Radius
<sup>8</sup> Total Axial Volume Achieved: 24.2 <sup>2</sup> inches	Description of Limitation: Insulation Support Ring Finner 15%-t Volume Achieved: 5.12inchs	*Outer 85-t% Volume Achieved: 7.72inches
<sup>C</sup> Percentage of Axial Coverage: 54% *(36%)  8 + A X 100 = C		mination Coverage: 29% *(18%) ) + A X 100 = J
	Combined Axial and Circumferential Weld Co	overage
	<sup>4</sup> Total Examination Coverage: 42% *	(27%)

 $(C+J) + 2 \times 100 = L$ NOTE: \*Scan coverages shown in parentheses include limitations caused by mirror insulation and insulation support ring.

Date: 03/23/07

Reviewed by: Adam/Conti

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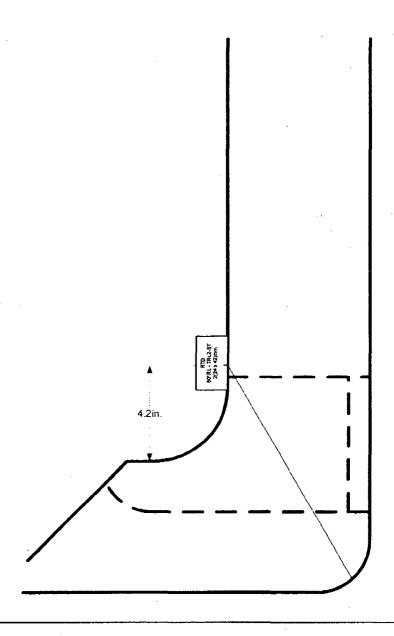
	DESCRIPTION									
Y.	Browns Ferry N5 Nozzle-to-Shell Weld Coverage Plot									
	DRAWN BY	DATE	TITLE	PAGE						
	Bret Flesner	03/23/07	N5BNV-CPS1	4 OF 12						

*RI57* 0003**85** 

Nozzle-to-Vessel weld examination coverage for axial (radial) scan

Total area of examination volume: 44.9 sq. in. (TVA supplied) Total area of examination volume achieved: 24.2 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned.



DESCRIPTION			
Browns Ferr	y N5 Nozzle-t	o-Shell Weld Coverag	e Plot
 DRAWN BY	DATE	TITLE	PAGE
Bret Flesner	03/23/07	N5BNV-CPS2	5 OF 12

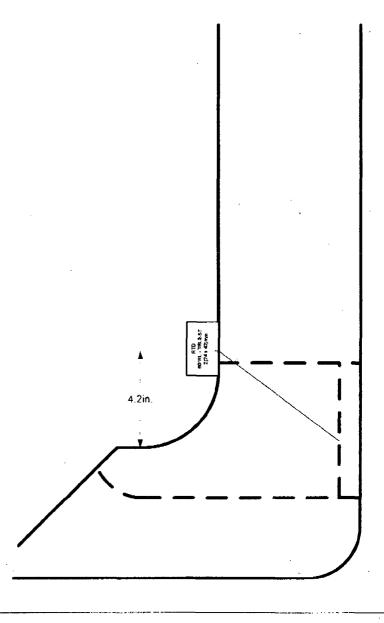
R167 00038**6** 

Nozzle-to-Vessel weld examination coverage for circumferential scan

Total area of examination volume: 44.9 sq. in. (TVA supplied)
Total area of outer 85%-t exam volume achieved: 7.7 sq. in.
Total area of inner 15%-t volume: 5.1 sq. in.
Total area of inner 15%-t exam volume achieved: 5.1 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned.

Inner 15%-t area examined from the blend with Supplement 5 techniques.



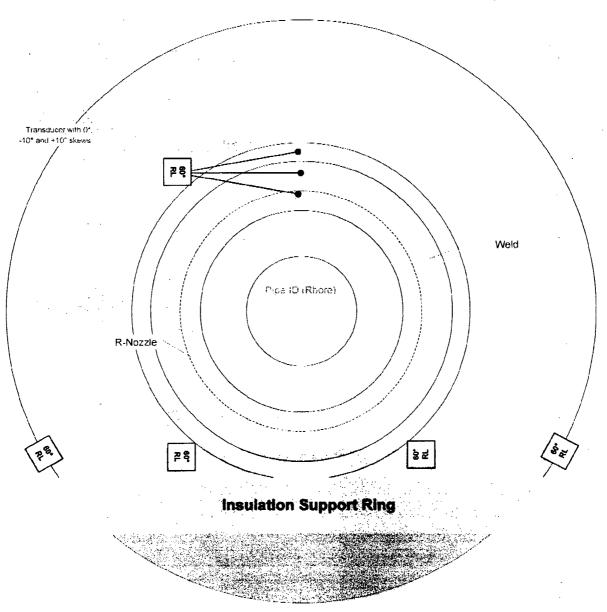
OF SCRIPTION
Browns Ferry N5 Nozzle-to-Shell Weld Coverage Plot

DRAWN BY DATE TITLE PAGE

Bret Flesner 03/23/07 N5BNV-CPS3 6 OF 12

R157

60°RL Scan Limitations
Radial Scan Area (Yellow) = 1365 sq. in.
Area of radial scan limitation (Red) = 438 sq. in.
Circ Scan Area = 229 sq. in.
Area of circ scan limitation = 69 sq. in.
438 / 1365 = 32% radial scan limitation
69 / 229 = 30% circumferential scan limitation
\*above percentages do not include the limitation caused by the nozzle configuration. The total examination coverage achieved combining all limitations is shown on the Coverage Calculation Worksheet.

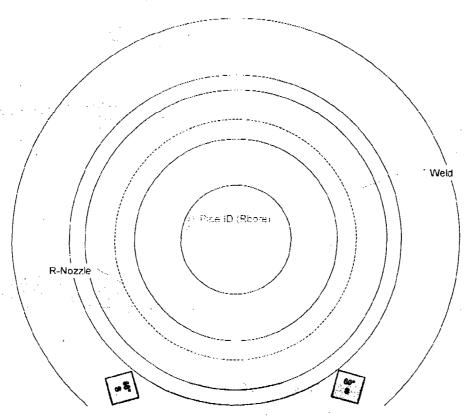


**Mirror Insulation** 

R157

60°S Scan Limitation
60°S Scan area (Yellow) = 527 sq. in.
60°S Scan limitation (Red) = 141 sq. in.
141 / 527 = \*27% 60°S scan limitation
Using Figures 6-3 & 6-4 of the modeling report it is estimated that the 60°S makes up 62% of the inner 15%-t coverage. The 35°S examination was not limited since scanning is performed from the blend.
27 x 62%= \*17% combined 60°S and 35°S scan limitation.

\*above percentages do not include the limitation caused by the nozzle configuration. The total examination coverage achieved combining all limitations is shown on the Coverage Calculation Worksheet.



**Insulation Support Ring** 

**Mirror Insulation** 



# Reactor Pressure Vessel 000389 Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	Site:	Browns	Ferry Nu	uclear	Plant	Unit: 2		Outa	age:	Cycle 14 RFO
Ca	ibration Data Sheet Number:			ISI Re	port Nun	nber:		7	719	7	
Co	mponent ID: N5B-NV			C	Compo	nent Des	scription: N5	Nozzle-	to-Vessel We	eld	
Exa	amination Procedure: 54-ISI-8	50-06		F	Applica	ble SDC	N(s): 30-90-	44520-0	00		
	Ultrasonic Inst	rument					Tra	ansduc	er		
Ма	nufacture: Staveley		s .	Manufa	cture:	KBA		Мо	del: Benchma	ark 8	92-600
Мо	del: Sonic 136			Serial N	lumbe	r: <b>0111P</b> '	v 🗸	Frequency: 2.25 MHz			
Ser	ial Number: 136P1200G0814	55		Size: 0.	.5" x 1.	0"		Sha	pe: Rectang	le	
Lin	earity Sheet No.: LDS1			# of Elements: 1					nfiguration: S	ingle	!
	Instrument Se	ttings		Refracted Angle: 35°					asured Angle	: 35'	•
ш	Range: 15.0" Sound Pat	h □Depth		Skew Angle: -68° / Mi					asured Skew	Ang	le: -68°
RANGE	Delay: 1.27"			Mode: §	Mode: Shear Radius: 3.1"						
Œ	Velocity: 0.127 in / μS			Cable T	Type: F	G-174	Length: 12'	Inte	rmediate Co	nnec	tors: 0
~	Display: Filt2					Verific	ation I	Block			
RCVR	Frequency: 2.25 MHz		Type: CS Rompas		npas	S/N: 99		9-6251			
	Reject: Off			Refle	ector:	1" Radius			2" Radius		adius
	Pulse Width: 222 nS			Sweep			0.65 div.		1.3 div.		div.
	Damping: 500 Ω			Ampli	tude:		80 %FSH			65 %	6FSH
	Mode: ⊠Pulse Echo □D	ual ·		Gain			32.4 dB			32.	4 dB
PULSER	Rep Rate: 2kHz	* > 2			Basic Calibration Block						
₹.	Pulser: ☐150V ☐300V (	Sonic 137 only)		Block ID: BF-18			Material: Clad CS				
	*Pulser voltage adjustable with the	Sonic 137 instrume	nt only.	Thickness: 6.0" with 0.125" Clad			Diameter: Flat				
	The Sonic 136 has a fixe	ed pulser voltage.		Temper	rature:	75 °F		Therm.	SN: VH-952	5	
				Couplar	nt: Ultra	agel II		Batch N	No.: 05325		
		R	eferen	ce Sens	itivity	Inform	nation			•	
Ref	lector: ID Notch	Sweep: 5.0 div	·····		Ampl	itude: 80	%FSH		Gain: 48.2 dl	3	
Cal	In: Date 3/14/07 Time 1435	Check: Date 3/14	/07 Tim	ne 1636	Chec	k: Date N	I/A Time N/A		Out: Date 03/	14/07	7 Time 1830
				Con	nment	5					
	miner: George Chapman nature:	Level: ii	Date:	03/14/07	Examiner: N/A Signature			·	Level:	N/A	Date: N/A
	EVA Review Adam Conti /	Level: III	Date:	03/23/07	,				I		Page 8 of 12



# Reactor Pressure Vessel (00390 Manual Ultrasonic Calibration Data Sheet

Util	lity: TVA	Site: B	Browns Ferr	y Nuclear	r Plant Unit: 2		Outage: (	Cycle 14 RFO	
Cal	libration Data Sheet Number:	N5BNV-CDS2		ISI Re	eport Number:		RIS	57	
Cor	mponent ID: N5B-NV			Comp	onent Description: No	5 Nozzle-t	o-Vessel Weld		
Exe	amination Procedure: 54-ISI-8	850-06		Applic	cable SDCN(s): 30-90	)44520-00	00		
	Ultrasonic Inst	irument			T	ransduc	er		
Ma	mufacture: Staveley		Mar	nufacture:	: KBA	Mod	del: Benchmark 89	92-600	
	del: Sonic 136		Ser	ial Numbr	er: 0111PM	Free	Frequency: 2.25 MHz		
Ser	rial Number: 136P1200G0814	155	Siz	e: 0.5" x 1	1.0"	Sha	pe: Rectangle		
Lin	earity Sheet No.: LDS1		# of	f Elements	is: 1	Соп	nfiguration: Single		
	Instrument Se	ettings	Ref	fracted An	ngle: 35°	Mea	asured Angle: 35°		
w	Range: 15.0" Sound Par	ath Depth	Ske	ew Angle:	+68°	Mea	asured Skew Angl	le: +68°	
RANGE	Delay: 1.27"	· · · · · · · · · · · · · · · · · · ·	Mor	de: Shear	Г	Rad	lius: 3.1"		
<u> </u>	Velocity: 0.127 in / μS		Cat	ole Type:	RG-174 Length: 12	rmediate Connect	tors: 0		
	Display: Filt2				Verif	ication E	ion Block		
RCVR	Frequency: 2.25 MHz		Тур	Type: CS Rompas		S/N: 99-6251			
<u>.                                    </u>	Reject: Off				: 1" Radius		2" Radius		
	Pulse Width: 222 nS			Sweep:	: 0.65 div.		1.3	div.	
!	Damping: 500 Ω		A	Amplitude:	: 80 %FSH		65 %	6FSH	
	Mode: ⊠Pulse Echo □□	Dual		Gain: 32.2 dB			32.2	2 dB	
PULSER	Rep Rate: 2kHz				Basic C	alibratio	n Block		
PU	Pulser: 150V 300V (	(*Sonic 137 only)	Blo	Block ID: BF-18			l: Clad CS		
-	*Pulser voltage adjustable with the	ne Sonic 137 instrumer	nt only.	Thickness: 6.0" with 0.125" Clad			Diameter: Flat		
	The Sonic 136 has a fix			mperature	): 75 °F	Therm.	Therm. SN: VH-9525		
			Сог	uplant: Ult	tragel II	Batch N	No.: 05325		
		Re	ference S	jensitivi	ity Information				
Ref	flector: ID Notch	Sweep: 5.0 div		Amı	plitude: 80 %FSH		Gain: 48.0 dB		
Cal	I In: Date 3/14/07 Time 1440	Check: Date 3/14/0	07 Time 16	19 Che	eck: Date N/A Time N/A	A (	Out: Date 03/14/07	Time 1835	
				Commen	nts				
	aminer: George Chapman	Level: II	Date: 03/14	: 03/14/07 Examiner: N/A Signature			Level: N/A	Date: N/A	
	EVA Review: Adam Copti /	Level: III	Date: 03/2	3/07				Page 9 of 12	



# Reactor Pressure Vessel 000391 Manual Ultrasonic Calibration Data Sheet

	ity. TVA	Site. Bit	wns reny	INDCIGAL	Plant	Unit. Z		Outage	Cycle 14 RFU	
Ca	ibration Data Sheet Number:	N5BNV-CDS3		ISI Re	eport Nun	nber:		R	57	
Co	mponent ID: N5B-NV			Comp	onent Des	scription: N5	Nozzle-t	to-Vessel Weld		
Exa	amination Procedure: 54-ISI-	850-06		Applic	able SDC	N(s): 30-90	44520-00	00		
	Ultrasonic Ins	trument				Tra	ansduc	er	,	
Ма	nufacture: Staveley		Man	ufacture	: KBA		Mod	del: Benchmark	892-600	
Мо	del: Sonic 136		Seria	al Numbe	er: 00X1X	В	Fre	Frequency: 2.25 MHz		
Ser	ial Number: 136P1200G0814	155	Size	: 0.5" x 1	<b>"0</b> .		Sha	pe: Rectangle		
Lin	earity Sheet No.: LDS1		# of	Element	s: 1		Cor	nfiguration: Sing	le	
	Instrument S	ettings	Refr	Refracted Angle: 60°				asured Angle: 5	9°	
ш	Range: 20.0" Sound Pa	ith Depth	Skev	Skew Angle: ± 30-64° /				asured Skew Ar	gle: N/A	
RANGE	Delay: 0.813*		Mod	Mode: Shear Radius: 1						
8	Velocity: 0.127 in / μS		Cabl	е Туре:	RG-174	Length: 12'	Inte	rmediate Conne	ectors: 0	
	Display: Filt2				Verific	cation E	Block	No.		
RCVR	Frequency: 2.25 MHz	Туре	: CS Ro	mpas		S/N: 99	-6251			
	Reject: Off			eflector:	ctor: 1" Radius		•	2"	Radius	
	Pulse Width: 222 nS			Sweep:	ep: 0.6 div.			1.1 div.		
.	Damping: 500 Ω		An	nplitude:		70 %FSH		80	%FSH	
	Mode: ⊠Pulse Echo □l	Dual		Gain:		27.6 dB		2	7.6 dB	
PULSER	Rep Rate: 2kHz	And Andrews		Basic Calibration Block					·	
PUL	Pulser: \$\Bigcap 150V \Bigcap 300V	(*Sonic 137 only)	Block	Block ID: BF-18 Ma			Materia	Material: Clad CS		
	*Pulser voltage adjustable with th	e Sonic 137 instrument	Thick	Thickness: 6.0" with 0.125" Clad Di				Diameter: Flat		
	The Sonic 136 has a fir			perature	: 75 °F		Therm. SN: VH-9525			
			Cour	olant: Ult	ragel II		Batch N	lo.: 05325		
	-	Refe	erence Se	nsitivi	ty Inform	nation				
Ref	lector: ID Notch	Sweep: 5.8 div		Amp	olitude: 80	%FSH	(	Gain: 62.2 dB		
Cal	In: Date 3/14/07 Time 1430	Check: Date 3/14/07	7 Time 165	2 Che	ck: Date N	/A Time N/A	. (	Out: Date 3/14/0	7 Time 1840	
			C	ommen	ts					
							,	•		
	miner: George Chapman nature:	Level: II	ate: 3/14/0		aminer: N	/A		Level; N/A	Date: N/A	
	EVA Review Adam Couti	Level: III	ate: 03/23	/07				Page 10 of 12		



## Reactor Pressure Vessel (3) Manual Ultrasonic Calibration Data Sheet

000392

Utility: TVA		Site: Bro	Site: Browns Ferry Nucle		ear Plant Unit: 2			Outage: Cycle 14 RFO			
Calibration Data Sheet Number: N5BNV-CDS4				ISI Report Number:				R157			
Co	mponent ID: N5B-NV		Component Description: N5 Nozzle-to-Ve				-Vessel Weld				
Exa	amination Procedure: N-UT-78 Re		Applicable SDCN(s): N/A								
	Ultrasonic Instrum	ent		Transducer							
Ma	nufacture: Staveley		Manu	Manufacture: RTD M				lodel: TRL2-ST			
Model: Sonic 136			Seria	Serial Number: 07-304				Frequency: 2 MHz			
Sei	Serial Number: 703I			Angle: 60°				Measured Angle: 61°			
Linearity Sheet No.: LDS4			Mode	Mode: Refracted Longitudinal				Size: 2(24x42)mm			
	Instrument Setting	gs	Focus	Focus: FS~125mm Squi				int Angle: 5°			
Ж	Range: 8.00" ⊠Sound Path □Depth			# of Elements		Shape: Rect. Config		iguration: Dual - SBS			
RANGE	Delay: 1.38"			Cable Type: RG-174 Length: 12' Intermediate Connecto					tors: 0		
_	Velocity: 0.230 in / μS			Verifica				tion Block			
~	Display: Filt 2			Type: CS Rompas			S/N: 99-6251				
RCVR	Frequency: 2.25 MHz			Reflector: 1" Rad		1" Radius		2" Radius			
	Reject: Off			Sweep:	Sweep: 1.2 div.			2.5 div.			
,	Pulse Width: 222 nS			Amplitude: 25 %FSH				80 %FSH			
	Damping: 500 Ω		, , <del></del>	Gain:	n: 52.0 dB			52.0 dB			
œ	Mode: □Pulse Echo  ☑Dual			Basic Calibration Bloc				Block			
PULSER	Rep Rate: 2kHz			Block ID: BF-18				Material: Clad CS			
瓧	Pulser: 150V 300V (*Sonic	: 137 only)	Thick	Thickness: 6.0" with 0.125" Clad			Diameter: Flat				
	*Probe voltage is adjustable with the Sonic 137 instrument. The Sonic 136 has a fixed pulser voltage.			Temperature: 75 °F		Therm. Sh		SN: VH-9525			
1				Couplant: Ultragel II			Batch No.: 05325				
		Refe	erence Se	nsitivit	y Infor	mation					
Reflector: 1/4-t SDH Sweep: 3.8 div			,	Amplitude: 80 %F				Gain: 58.4 dB			
Cal In: Date 3/14/07 Time 1400 Check: Date 3/14/0			14/07 Time	7 Time 1550 Check: Date N/A Time			N/A	/A Out: Date 3/14/07 Time 1829			
Comments											
Zone 1 - Near Surface calibration.											
	Examiner: Thomas Brown Level: II Date: Signature				Examiner: N/A Signature			Level: N/A	Date: N/A		
	EVA Review: Adam Contin	ate: 03/23/	07 .	Page 1							



# Reactor Pressure Vessel (30393) Manual Ultrasonic Calibration Data Sheet

Util	lity: TVA	: TVA Site: Brown		Nuclear	Plant	Unit: 2		Outage: Cycle 14 RF		Cycle 14 RFO
Cal	libration Data Sheet Number: N5BNV		ISI Report Number:					R157		
Component ID: N5B-NV				Component Description: N5 Nozzle-to-Vess					Weld	
Examination Procedure: N-UT-78 Revision 4				Applicable SDCN(s): N/A						
	Ultrasonic Instrumen	it		Transducer						
Mai	inufacture: Staveley		Manı	Manufacture: RTD Me				Model: TRL2-ST		
Model: Sonic 136				Serial Number: 07-304				uency: 2	2 MHz	And the second s
Ser	rial Number: 7031		Angle	Angle: 60°				sured Ar	ngle: 61°	
Line	earity Sheet No.: LDS4		Mode	∋: Refrac	cted Long	jitudinal	Size:	2(24x42	2)mm	
	Instrument Settings	1	Focu	Focus: FS~125mm				nt Angle:	£ 5°	
Щ	Range: 18.0" ⊠Sound Path □I			Elements	<b>5</b> : 2	Shape: Rect	Shape: Rect. Config		iguration: Dual - SBS	
RANGE	Delay: 1.38"		Cable	e Type: F	RG-174	Length: 12	2' Interr	Intermediate Connectors: 0		
LL	Velocity: 0.230 in / μS					Verific	cation Bl	lock		
~	Display: Filt 2		Туре	: CS Ror	mpas		S/N: 99-6	3251		
RCVR	Frequency: 2.25 MHz		Re	eflector:		1" Radius		2" Radius		
	Reject: Off			Sweep:		0.5 div.		1.1 div.		div.
	Pulse Width: 222 nS		Arr	Amplitude:		25 %FSH		80 %FSH		
	Damping: 500 Ω			Gain: 52.0					52.0	0 dB
œ	Mode: ☐Pulse Echo ☑Dual	Language Company		Basic Calibr				Block	(	·
PULSER	Rep Rate: 2kHz			Block ID: BF-18 Mat				iterial: Clad CS		
<u>a</u>	Pulser: 150V 300V (*Sonic 137 only)			Thickness: 6.0" with 0.125" Clad Dia				ameter: Flat		
	Probe voltage is adjustable with the Sonic 1		The Temp	Temperature: 75 °F			Therm. S	herm. SN: VH-9525		
	Sonic 136 has a fixed pulser vo	iltage.	Cour	Couplant: Ultragel II B			Batch No	o.: 0532	25	
		Refe	erence Se	nsitivit	y Inform	nation	-	-		
Reflector: ID Notch Sweep: 6.3 div			,		Amplitud	mplitude: 80 %FSH		Gain: 73.2 dB		
Cal	In: Date 3/14/07 Time 1355 Ch	heck: Date 3/1	14/07 Time	Time 1615 Check: Date N/A Time N/			, N/A	Out: Date 3/14/07 Time 1837		
	Comments									
Zor	ne 2 - Full Volume calibration.									
Examiner: Thomas Brown Level: II Date:			Date: 03/14/		Examiner: N/A Signature			Lev	vel: N/A	Date: N/A
AREVA Review: Adam Confi Level: III Date:			Date: 03/23/	/07		-		<u></u>	<del></del>	Page 12 of 12

### Examination Report, R-080 N7-NV, RPV Nozzle-To-Head Weld



# RPV Nozzle Ultrasonic Examination Summary Sheet

000394

7 (1 ( 2 ( ) )							
Utility: TVA	Site: Browns F	erry Nuclea	ar Plant l	Jnit: 2	Outage: Cycle 14	ISI Repor	t#: <i>R080</i>
Component Numb	er: N7-NV	Componer	nt Description	n: N7 No	zzle-to-Head Weld	System: F	RPV
Examination Proc applicable		ISI-850-06 w	/ revision 11 o / SDCN 30-90		I-UT-6 qualified equipme 00.	ent table.	
Modeling Report:	IR-2003-17 Sec	tion 2		ISO	/ Drawing(s): ISI-0408	3-C01	
Calibration Data S	Sheets: N7NV-	CDS1 N7NV-	CD\$2 N7NV-(	DS3	Coverage sheets:	N7NV-CW N7NV-CP	S1 N7NV-CPS1 S2
Examination Data	Sheets: N7N\	/-ED <b>S1</b>			Exam Results:	⊠No Reporta □Reportable □Geometric	
Code Category: B	-D C	ode Item: B3	3.90	Cod	e Class: 1	Material:	cs
from the head sur reportable indicati In accordance wit	face in both the ons. h UT procedure	radial and o	ircumferentia 	al scan ( N 30-90	ed longitudinal wave edirections. These exact 44520-000 and the read. This examination	minations re ferenced TV	sulted in no
·		N7 Ve	nt Nozzle Me	deling	Parameters		
i	Probe Refra		Probe Ske		Scan Surface		
	45°		±33° to 71		Shell (Head)		
minimum coverage The examination 10CFR 50.55a. To reduced the example the scanning voluments of the scanning voluments of the scanning ASME Section 100 This examination using ASME Section 100 The examination using ASME Section 100 The examination 100 This exami	e requirements procedure require to 60° refracte ination coverageme, examination satisfies the rec	of 10 CFR5 res an addition of 10 CFR5 do longitudinate obtained to coverage, quirements of 10 CFR5	0.55a (b)(2)( ional circumf al wave exam to 69%. Refe and scan lim	xv)(K) werential ninations er to covolitations. tion XI (	e criteria of 10 CFR50, vere achieved to the moscan of the outer 85% were limited due to the rage sketches and were 2001 thru 2003 Adder lures, and equipment	naximum ext b-t which is r he nozzle co vorksheet for nda) and was	ent possible. not addressed in onfiguration which r a description of s performed
request reduced t	he area to be e				50-261/296, 50-327/3 (b) to the weld plus ½		
Prepared by: Bret Signature:		ner Di	ate: 03/02/07	Sig	ewed by: George Char nature: اگر مرک	oman	Date: 03/02/07
Customer: Matt W Signature:	/v.		ate: 3/6/0	7 Sig	nature Land	tunk	Date: 4/13/37
· -							Page 1 of 9



### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

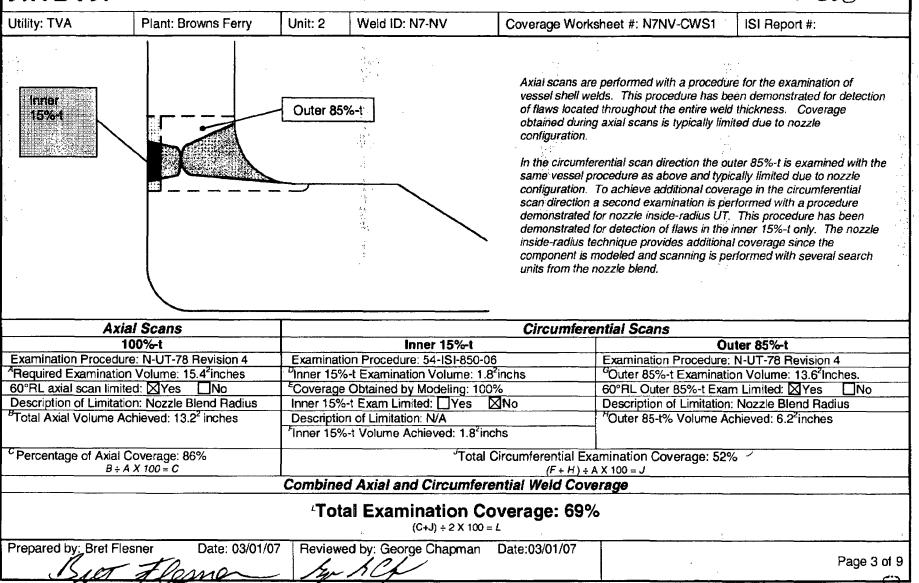


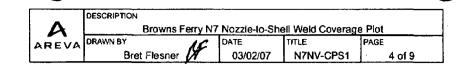
Itility: T\	/A		T S	Site: Browns Feri	v				·	Ti	Jnit: 2		Outage	e: Cycle 14 RI	0
xamina	tion Data	Sheet Number: N					•	ISI Report N							
ompon	ent ID: N	17-NV				1,			nt Description: N7 Nozzle-to-Head Weld						
	:				Exa			ormation						<u>:                                    </u>	
		nber: ISI-0408-C0				W <sub>0</sub>	Locatio	n: Nozzle Bo	ss (Rnozzle)	)		Location			
xamina	tion Limit	ed:⊠Yes □No			·			Sheet Number	er(s): N7NV-	CPS1, N	7NV-CF	PS2, & N	7NV-CW	<u>'S1</u>	
						Scan	Inform	ation				,		<u>, , , , , , , , , , , , , , , , , , , </u>	
aminati	on Proced	ure: N/A	<u></u>	Applicable SDC	N's: N/A	·							urface: N/	<del>,</del>	<del></del>
\ngle/ Mode	Skew	Calibrat	ion Sheet #	Date	Time	Tem	ip T	hermometer S/N:	Scan Gain	Scan L		Recor Indica	dable tion(s)	Indication Data Sheet #	Examiner Initials
I/A /	N/A	•	N/A	N/A	N/A	N/A	4	N/A	N/A	□Yes	□No	□Yes	□No	N/A	N/A
/A /	N/A		N/A	N/A	N/A	N/A	<b>1</b>	N/A N/A ☐Yes ☐No					□No	N/A	N/A
/A /	· N/A		N/A	N/A	N/A	N/A	١	N/A N/A ☐Yes ☐No			□Yes	□No	N/A	N/A	
/A /	N/A		N/A	N/A	N/A	N/A	4	N/A	N/A	□Yes	□No	□Yes	□No	N/A	N/A
aminati	on Proced	ure: 54-ISI-850-06		Applicable SD0	N's: 30-904	4520-00	00			*	-	Scan St	urface: Ol	D Head Surface	
Angle/ Mode	Skew	Calibrat	ion Sheet #	Date	Time	Tem	ıp T	hermometer S/N:	Scan Gain	Scan I	_imited	Recor Indica		Indication Data Sheet #	Examiner Initials
45° / s	±33° - 7	1° N7N	V-CDS1	03/01/07	1341	73°l	F	VH-9525	61.6 dB	□Yes	⊠No	□Yes	⊠No	N/A	GC
N/A /	N/A		N/A	N/A	N/A	N/A	4	N/A	N/A	□Yes	□No	□Yes	□No	N/A	N/A
xaminati	on Proced	ure: N-UT-78 Revisi	on 4	Applicable SD0	N's: N/A							Scan Si	urface: O	D Head Surface	
ingle/ /lode	Zone	Beam Direction	Calibration Sheet #	Date	Time	Tem	ıp T	hermometer S/N:	Scan Gain	Scan I	_imited	Recor	rdable tion(s)	Indication Data Sheet #	Examiner Initials
0°/RL	1	⊠Radial □Circ	N7NV-CDS2	03/01/07	1417	73°	F	VH-9525	80.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	GC
60°/RL	2	⊠Radial □Circ	N7NV-CDS3	03/01/07	1500	73°l	F	VH-9525	84.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	GC
60°/RL	1	□Radial ☑Circ	N7NV-CDS2	03/01/07	1417	73°l	F	VH-9525	80.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	GC
60°/RL	2	□Radial ⊠Circ	N7NV-CDS3	03/01/07	1500	73"	F	VH-9525	84.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	GC
Commer Examin		ed due to nozzle cor	ifiguration. See at	tached coverage s	sheets for de	tails.									
xaminer Signatu	: George C	chapman		Level: II	Date: 03/0	01/07		iner: N/A ature:				· · · · · · · · · · · · · · · · · · ·	Level:	N/A Da	te: N/A
xaminer Signatu	: N/A			Level: N/A	Date: N/A		Exami	iner: N/A ature:					Level:	N/A Da	te: N/A
	eview: Bre	t Flesner	tleme	Level: II	Date: 03/0	01/07									
. 9 · ·····		- U/W/ 1	, v v v v v		<del></del>		<u> </u>								Page 2 of 9



### RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet



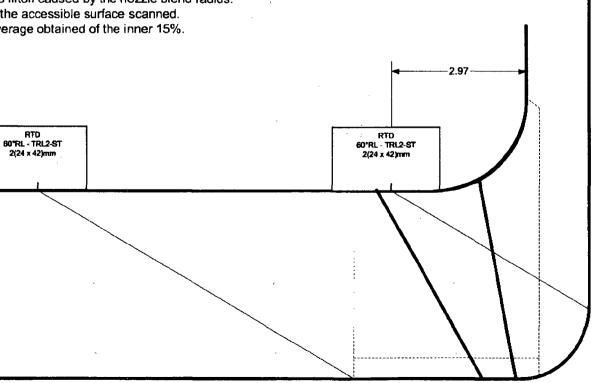




Nozzle-to-Shell weld examination coverage for axial (radial) scan

Total area of examination area: 15.4\* sq. in. (\*Provided by TVA) Total area of examination area achieved: 13.2 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned. 100% coverage obtained of the inner 15%.



Γ		ESCRIPTION				
	A	Ĺ	<b>Browns Ferry N7</b>	Nozzle-to-She	ell Weld Coverage	Plot
۵	REVA	DRAWN BY	10	DATE	TITLE	PAGE
		Bret	t Flesner	03/02/07	N7NV-CPS2	5 of 9

Nozzle-to-Shell weld examination coverage for circumferential scan

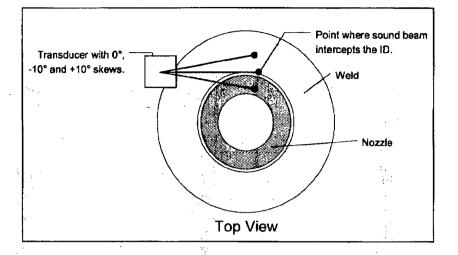
Total area of examination area: 15.4\* sq. in. (\*Provided by TVA)
Total area of outer 85%-t exam area achieved: 6.2 sq. in.
Total area of inner 15%-t area: 1.8 sq. in.
Total area of inner 15%-t exam area achieved: 1.8 sq. in.
Total area of examination area achieved: 8.6 sq. in.

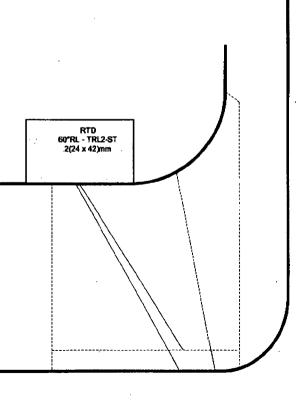
Scan limited due to liftoff caused by the nozzle blend radius.

100% of the accessible surface scanned.

100% coverage obtained of the inner 15%.

Inner 15%-t area examined with Supplement 5 techniques.





000399



## Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet

R080

Util	ity: TVA	Site: B	rowns F	erry		Unit: 2		Outag	e: Cycle 14 RFO		
Cal	ibration Data Sheet Number:	N7NV-CDS1		ISI Report Number:					-		
Cor	mponent ID: N7-NV		, , , ,	C	Compo	nent Description: N	7 Nozzle	to-Head Weld			
Exa	mination Procedure: 54-ISI-8	350-06		1	Applica	ble SDCN(s): 30-9	044520-0	000			
	Ultrasonic Inst	rument				7	ransdu	nsducer			
Mai	nufacture: Staveley			Manufa	cture:	KBA	Mo	Model: Benckmark 892-600			
Мо	del: Sonic 136			Serial Number: 0111PL				equency: 2.25 N	ΛHz ✓		
Ser	ial Number: 136P1200G0814	55 .	j	Size: 0	.5" x 1.	0" .	Sh	ape: Rectangle			
Line	earity Sheet No.: LDS1			# of Ele	ements	: 1	Co	nfiguration: Sin	gle		
	Instrument Se	ottings		Refracted Angle: 45°				easured Angle:	45°		
ш	Range: 10.0" Sound Par	th Depth		Skew A	Angle: :	£33° to 71° ·	Me	easured Skew A	ngle: N/A		
RANGE	Delay: 0.556"			Mode:	Shear		dius: Flat				
Ľ	Velocity: 0.127 in / μS			Cable 1	Type: F	RG-174 Length: 12	' Int	ermediate Conr	nectors: 0		
<b> </b>	Display: Filt2					Veri	ication	Block	-		
RCVR	Frequency: 2.25MHz			Туре: С	CS Ror	npas	S/N: 9	9-6251			
	Reject: Off		Refl	ector:	1" Radius	<b>3</b>	2	" Radius			
	Pulse Width: 222nS		Sı	weep:	1.0 div.		·	2.0 div.			
	Damping: 500Ω			Ampl	itude:	60 %FSH		8	0 %FSH		
	Mode: ⊠Pulse Echo □□	Dual			Gain:	23.6 dB			23.6 dB		
PULSER	Rep Rate: 2kHz			Basic Calib				libration Block			
J.	Pulser: 150V 1300V (	*Sonic 137 only)		Block II	D: BF-	19	Material: CS				
	*Pulser voltage adjustable with the	e Sonic 137 instrumer		Thickne	ess: 4.0	)2"	Diame	ter: Flat			
	The Sonic 136 has a fix	ed pulser voltage.		Tempe	rature:	66 °F	Therm	. SN: VH-9525			
				Coupla	nt: Ultr	agel II	Batch	No.: 05325			
		Re	eferenc	e Sen	sitivit	y Information					
Ref	lector: ID Notch	Sweep: 5.6 div	/		Amp	litude: 80 %FSH		Gain: 38.6 dB			
Cai	In: Date 03/01/07 Time 0945	Check: Date 03/0	1/ <b>07 T</b> in	me 13 <b>40</b>	Chec	k. Date N/A Time N	′A	Out: Date 03/01	/07 Time 1805		
				Cor	nment	·s					
									•		
	miner: George Chapman nature:	. Level: II	Date:	ate: 03/01/07 Examiner: N/A Signature			Level: N/A	Date: N/A			
	EVA Review: Bret Flesner nature:	Level: II	Date: (	ate: 03/01/07				Page 6 of 9			



# Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet

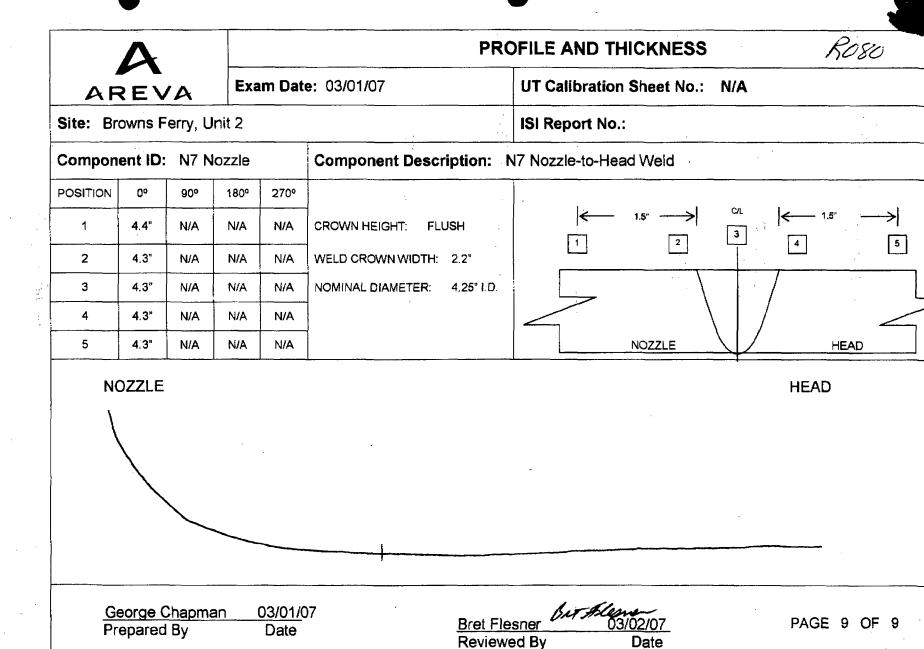
R080

Utili	ty: TVA	Site: Bro	owns Ferry	Ferry Unit: 2			Outage: 0	Cycle 14 RFO			
Cal	bration Data Sheet Number: N7NV	/-CDS2		ISI Rep	oort Nun	nber:		· · · · · · · · · · · · · · · · · · ·			
Cor	nponent ID: N7-NV			Compo	nent De	scription: N7	Nozzle-to-l	Head Weld			
Exa	mination Procedure: N-UT-78 Rev	rision 4 🗸		Applica	able SDC	CN(s): N/A			,		
	Ultrasonic Instrume	ent				Tra	ansducer				
Mai	nufacture: Staveley		Manu	facture:	RTD		Model	Model: TRL2-ST			
Мо	del: Sonic 136		Seria	Numbe	er: 07-30	4 💉	Freque	ency: 2 MHz			
Ser	ial Number: 136P1200G081455		Angle	: 60°		.*	Measu	red Angle: 61°			
Line	earity Sheet No.: LDS1		Mode	Mode: Refracted Longitudinal			Size: 2	2(24x42)mm	V		
	Instrument Setting	S	Focus	s: FS~12	25mm	w.	Squint	Angle: 5° 🧳			
ш	Range: 5.00" Sound Path	<b></b> □Depth	# of E	lements	s: 2	Shape: Rect	. Config	uration: Dual -	SBS		
RANGE	Delay: 1.38"		Cable	Type: I	RG-174	Length: 1	2' Interm	ediate Connect	ors: 0		
<sup>Œ</sup>	Velocity: 0.230 in / μS					Verific	cation Blo	ock			
	Display: Filt 2		Type:	CS Ro	mpas		S/N: 99-6	251			
RCVR	Frequency: 2.25 MHz	Re	flector:		1" Radius		2" Ra	adius			
	Reject: Off		Sweep:		2.0 div.		4.0 div.				
	Pulse Width: 222 nS /		Am	Amplitude: 25 %FSH				80 %FSH			
	Damping: 500 Ω 🔑 🔠		'	Gain: 51.4 dB				51.4	l dB		
æ	Mode: □Pulse Echo □□Dual	* 1:1		Basic Calibration Block							
PULSER	Rep Rate: 2kHz		Block	Block ID: BF-19 / Mat			Material: (	Material: CS			
۵	Pulser: ☐150V ☐300V (*Sonic	137 only)	Thick	ness: 4.	02"		Diameter:	Flat			
	Probe voltage is adjustable with the Sonic		The Temp	erature	66 °F		Therm. Si	N: VH-9525			
	Sonic 136 has a fixed pulser	voitage. 🔐	Coup	lant: Ult	ragel II		Batch No.	: 05325			
		Ref	erence Se	nsitivit	y Inforr	nation					
Ref	lector: 1/4-t SDH /	Sweep: 4.0 d	iv		Amplitud	de: 80 %FSH		Gain: 65.2 dE	<b>3</b>		
Cal	In: Date 03/01/07 Time 0905	Check: Date 0	3/01/07 Time	1416	Check: E	Date N/A Time	N/A	Out: Date 03/0	1/07 Time 1755		
			Co	ommen	ts						
Zon	e 1 - Near Surface calibration.										
	miner: George Chapman	Level: ii	Date: 03/01/		caminer: gnature	N/A		Level: N/A	Date: N/A		
	EVA Review: Bret Flésner	Level: II	Date: 03/01/	07					Page 7 of 9		
Jig	nature: Brot Aleman								go , 0, 0		



# Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet ROSO

Util	lity: TVA	Site: Bro	owns Ferry	Ferry Unit: 2				Outage: Cycle 14 RFO		
Ca	libration Data Sheet Number: N7	NV-CDS3		ISI Re	eport Nur	mber:				
Co	mponent ID: N7-NV			Comp	onent De	scription: N7	Nozzle-to	-Head Weld		
Exa	amination Procedure: N-UT-78 Re	evision 4		Applic	cable SDC	CN(s): N/A				
	Ultrasonic Instrum	nent				Tra	ansduce	ucer		
Ма	nufacture: Staveley		Manu	facture	: RTD		Mode	el: TRL2-ST	·	
Мо	del: Sonic 136		Seria	Numb	er: 07-30	4	Frequ	uency: 2 MHz		
Ser	rial Number: 136P1200G081455		Angle	e: 60°			Meas	sured Angle: 6	1°	
Lin	earity Sheet No.: LDS1		Mode	Mode: Refracted Longitudinal				2(24x42)mm		
	Instrument Settin	gs	Focus	s: FS~1	125mm		Squir	nt Angle: 5°		
w_	Range: 12.0" Sound Path	□Depth	# of E	lement	ts: 2	Shape: Rect	t. Confi	guration: Dua	I - SBS	
RANGE	Delay: 1.38"		Cable	Туре:	RG-174	Length: 1	2' Interr	nediate Conne	ectors: 0	
l <sup>œ</sup>	Velocity: 0.230 in / μS					Verific	cation B	ock		
	Display: Filt 2		Type:	CS Ro	ompas		S/N: 99-6	6251		
RCVR	Frequency: 2.25 MHz		Re	flector:	:	1" Radius		2"	Radius	
"	Reject: Off			Sweep:	:	0.8 div.		1.6 div.		
	Pulse Width: 222 nS		Am	Amplitude: 25			25 %FSH		%FSH	
	Damping: 500 Ω	_		Gain:		52.0 dB		52	2. <b>0</b> dB	
<u>~</u>	Mode: ☐Pulse Echo ☑Dual	- Marie			<u> </u>	Basic Ca	libration	Block		
PULSER	Rep Rate: 2kHz		Block	Block ID: BF-19			Material:	CS		
ď	Pulser: 150V 300V (*Soni	ic 137 only)	Thick	ness: 4	3.02"		Diameter: Flat			
	*Probe voltage is adjustable with the Sor		Temp	erature	e: 66 °F		Therm. S	SN: VH-9525		
	Sonic 136 has a fixed pulse	er voltage.	Coup	lant: Ul	tragel II		Batch No	o.: 05325		
		Ref	erence Se	nsitivi	ity Inforr	nation	***************************************			
Ref	lector: ID Notch	Sweep: 6.2 div			Amplitud	e: 80 %FSH		Gain: 61.8	dB ·	
Cal	In: Date 03/01/07 Time 0927	Check: Date 03/	01/07 Time	1459	Check; D	ate N/A Time	N/A	Out: Date 03	3/01/07 Time 1800	
Zor	ne 2 - Full Volume calibration.		Cc	ommei	nts					
-	nminer: George Chapman nature: May 1919	Level: II	Date: 03/01		xaminer: ignature	N/A		Level: N/A	Date: N/A	
	EVA Review: Bret Flesner nature: Set Flesne	Level: II	Date: 03/01	/07					Page 8 of 9	



### Examination Report, R-117 N9-NV, RPV Nozzle-To-Head Weld



#### RPV Nozzle Ultrasonic Examination Summary Sheet

000430

AREV	A			· · · · ·			
Utility: TVA	Site: Brow	ns Ferry Nuclear Pl	ant Ur	nit: 2	Outage: Cyc	e 14	ISI Report #: RII7
Component Nui	mber: N9-NV	Component De	escription: N9 Nozzle t	o Vess	sel Weld		System: RPV
Code Category:	B-D	Code Item: B3	.90	Cod	e Class: 1		Material: CS
ISO / Drawing(s	): 2-CHM-2046	-C-01 & 2-ISI-0272-(	C-01				
Procedure Nu	ımber Pr	ocedure Revision	SDCN		Pr	ocedure l	Misc. Info
N-UT-78		4	NA	Rev	rision 11 of the	PDI-UT-6	qualified equipment table
N-UT-79	)	1	NA	Re	vision 5 of the F	PDI-UT-7	qualified equipment table
54-ISI-85	0	06	30-9044520-000		Modeling Re	eport: IR-	2006-236 Section 2
	Calibration She	eets	Exam Data Sheets	Inc	dication Data Sheets	[No.1	Exam Results
N9NV-CDS1	N9NV-CDS6	N9NV-CDS11	N9NV-EDS1	1	N9NV-IDS1		Recordable Indications ordable Flaw Indications
N9NV-CDS2	N9NV-CDS7	N9NV-CDS12	N9NV-EDS2	1	N9NV-IDS2		ceptable flaw evaluation)
N9NV-CDS3	N9NV-CDS8	<del></del>				⊠Rep	ortable Flaw Indications
N9NV-CDS4	N9NV-CDS9	***	<del></del>	<del>                                     </del>		(una	acceptable flaw evaluation)
N9NV-CDS5	N9NV-CDS10			+ -		-	
the recording procedure N-L examination a report.	of 1 reportable JT-79 Revision Ind indication of with UT proce minations wer	e flaw indication. So a 1. Final indication data sheets along edure 54-ISI-850-0 e performed. The	Subsequent indication characterization a with the flaw characterization and the reference se examinations restern Return Nozzle	on dim and ac teriza ed TV/ sulted	ensioning was ceptance evaluation and evaluation A / EPRI mode in no reportation	s performuluation in particular in work in the particular in the particular indicates	s provided on the orksheet for this ISI ort the following
	Probe	Refracted Angle	Probe Skew		Scan Surfac		
		35°S	±35°		Blend Radiu		
		35°S	±52°		Blend Radiu	S	
minimum cove examination p 10CFR 50.556 examination v volume, exam This examinat	erage requirent rocedure requal. The 60°RL olume obtained ination coveration satisfies the	nents of 10 CFR50 ires an additional examinations wered to 40%. Refer toge, and scan limit are requirements of	0.55a (b)(2)(xv)(K) v circumferential scar e limited due to the o coverage sketch(s ations.	vas ac n of the nozzle s) and 2001 (	hieved to the e outer 85%-te configuration worksheet for thru 2003 Add	maximu which is which i r a desc	b)(2)(xv)(G) and the m extent possible. The s not addressed in reduced the ription of the scanning and was performed using
Note: See TV request reduc	A Request for ed the area to	Relief PDI-1 and be examined per	IWB-2500-7 (a) and	50-26 I (b) to	51/296, 50-32 the weld plus iewed by: Ada	s ½" on o	<del></del>
Signature: L	ne Fle	me	ate: 3//7/07	Sign	ature.	60	Date: 3/11/07
Customer: Ma Signature:	Mai	i Welder D	ate: 3/19/07	1	ature:	me_	Date: 5/(7/37
I	1.0	rent exercision from the contract of the contr					Page 1 of 27

référence NOI# 42014-049 grif 6/1/07



#### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

R117

Utility: T\	/A		S	ite: Browns Fer	ry Nuclear F	Plant				Jnit: 2		Outage	e: Cycle 14 F	RFO
		Sheet Number: No	9NV-EDS1					lumber: R!						
Compone	ent ID: N	19-NV					Component	Description:	N9 Noz	zle-to-V	essel We	ld .		
					Exa		Information							
		nber: 2-CHM-2046		'2-C-01			cation: Nozzle Bo			Lo	Location	: Nozzle	TDC	
Examinat	tion Limite	ed:⊠Yes □No					age Sheet Numb	er(s): N9NV-	CWS1					·
						Scan Inte	ormation							·
Examination	on Procedi	ure: 54-ISI-850-06		Applicable SD	CN's: 30-904	4520-000					Scan Su	ırface: O	D Blend Radiu	is
Angle/ Mode	Skew	Calibrat	ion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Li	mited	Recor		Indication Data Sheet	
35°/s	-35°	N9N	V-CDS1	03/15/07	1210	81°F	VH-9520	85.6 dB	☐Yes	⊠No	☐Yes	⊠No	N/A	BF
35°/s	+35°	N9N	V-CDS2	03/15/07	1220	81°F	VH-9520	85.6 dB	□Yes	⊠No	□Yes	⊠No	. N/A	8F
35°/s	-50°	N9N	V-CDS3	03/15/07	1230	81°F	VH-9520	80.6 dB	□Yes	⊠No	□Yes	⊠No	N/A	BF
35°/s	+50°	N9N	V-CDS4	03/15/07	1240	81°F	VH-9520	80.6 dB	□Yes	⊠No	□Yes	⊠No	N/A	BF
Examinati	on Proced	ure: N/A		Applicable SD	CN's: N/A	•					Şcan Su	ırface: N	/A	
Angle/ Mode	Skew	Calibrat	ion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	imited	Recor Indicat		Indication Data Sheet	Examiner # Initials
N/A /	N/A		N/A	N/A	N/A	N/A	N/A	N/A	∐Yes	□No	☐Yes	□No	N/A	N/A
N/A /	N/A		N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	∐Yes	□No	N/A	N/A
Examinati	on Proced	ure: N-UT-78 Revisi	ion 4	Applicable SD	CN's: N/A						Scan Su	ırface: O	D Vessel Shel	ı
Angle/ Mode	Zone	Beam Direction	Calibration Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan L	imited	Recor Indicat		Indication Data Sheet	
60°/RL	1	⊠Radial □Circ	N9NV-CDS5	03/15/07	1250	81°F	VH-9520	80.0 dB	⊠Yes	□No	⊠Yes	□No	N9NV-IDS	1 BF
60°/RL	2	⊠Radial □Circ	N9NV-CDS6	03/15/07	1330	81°F	VH-9520	84.0 dB	⊠Yes	□No	⊠Yes	□No	N9NV-IDS	t BF
60°/RL	1	☐Radial ⊠Circ	N9NV-CDS5	03/15/07	1250	81°F	VH-9520	80.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	BF
60°/RL	2	□Radial ⊠Circ	N9NV-CDS6	03/15/07	1330	! 81°F	VH-9520	84.0 dB	⊠Yes	□No	□Yes	⊠No	N/A	BF
Commen	ts: (Detec	tion Examination)												
Recordabi	le indicatio	n observed during th	ne 60°RL examinat	ion. See indicatio	on data sheet	s for additi	onal details							
•		J												
In addition	to the typ	ical scan limitation c	aused by nozzle in	terference an ins	ulation suppo	rt ring and	associated lug limit	ted examination	on coverag	je. See a	attached c	overage	sheets for add	itional details.
F	Deat Class			1	D-1 00/4	E/07 F	ALIA					T 11	N/A I D	and a Rick
Signatu	Bret Flesr	e Kron D	lesne	Level: II	Date: 03/1		xaminer: N/A Signature:					Level:	N/A.	ate: N/A
Examiner:		May /	ana	Level: N/A	Date: N/A		xaminer: N/A					Level:	N/A D	ate: N/A
Signatur		. n		20101.14//1			Signature:							- W. C. 1971
AREVA R	eview: Ada	un Conti	<i></i>	Level: III	Date: 03/1		- <u> </u>					_L	<u></u>	
Signatur	re 🤊	Tyona / TE	7		<u>.</u>									



#### Ultrasonic Examination Data Sheet Nozzle-to-Shell Weld Examination

RIIT

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•																
Utility: T\	/A			Si	te: Browns Ferr	y Nuclear I	Plant				nit: 2	, (	Outage	: Cycle 14	RFO	
Examina	tion Data	She	et Number: N	9NV-EDS2				ISI Report N	lumber: 🤾	117						
Compone	ent ID: N	9-N	IV					Component	Description:	N9 Nozz	le-to-V	essel Weld				
						Exa		Information								
				6-C-01, 2-ISI-027	'2-C-01			ation: Nozzle Bo			Lo	Location:	Nozzle	TDC		
Examina	tion Limite	ed:	∐Yes ⊠No					ge Sheet Numb	er(s): N9NV-	<u>-CWS1</u>						
							Scan Info	rmation							: :	
Examinati	on Procedi	ure:	N-UT-79 revision	n 1	Applicable SD0	CN's: N/A						Scan Surf	ace: OD	Vessel Sh	ell	
Angle/ Mode	Skew		Calibrat	ion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Lin	nited	Recorda Indicatio		Indication Data She		Examiner Initials
45° / s	N/A		N9NV-CDS	7 / N9NV-CDS8	03/16/07	0940	79°	VH-9520	N/A	□Yes	⊠No	⊠Yes [	□No	N9NV-ID	S2	BF
60°/s	N/A		N9NV-CDS9	/ N9NV-CDS10	03/16/07	1030	79°	VH-9520	N/A	□Yes	⊠No	⊠Yes	□No	N9NV-∤D	S2	BF
0°/L	N/A		N9N/	/-CDS11	03/16/07	0915	79°	VH-9520	N/A	□Yes	⊠No	□Yes [	⊠No	N/A		BF
N/A /	N/A			N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes [	□No	N/A		N/A
Examinati	on Proced	ure:	N/A		Applicable SD0	CN's: N/A						Scan Surf	ace: N/A	4		
Angle/ Mode	Skew		Calibrat	ion Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Li	mited	Recorda Indicatio		Indication Data She		Examiner Initials
N/A /	N/A			N/A	N/A	N/A	i N/A	N/A	N/A	□Yes	□No	☐Yes [	□No	N/A		N/A
N/A /	N/A			N/A	N/A	N/A	N/A	N/A	N/A	☐Yes	□No	☐Yes [	□No	N/A	Ţ	N/A
Examinati	ion Procedi	ure:	N-UT-78 revisio	n 4	Applicable SD0	CN's: N/A						Scan Surf	ace: OD	Vessel Sh	nell	
Angle/ Mode	Zone	В	eam Direction	Calibration Sheet #	Date	Time	Temp	Thermometer S/N:	Scan Gain	Scan Li	mited	Recorda Indicatio		Indication Data She		Examiner Initials
60°/RL	1	Ø	Radia⊨ ⊟Circ	N9NV-CDS12	03/16/07	0920	79°	VH-9520	. 80.0	⊠Yes	□No	⊠Yes I	□No	N9 <b>N</b> V-ID	S1	GC
60°/RL	2	×	Radial Dirc	N9NV-CDS13	03/16/07	0930	79°	VH-9520	84.0	⊠Yes	□No	⊠Yes [	□No	N9NV-ID	S1	GC
N/A	N/A		Radial Circ	N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A		N/A
N/A	N/A		Radial □Circ <sup>!</sup>	N/A	N/A	N/A	N/A	N/A	N/A	□Yes	□No	□Yes	□No	N/A		N/A
Commen	ts: (Sizing	Exa	amination)		-t				<del></del>			L				
				component thicknes verify indication loca			as required	by the examinatio	n procedure.		÷				-	
Examiner	: Bret Flesr	ner	1		Level: II	Date: 03	/16/07	Examiner: N/A					leve	I: N/A	Date: N	i/A
Signatu	re:		Sret Fo	Elesne-	·			Signature:								
	George C	hapı	man /	11/	Level: II	Date: 03		Examiner: N/A					Leve	l: N/A	Date: N	/A
Signatu	re:	D:	14 /9G	Sy	1 1 10	:   Data 22		Signature:						L		
AKEVAR	eview: A	albu C	JORT / L	<u></u>	Level: III	Date: 03	/16/06									



### N9 Nozzie-to-Shell Weld 60°RL Indication Data Sheet (N9NV-IDS1)

R117

			Indi	cation	Recording (I	Detection Exa	amination)			
Scan Direction	Amplitude	L <sub>1</sub>	L <sub>max</sub>	L <sub>2</sub>	Metal Path (W <sub>1</sub> )	Metal Path (W <sub>max</sub> )	Metal Path (W <sub>2</sub> )	W <sub>1</sub>	W <sub>max</sub>	W <sub>2</sub>
Radial	115 % FSH	12"	21.0"	22.2"	6.30"	6.84" (3.42" depth)	8.28"	4.5"	5.5"	6.6"

#### **Examiner Notes:**

- Echo-dynamic characteristics typical of a fabrication type discontinuity (Porosity / Slag)
  - Numerous peaks at varying depths
  - o Broad wide signal presentation.
- Recorded length position provided unique and defined start and end positions with >10:1 S/N ratio. Similar responses observed intermittently 360° below recordable levels (≤ 20% FSH)
- "W" dimensions measured from nozzle boss (Rnozzle)
- "W" and metal path distances shifts slightly along length indicating potential misorientation.
- Indication amplitude recorded at Zone 2 scanning sensitivity
- Indication confirmed with Zone 1 calibration at ~ 125% FSH at scan sensitivity
- No distinct tip diffracted signals
- Nozzle blend radius interference prevents confirmation with 28° shear component or 0° transducer
- Length Sizing information is an estimate only. See indication data sheet N9NV-IDS2 for length and depth sizing information

Prepared By: Bret Flesner Signature: Level: II	Date: 03/16/0/	ewed by: Adam Conti	Level: III	Date: 03/16/07
				Page: 4 of 27



#### N9 Nozzle-to-Shell Weld 45° & 60° Shear Wave Indication Data Sheet (N9NV-IDS2)

R117

Indicat	ion Length I	nformation (	Note 1)	Indication Depth Information (Note 2)					
, Probe	L <sub>1</sub>	L <sub>2</sub>	Total Length	Upper Tip Signal (depth)	Lower Tip Signal (depth)	Through Wall Extension (TWE) (Note 3)			
45° shear	12.1"	23.1"	11.0"	3.01 (Note 4)	4.07"	1.06"			
60° shear	12.1"	22.2"	10.1"	2.97"	4.04"	1.07"			

Note 1: Indication length information from 45° shear wave was limited due to nozzle blend radius interference. 60° shear wave data used for flaw length evaluation purposes.

Note 2: This indication does not provide typical upper and lower tip signal responses. It provided signal responses indicative of multiple small fabrication type defects. UT system resolution and indication proximity does not allow for separation measurements.

Note 3: Flaw depth identifies the shallowest and deepest extremities of the bounded flaw as defined in ASME Section XI, IWA-3000. "W" and metal path distances shift slightly along length of the indication indicating that the flaw orientation is slightly non-parallel with the pressure retaining surface. The flaw dimensions (length and TWE in bold) identified above define the bounding rectangle that fully contains the area of the flaw in accordance with IWA-3300 and Fig. IWA-3310 through IWA-3390. The TWE extremity (1.06") of this bounding rectangle is conservative compared to an estimated physical TWE of ≤ 0.40".

Note 4: Upper tip signal difficult to obtain with 45° shear due to nozzle blend radius interference. Upper tip extremity confirmed with 60° shear.

Prepared By: Bret Flesner Signature: But Flesner Level: II	Date: 03/16/07	Reviewed by: Adam Conti Signature:	Level: III	Date: 03/16/07	
				Page: 5 of 27	



### N9 Nozzle-to-Shell Weld Flaw Characterization and Evaluation Worksheet

RIIT

Flaw Evaluation Parameters	
Nozzle ID	N9
*Thickness (UT measured OD to clad base metal interface)	6.30"
S1 dimension (OD to upper flaw tip)	3.01"
S2 dimension (clad base metal interface to lower flaw tip)	2.23"
*d	0.55"
Flaw Characterization	Subsurface Planar Flaw (S > 0.4d)
*Flaw Length (ℓ)	10.10"
*Flaw Depth (2a)*	1.10"
α/ℓ	0.054
*a / t %	8.7%
*Allowable α / t % (0.05 α/ ℓ)	2.2%

Code Year Used: ASME Code, Section XI, 2001 with Addenda thru 2003

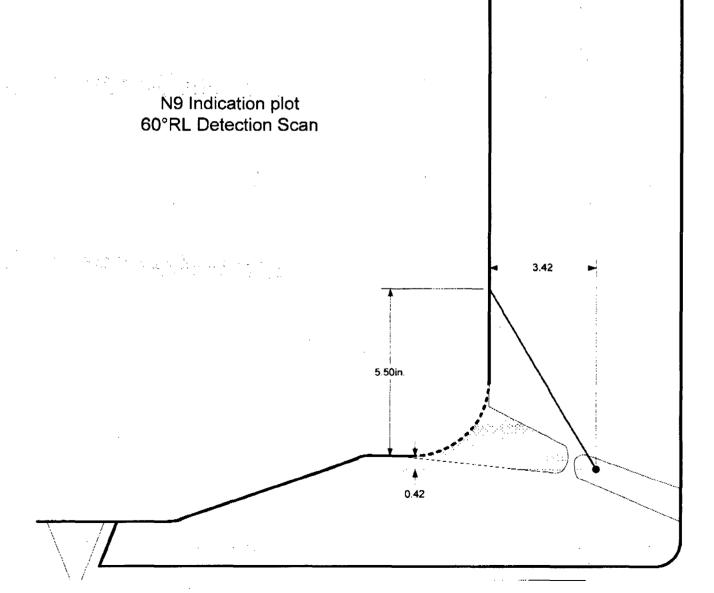
\*Rounded in accordance with IWA-3200.

This flaw exceeds the acceptance criteria defined in IWB-3512-1.

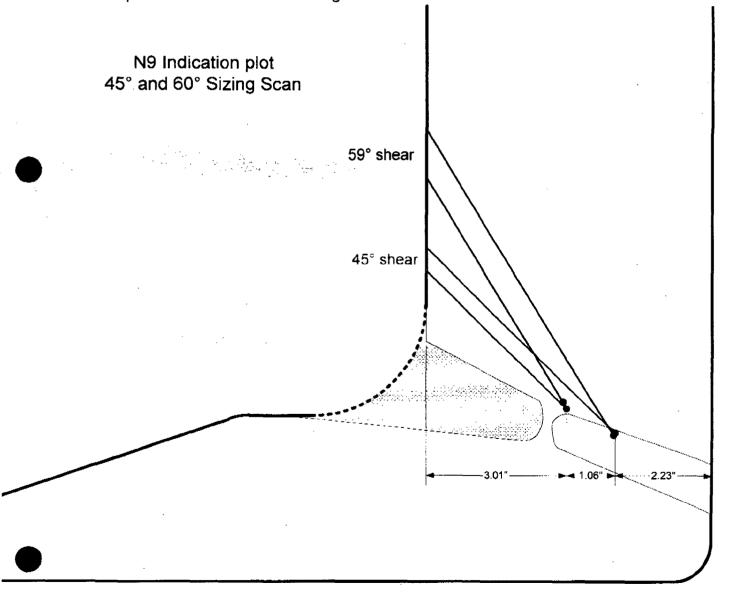
Flaw orientation is characterized as slightly non-parallel with the pressure retaining surface (see indication plot on page 9). The flaw dimensions identified above define the bounding rectangle that fully contains the area of the flaw in accordance with IWA-3300 and Fig. IWA-3310 through IWA-3390. The TWE extremity (1.06") of this bounding rectangle is conservative compared to an estimated physical TWE of  $\leq 0.40$ ".

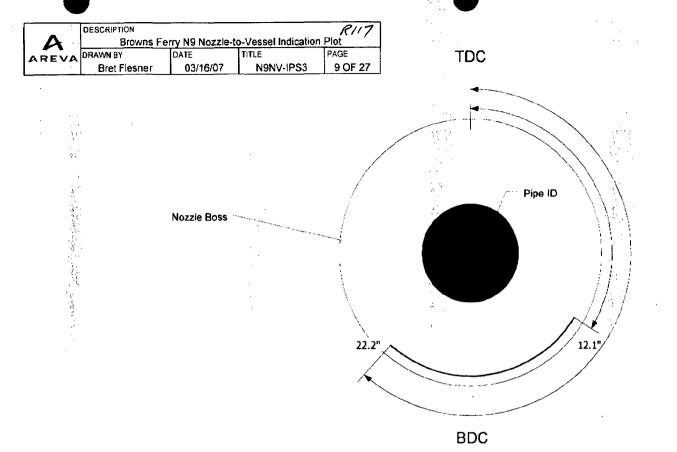
Prepared by: Adam Conti,	Level: III	Date: 03/17/07	Reviewed By: Bret Flesner Signature: Sur Flesner	Level: II	Date: 03/17/07	
					Page: 6 of 27	دت

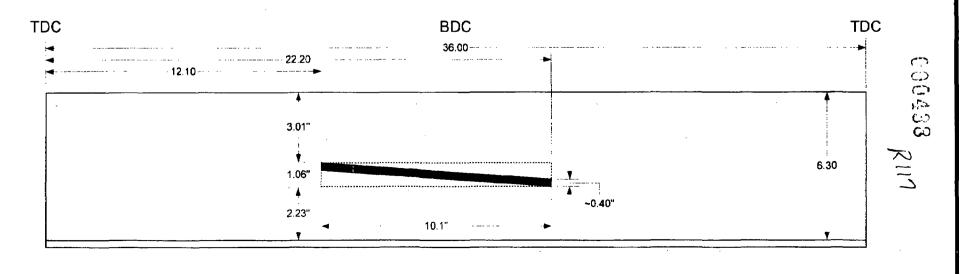
Weld profile is a best effort rendering.



Weld profile is a best effort rendering.

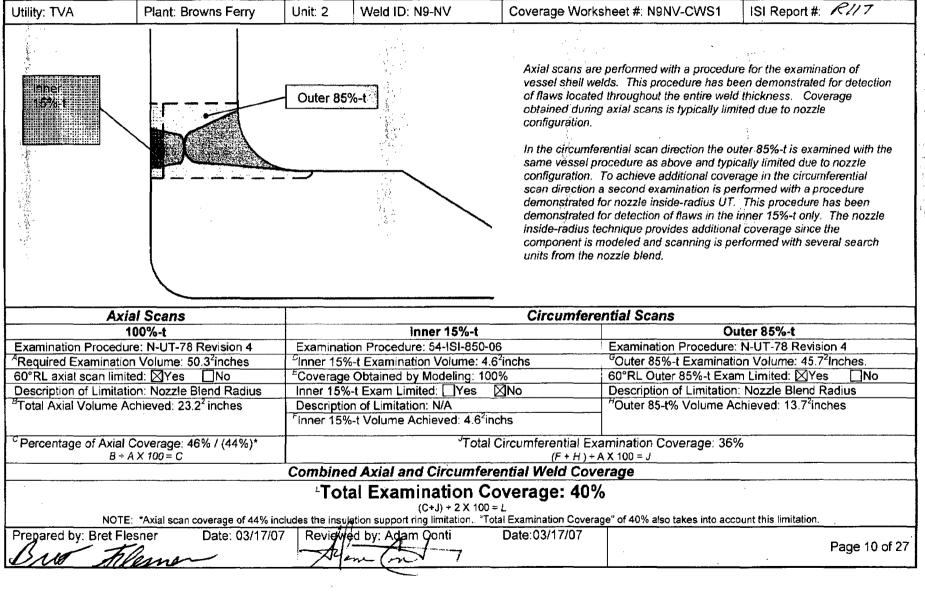








### RPV Nozzle-To-Shell Weld Ultrasonic Examination Coverage Calculation Worksheet



Browns Ferry N9 Nozzle-to-Vessel Weld Coverage Plot

ORAWN 8Y

Bret Flesner

DESCRIPTION

Browns Ferry N9 Nozzle-to-Vessel Weld Coverage Plot

TITLE

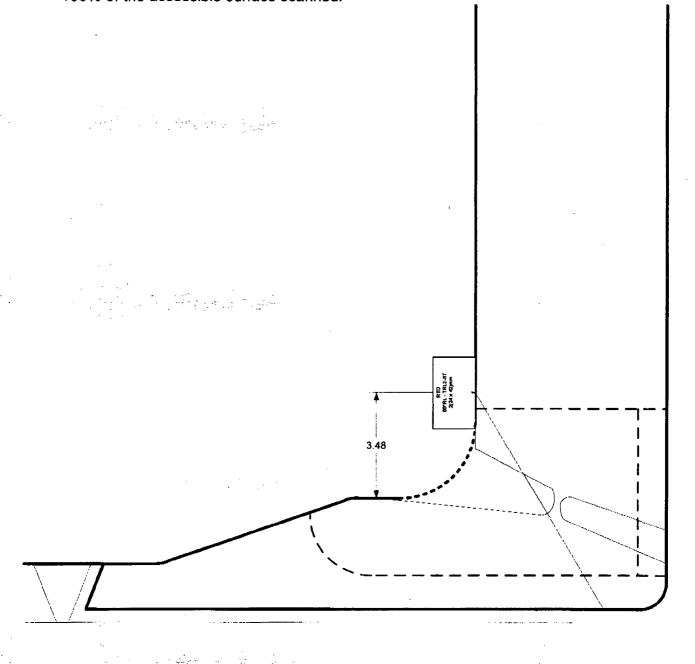
PAGE

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Nozzle-to-Vessel weld examination coverage for axial (radial) scan

Total area of examination volume: 50.3 sq. in. Total area of examination volume achieved: 23.2 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned.



RIIT

DESCRIPTION
Browns Ferry N9 Nozzle-to-Vessel Weld Coverage Plot

DRAWN BY
DATE
Bret Flesner.

DATE
DATE
N9NV-CPS2
12 OF 27

Nozzle-to-Vessel weld examination coverage for circumferential scan

Total area of examination volume: 50.3 sq. in.

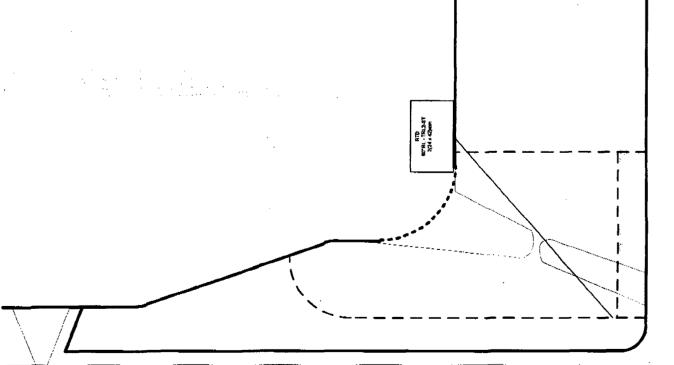
Total area of outer 85%-t exam volume achieved: 13.7 sq. in.

Total area of inner 15%-t volume: 4.6 sq. in.

Total area of inner 15%-t exam volume achieved: 4.6 sq. in.

Scan limited due to liftoff caused by the nozzle blend radius. 100% of the accessible surface scanned.

inner 15%-t area examined from the blend with Supplement 5 techniques.



RI17

Browns Ferry N9 Nozzle-to-Vessel Weld Coverage Plot

DRAWN BY

Bret Flesner

DATE

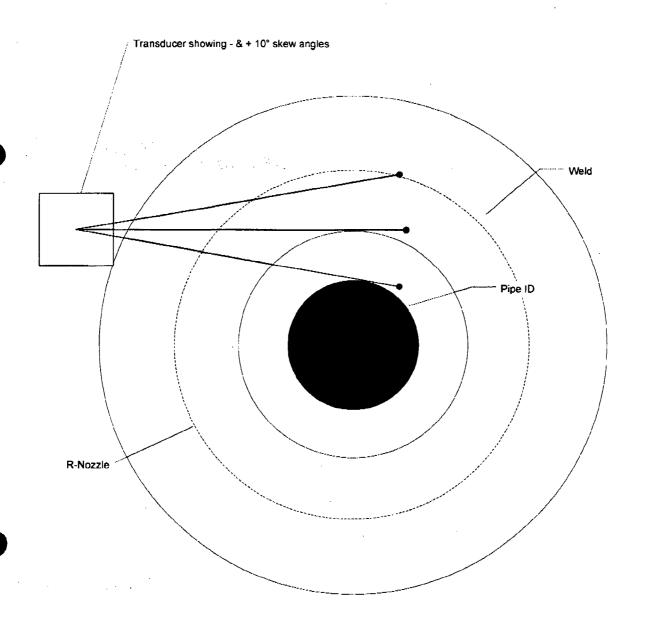
TITLE

PAGE

13 OF 27

Top View
Measurements based on modeling report,
design drawings, and as-found measurements.

R117

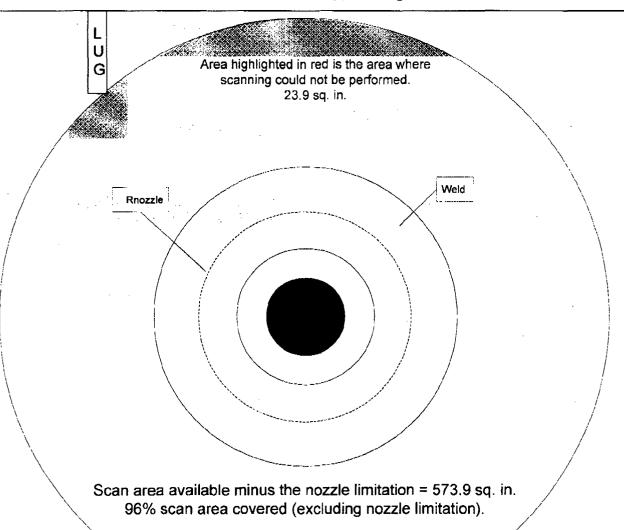


RIIT

000443

#### Limitation sketch

#### Insulation Support Ring



		<b>A</b>	ķ	
A	R	E	V	A

# Reactor Pressure Vessel 600444 Manual Ultrasonic Calibration Data Sheet

Util	lity: TVA	Site: Browns	Ferry Nuclea	ar Plant	Unit: 2		Outage: 0	Cycle 14 RFO	
Cal	libration Data Sheet Number:	N9NV-CDS1	ISI	Report Num	nber: 12	117			
Co	mponent ID: N9-NV		Соп	nponent Des	cription: N9	Nozzle-to-V	essel Weld		
Exa	amination Procedure: 54-ISI-	850-06	Арр	olicable SDC	N(s): 30-90	44520-000			
	Ultrasonic Inst	trument			Tr	ransducer			
Ma	nufacture: Staveley		Manufacture: KBA			Model:	Benchmark 84	42-600	
Mo	del: Sonic 136		Serial Num	nber: 015V98	В	Freque	ncy: 2.25 MHz		
Ser	ial Number: 136P1200G0814	,56	Size: 0.50"	·		Shape:	Round		
Lin	earity Sheet No.: LDS2		# of Eleme	ents: 1		Configu	ıration: Single		
	Instrument Se	ettings .	Refracted	Angle: 35°		Measur	ed Angle: 37°		
щ	Range: 5.00" Sound Pa	th □Depth	Skew Angl	le: -35°		Measur	ed Skew Angl	e: -35°	
RANGE	Delay: 8.07"		Mode: She	ar		Radius	: 3.0" R		
ш.	Velocity: 0.127 in / μS		Cable Type	e: RG-174	Length: 12'	Interme	diate Connec	tors: 0	
n <u>r</u>	Display: Filt2				Verifi	cation Bloc	sk		
RCVR.	Frequency: 2.25MHz		Type: N/A			S/N: N/A			
<b>.</b>	Reject. Off	Reflecto	or:	N/A		N/A			
	Pulse Width: 222nS		Sweep: N/A		<u> </u>		/A		
	Damping: 500Ω		Amplitud	le:	N/A		N	/A	
	Mode: ⊠Pulse Echo □□	Dual	Gain: N/A		N/A				
PULSER	Rep Rate: 2kHz			Basic Cali			alibration Block		
P.	Pulser: ☐150V ☐300V	(*Sonic 137 only)	Block ID: E	3F-18		Material: Clad CS			
	*Pulser voltage adjustable with th	e Sonic 137 instrument only.	Thickness:	: 6.0" with 0.	125" clad	Diameter: Flat			
	The Sonic 136 has a fix	ced pulser voltage.	Temperatu	ıre: 74 °F		Therm. SN	: VH-9520		
			Couplant: I	Ultragel II		Batch No.:	05325		
		Referen	nce Sensiti	vity Inform	nation				
Ref	flector: ID Notch	Sweep: 1.4 div	A	mplitude: 80	%FSH	Gair	n: 50.0 dB		
Cal	In: Date 03/15/07 Time 1135	Check: Date N/A Time N	V/A C	heck: Date N	I/A Time N/A	A Out:	Date 03/15/07	Time 1500	
7" c	of soundpath delayed off scre	en to display from 7" to 1	Comme						
	aminer: Bret Flesner nature: Sut Tillesne			Examiner: Na Signature	/A		Level: N/A	Date: N/A	
	EVA Revigw Adam Conti	Level: III Date:	03/16/07					Page 15 of 27	



## Reactor Pressure Vessel (1)0445 Manual Ultrasonic Calibration Data Sheet

Uti	lity: TVA	Site: Brow	vns Ferry N	uclear Pla	nt Unit: 2		Outage: 0	Cycle 14 RFO	
Ca	libration Data Sheet Number: N9NV-0	CD\$2		ISI Repo	t Number:	RIIT			
Со	mponent ID: N9-NV			Compone	nt Description:	N9 Nozzle-to	o-Vessel Weld		
Ex	amination Procedure: 54-ISI-850-06			Applicable	SDCN(s): 30-	9044520-00	0		
	Ultrasonic Instrumen	t				Transduce	er		
Ма	hufacture: Staveley		Manut	facture: KE	A	Mod	el: Benchmark 8	42-600	
Мо	del: Sonic 136		Serial	Number: (	16BT1	Fred	juency: 2.25 MHz	<u> </u>	
Se	rial Number: 136P1200G081456		Size:	0.50"		Sha	pe: Round		
Lin	earity Sheet No.: LDS2		# of E	lements: 1		Con	figuration: Single		
	Instrument Settings		Refra	cted Angle	35°	Mea	sured Angle: 39°		
ш	Range: 5.00" ⊠Sound Path □[	Depth	Skew	Angle: +3	)°	Mea	sured Skew Ang	le: +35°	
RANGE	Delay: 8.07"		Mode	Shear		Rad	ius: 3.0" R		
Ľ	Velocity: 0.127 in / μS	Cable	Type: RG	174 Length: 1	2' Inter	mediate Connec	tors: 0		
۔۔۔	Display: Filt2			Ver	ification B	lock			
RCVR	Frequency: 2.25MHz	Туре:	N/A		S/N: N/A	S/N; N/A			
	Reject: Off	Re	Reflector: N/A			N/A			
	Pulse Width: 222nS		Sweep: N/A			N/A			
	Damping: 500Ω		Amp	Amplitude: N/A			N	/A	
	Mode: ⊠Pulse Echo □Dual			Gain:	N/A		N/A		
PULSER	Rep Rate: 2kHz				Basic	Calibration	alibration Block		
J.	Pulser: 150V 300V (*Sonic 13	7 only)	Block	ID: BF-18		Material	Material: Clad CS		
	*Pulser voltage adjustable with the Sonic 13	37 instrument or	Thickr	ness: 6.0" \	vith 0.125" clad	Diamete	Diameter: Flat		
	The Sonic 136 has a fixed pulser	voltage.	Temp	erature: 74	°F	Therm.	SN: VH-9520		
			Coupl	ant: Ultrag	ei II	Batch N	o.: 05325		
		Refe	rence Ser	sitivity l	nformation				
Re	flector: ID Notch Sweep	: 1.7 div		Amplitu	de: 80 %FSH		Gain: 52.0 dB		
Cal	In: Date 03/15/07 Time 1140 Check:	Date N/A Tin	ne N/A	Check:	Date N/A Time	N/A C	Out: Date 03/15/07	Time 1510	
7" (	of soundpath delayed off screen to dis	play from 7" 1		omments ne A-scan.					
	aminer: Bret Flesner nature:	evel: II Da	ate: 03/15/0	)7 Exami Signat	ner: N/A ure		Level: N/A	Date: N/A	
		evel: III Da	ate: 03/16/0	07		-		Page 16 of 27	



# Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet

UU	ity: IVA	Site: Brown	is Ferry Ni	iclear P	iant Unit: 2	2		Outage: 0	Sycie 14 RFO		
Cal	ibration Data Sheet Number: N	9NV-CDS3		ISI Rep	ort Number:	RI	17				
Cor	mponent ID: N9-NV			Compo	nent Description	n: N9 I	Nozzle-to-Ve	ssel Weld			
Exa	amination Procedure: 54-ISI-85	0-06		Applica	ole SDCN(s): 3	0-904	4520-000				
	Ultrasonic Instru	ıment				Tra	ınsducer	ucer			
Ma	nufacture: Staveley		Manuf	Manufacture: KBA				Model: Benchmark 842-600			
Мо	del: Sonic 136		Serial	Number	: 01658N		Frequen	cy: 2.25 MHz			
Ser	ial Number: 136P1200G081456	3	Size: 0	0.50"			Shape: F	Round			
Line	earity Sheet No.: LDS2		# of El	ements:	1		Configur	ation: Single			
	Instrument Sett	ings	Refrac	ted Ang	le: 35°		Measure	d Angle: 39°			
ш	Range: 6.00" Sound Path	□Depth	Skew	Angle: -	50°	Measure	d Skew Angl	le: -54°			
RANGE	Delay: 6.28"		Mode:	Mode: Shear Radi							
œ	Velocity: 0.127 in / μS		Cable	Cable Type: RG-174 Length: 12' Interm					tors: 0		
	Display: Filt2				V	erific	ation Bloc	k			
RCVR	Frequency: 2.25MHz	Type:	N/A		S/N: N		N/A				
	Reject: Off			lector:	N/A			N/A			
	Pulse Width: 222nS			weep:	N/A			N/A			
ř	Damping: 500Ω		Amp	Amplitude: N/A		Α		N	I/A		
	Mode: ⊠Pulse Echo □Du	al		Gain: N/A		Α		N	I/A		
PULSER	Rep Rate: 2kHz			Basic Calibration I				Block			
될	Pulser: 150V 300V (*s	onic 137 only)	Block	ID: BF-1	8		Material: Clad CS				
	*Pulser voltage adjustable with the S	Sonic 137 instrument onl	Thickn	ess: 6.0	" with 0.125",cl	ad	Diameter: Flat				
	The Sonic 136 has a fixed	l pulser voltage.		erature:	74 °F		Therm. SN:	VH-9520			
		·	Couple	ant: Ultra	agel II		Batch No.: 0	5325			
		Refere	ence Sen	sitivity	Information						
Ref	lector: ID Notch	Sweep: 4.6 div		Ampl	itude: 80 %FSF	ł	Gain	53.0 dB			
Cal	In: Date 03/15/07 Time 1143	Check: Date N/A Time	e N/A	Chec	k: Date N/A Tim	e N/A	Out: [	Date 03/15/07	7 Time 1505		
5" (	of soundpath delayed off screen	to display from 5" to		mment e A-sca							
	aminer: Bret Flesner nature: Sua Alexa	1 1	te: 03/15/0		miner: N/A ature			Level: N/A	Date: N/A		
AR Sig	EVA Review Adam Conti nature:	te: 03/16/0					Page 17 of 27				



## Reactor Pressure Vessel 600447 Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	Site: Bi	rowns	Ferry Nuc	lear P	lant	Unit: 2	~ <u></u>	Outage: C	Cycle 14 RFO	
Cal	ibration Data Sheet Number:	N9NV-CDS4		18	SI Rep	oort Nun	nber: R	117			
Co	mponent ID: N9-NV			Cı	ompo	nent Des	scription: N9	Nozzle-to	-Vessel Weld		
Exa	mination Procedure: 54-ISI-8	350-06		A	pplica	ble SDC	N(s): 30-90	44520-000			
	Ultrasonic Inst	rument		Transduce					r		
Ma	nufacture: Staveley	123	-	Manufac	ture:	KBA		Mode	el: Benchmark 84	12-600	
Mo	del: Sonic 136			Serial Nu	umbei	r: <b>0</b> 16BT	1	Freq	uency: 2.25 MHz		
Ser	ial Number: 136P1200G0814	56		Size: 0.5	50"			Shap	e: Round		
Line	earity Sheet No.: LDS2			# of Eler	nents	: 1		Conf	iguration: Single		
	Instrument Se	ettings		Refracte	d Ang	le: 35°		Mea	sured Angle: 38°		
111	Range: 6.00" Sound Par	th Depth		Skew Ar	ngle: +	-50°		Meas	sured Skew Angl	e: +54°	
RANGE	Delay: 6.28"			Mode: S	hear			Radi	us: 3.1" R	· · ·	
oΣ	Velocity: 0.127 in / μS-			Cable Ty	ype: R	RG-174	mediate Connect	ors: 0			
	Display: Filt2			Verifica			cation B	lock			
RCVR	g Frequency: 2.25MHz				/A		S/I		5/n: N/A		
uz.	Reject: Off				Reflector:		N/A		N	N/A	
	Pulse Width: 222nS			Sweep: N//		N/A		N	/A		
	Damping: 500Ω		, , , , , , , , , , , , , , , , , , , ,	Amplit	plitude: N/A			N	/A		
.:	Mode: ⊠Pulse Echo □□	Dual		0	Gain:	ain: N/A			N/A		
SER	Rep Rate: 2kHz				Basic Calibrat			alibratio	ation Block		
PULSER	Pulser: ☐150V ☐300V (	*Sonic 137 only)		Block ID	: BF-1	18		Material: Clad CS			
	*Pulser voltage adjustable with th	e Sonic 137 instrume	nt only	Thicknes	ss: 6.0	)" with 0.	125" clad	Diameter: Flat			
	The Sonic 136 has a fix		in only.	Tempera	ature:	<b>74</b> °F		Therm.	SN: VH-9520		
				Couplan	it: Ultr	agel II	<del></del>	Batch N	o.: 05325		
		Re	eferen	ce Sens	itivity	y Inforn	nation	.1		·-	
Re	Rector: ID Notch	Sweep: 4.6 div			Amp	litude: 80	) %FSH	G	Sain: 51.0 dB		
Cal	In: Date 03/15/07 Time 1145	Check: Date N/A	Time N	I/A	Chec	k: Date N	N/A Time N/A	4 C	out: Date 03/15/07	Time 1503	
*****		I		Com	ıment	s		<u></u>			
5" (	of soundpath delayed off scree	en to display from	5" to 1	1" on the	A-sca	ın.					
	•										
	aminer: Bret Flesner nature:	Level: II	Date:	03/15/07		ıminer: N nature	I/A		Level: N/A	Date: N/A	
	EVA Review: Adam Continature:	Date:	03/16/07						Page 18 of 27		



## Reactor Pressure Vessel 630448 Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	Site: Bro	owns Ferry P	vuclear	Plant	Unit: 2		Outage:	Cycle 14 RFO	
Cal	ibration Data Sheet Number: N9N\	V-CDS5		ISI Re	port Nun	nber:	3117			
Col	mponent ID: N9-NV			Compo	onent De	scription: N9	Nozzle-to-\	/essel Weld		
Exa	amination Procedure: N-UT-78 Rev	vision 4		Applic	able SDC	N(s): N/A				
	Ultrasonic Instrume	ent				Tr	ansducer	ıcer		
Ма	nufacture: Staveley	-	Manu	ıfacture:	RTD		Model	: TRL2-ST		
Мо	del: Sonic 136		Seria	l Numbe	er: 07-30	5	Freque	ency: 2 MHz		
Sei	rial Number: 136P1200G081456		Angle	e: 60°		,	Measu	red Angle: 60		
Lin	earity Sheet No.: LDS2		Mode	: Refrac	cted Long	gitudinal	Size: 2	2(24x42)mm	·	
	Instrument Setting	ıs	Focu	s: FS~1	25mm		Squint	Angle: 5°		
ш	Range: 8.00" Sound Path	Depth	# of E	Element	s: 2	Shape: Rec	t. Config	juration: Dual	- SBS	
RANGE	Delay: 1.34"	¢	Cable	Type:	RG-174	Length: 1	2' Interm	ediate Connec	ctors: 0	
ı.	Velocity: 0.227 in / µS				Verifi	cation Blo	ock			
	Display: Filt 2	Туре	: N/A			S/N: N/A				
RCVR	Frequency: 2.25 MHz	Re	eflector:		N/A		1	N/A		
	Reject: Off			Sweep:		N/A		N/A		
	Pulse Width: 222 nS			plitude:		N/A		. 1	N/A	
	Damping: 500 Ω			Gain:		N/A		1	N/A	
æ	Mode: □Pulse Echo  ☑Dual		·			Basic Ca	libration	Block	,	
PULSER	Rep Rate: 2kHz		Block	Block ID: BF-18			Material: (	cs		
4	Pulser: 150V 300V (*Sonic	137 only)	Thick	ness: 6	0" with 0	.125" Clad	Diameter: Flat			
	*Probe voltage is adjustable with the Sonic	c 137 instrument.	The Temp	perature	: 74 °F		Therm. SN: VH-9520			
	Sonic 136 has a fixed pulser	voitage.	Coup	lant: Ult	ragel II		Batch No.: 05325			
		Ref	erence Se	nsitivi	ty Inform	nation				
Ref	flector: 1/4-t SDH	Sweep: 3.7 di	V		Amplitud	de: 80 %FSH		Gain: 58.4 d	В	
Cal	In: Date 03/15/07 Time 1141	Check: Date N	I/A Time N/A	<u> </u>	Check: E	Date N/A Tim	e N/A	Out: Date 03/	/15/07 Time 1507	
	•		C	ommer	ıts					
Zor	ne 1 - Near Surface calibration.									
	nature: Stat Flesner	Pate: 03/15/0		Examiner: N/A Signature			Level: N/A	Date: N/A		
	EVA Review: Adam Copti nature:	oate: 03/16/0	07					Page 19 of 27		



## Reactor Pressure Vessel 600449 Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	owns F	erry Nu	ıclear l	Plant	Unit: 2		Outage: Cycle 14 RFO			
Cal	ibration Data Sheet Number: N9N	V-CDS6		1	 ISI Rej	port Nun	nber: /	3117	1		
Cor	nponent ID: N9-NV			,	Compo	onent De	scription: N9	Nozzle-to-V	essel Weld		
Exε	mination Procedure: N-UT-78 Re	vision 4		,	Applica	able SDC	CN(s): N/A		· :		
	Ultrasonic Instrum	ent					Tra	ansducer			
Mai	nufacture: Staveley			Manufa	acture:	RTD		Model:	TRL2-ST		
Мо	del: Sonic 136			Serial I	Numbe	er: <b>07</b> -30	5	Freque	ncy: 2 MHz		
Ser	ial Number: 136P1200G081456			Angle:	60°			Measu	red Angle: 60	0	
Line	earity Sheet No.: LDS2			Mode:	Refrac	ted Long	itudinal	Size: 2	(24x42)mm		
	Instrument Settin	gs		Focus:	FS~1	25mm		Squint	Angle: 5°	į.	
Щ	Range: 18.0" Sound Path	□Depth		# of Ele	ements	s: 2	Shape: Rect	t. Config	uration: Dual	- SBS	
RANGE	Delay: 1.34"			Cable	Type: I	RG-174	Length: 1	2' Interme	ediate Connec	otors: 0	
	Velocity: 0.227 in / μS		-,			,	Verific	cation Blo	ck		
	Display: Filt 2				N/A			S/N: N/A			
₹CVF	Frequency: 2.25 MHz				ector:		N/A		N/A		
	Reject: Off			Sweep:		N/A		N/A			
	Pulse Width: 222 nS	-		Ampl	Amplitude: N/A				1	N/A	
	Damping: 500 Ω			Gain:		N/A		1	N/A		
æ	Mode: □Pulse Echo  ☑Dual			Basic Calibratio			libration i	Block			
PULSER	Rep Rate: 2kHz			Block ID: BF-18 Ma			Material: C	Material: CS			
ā.	Pulser: 150V 300V (*Sonie	: 137 only)		Thickn	ess: 6.	0" with 0	.125" Clad	Diameter: Flat			
	*Probe voltage is adjustable with the Son		. The	Tempe	rature	74 °F	Therm. SN: VH-9520		I: VH-9520	<u></u>	
	Sonic 136 has a fixed pulse	er voltage.		Coupla	nt: Ult	ragel II		Batch No.: 05325			
		Re	ferenc	ce Sen	sitivit	y Infor	nation		<b>.</b>		
Ref	lector: ID Notch	Sweep: 6.3 c	vib			Amplitud	de: 80 %FSH		Gain: 73.2 d	В	
Cal	In: Date 03/15/07 Time 1142	Check: Date I	N/A Tin	ne N/A		Check: E	Date N/A Time	e N/A	Out: Date 03/	/15/07 Time 1508	
				Cor	mmen	ıts				,	
Zone 2 - Full Volume calibration.											
										•	
	aminer: Bret Flesner nature: Not Alaman	Level: II	Date: 0	3/15/07	- 1	aminer: I inature	N/A		Level: N/A	Date: N/A	
	EVA Review odam Conti nature:	Date: 0	3/16/07					•	Page 20 of 27		



# Reactor Pressure Vessel 000450 Manual Ultrasonic Calibration Data Sheet

Util	ity: TVA	vns Ferry	Nuclear I	Plant	Unit: 2		Outage: 0	Cycle 14 RFO		
Çal	ibration Data Sheet Number:	N9NV-CDS7		ISI Re	port Nun	nber: 🗲	2117			
Co	inponent ID: N9-NV			Compo	onent Des	scription: N9	Nozzle-to-V	essel Weld		
Exa	amination Procedure: N-UT-7	9 Revision 1		Applica	able SDC	N(s): N/A		-	,	
	Ultrasonic Inst	rument				Tr	ansducer	sducer		
Ма	nufacture: Staveley		Man	Manufacture: KBA			Model:	Model: Benchmark 113-242-591		
Мо	del: Sonic 136		Seria	Serial Number: 00XT7F				ncy: 2.25 MHz	<u>'</u>	
Ser	ial Number: 136P1200G0814	56	Size	Size: 0.50"				Round		
Lin	earity Sheet No.: LDS2		# of	# of Elements: 1				uration: Single		
	Instrument Se	ettings	Refr	acted An	gle: 45°	=	Measu	red Angle: 45°		
ш	Range: 10.0" Sound Pa	th □Depth	Skev	v Angle:	N/A		Measu	ed Skew Angl	e: N/A	
RANGE	Delay: 0.380"		Mode	e: Shear			Radius	Flat		
Ľ	Velocity: 0.127 in / μS		Cabl	е Туре: І	RG-174	Length: 6'	Interme	ediate Connec	tors: 0	
	Display: Filt2				Verifi	cation Blo	ck			
RCVR	Frequency: 2.25MHz	Туре	: CS Roi	mpas		S/N: 791413				
	Reject: Off			eflector:	or: 2" Reflector		r 8" Reflect		flector	
	Pulse Width: 222nS			Sweep:		2.0 div.		8.0 div.		
ĺ	Damping: 500Ω			Amplitude: 80 %FSH			80 %	FSH		
	Mode: ⊠Pulse Echo □□	Dual		Gain: 19.4 dB			45.2	2 dB		
PULSER	Rep Rate: 2kHz			Basic Calibration Block						
Į Į	Pulser: ☐150V ☐300V	(*Sonic 137 only)	Bloc	k ID: BF-	18		Material: Clad CS			
	*Pulser voltage adjustable with th	e Sonic 137 instrument o	nly. Thic	kness: 6.	0" with 0.	125" clad	Diameter: Flat			
	The Sonic 136 has a fo	ced pulser voltage.	Tem	perature	: 73 °F		Therm. SN: VH-9520			
			Cou	olant: Ult	ragel II		Batch No.:	05325		
L		Refe	rence Se	ensitivit	y Inforn	nation				
Ref	lector: (See Verification)	Sweep: (See Verific	ation) div	Amp	olitude: N	/A	Gai	n: N/A		
Cal	In: Date 03/16/07 Time 0835	Check: Date N/A Tir	ne N/A	Che	ck: Date N	N/A Time N/A	Out	Date 03/16/07	Time 1130	
			C	ommen	ts					
This full volume calibration used to locate and characterize fla					n prior to	sizing.				
	aminer: Bret Flesner nature:		ate: 03/16	S/07 Examiner: N/A Signature Level: N/A Date: N/A			Date: N/A			
I	EVA Review Adam Canti nature:	ate: 03/16	707	Page			Page 21 of 27			



# Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet 30451

<b>,</b> , , , ,	ity: TVA	Site. Browns	CITY NUCLE	Sair	nant Unit: 2		Outage.	Sycie 14 KPU	
Cal	ibration Data Sheet Number:	N9NV-CDS8	ISI	l Rep	port Number: R	117			
Col	mponent ID: N9-NV		Cor	mpo	nent Description: N9	Nozzle-to	-Vessel Weld		
Exa	mination Procedure: N-UT-79	9 Revision 1	App	plica	ble SDCN(s): N/A			=\ <u></u>	
	Ultrasonic Inst	rument	Trans			ansduce	sducer		
Ma	nufacture: Staveley		Manufactu	ure: l	KBA	Mode	el: Benchmark 1	13-242-591	
Мо	del: Sonic 136		Serial Nur	mber	: 00XT7F	Freq	uency: 2.25 MHz	<u> </u>	
Ser	ial Number: 136P1200G0814	56	Size: 0.50	)"		Shar	e: Round		
Line	earity Sheet No.: LDS2		# of Eleme	ents:	1	Conf	iguration: Single		
	Instrument Se	ttings	Refracted	I Ang	le: 45°	Mea	sured Angle: 45°		
Ш	Range: 6.00"  Sound Pat	h □Depth	Skew Ang	gle: N	<b>∜</b> A	Meas	sured Skew Ang	le: N/A	
RANGE	Delay: 3.380"	Mode: She	ear		Radi	us: Flat			
Œ	Velocity: 0.127 in / μS		Cable Typ	oe: R	G-174 Length: 6'	Inter	mediate Connec	tors: 0	
~	Display: Filt2				Verific	cation B	lock		
RCVR	Frequency: 2.25MHz		Type: CS	Rom	npas	S/N: 791413			
Reject: Off			Reflect	tor:	5" Reflector	8" Re		flector	
•	Pulse Width: 222nS			ep:	3.3 div.	8.3 div.		div.	
	Damping: 500Ω		Amplitud	de:	80 %FSH		20 %FSH		
٠	Mode: ⊠Pulse Echo □D	ual	Gain:		33.4 dB	33.4 dB		4 dB	
PULSER	Rep Rate: 2kHz		Basic Cal			libration Block			
Į,	Pulser: ☐150V ☐300V (*	Sonic 137 only)	Block ID: I	Block ID: BF-18		Material: Clad CS			
	*Pulser voltage adjustable with the	Sonic 137 instrument only.	Thickness	s: 6.0	" with 0.125" clad	Diameter: Flat			
	The Sonic 136 has a fixe	ed pulser voltage.	Temperature: 73 °F		Therm. SN: VH-9520				
			Couplant:	Ultra	agel II	Batch No	o.: 05325		
		Referen	ce Sensit	ivity	Information				
Ref	lector: (See Comments)	Sweep: (See Comments	s) A	Ampl	itude: N/A	G	Bain: N/A		
Cal	In: Date 03/16/07 Time 0836	Check: Date N/A Time N	I/A C	Chec	k: Date N/A Time N/A	. 0	out: Date 03/16/07	Time 1131	
1/2	s "depth zone" calibration used t SDH in basic calibration bloc t SDH in basic calibration bloc	ck 1.7 divisions @ 39.2 d	JB.			display 3"	to 9" on A-scan.		
	nminer: Bret Flesner nature: Flesn				miner: N/A nature		Level: N/A	Date: N/A	
	VA Review Adam Conti / Level: III Date: 03/16/07 Page 22 of 27								



# Reactor Pressure Vessel 000452 Manual Ultrasonic Calibration Data Sheet

Utili	ty: TVA	Site: Brown	s Ferry Nu	iclear Pla	nt Unit: 2		Outage: 0	Cycle 14 RFO		
Calibration Data Sheet Number: N9NV-CDS9				ISI Report Number: RIM						
Component ID: N9-NV				Component Description: N9 Nozzle-to-Vessel Weld						
Exa	mination Procedure: N-UT-79	Revision 1		Applicable SDCN(s): N/A						
	Ultrasonic Instru	ıment			Tr	ansducer				
Mai	nufacture: Staveley		Manufa	acture: K	BA /	Model:	Benchmark 1	13-242-591		
Mod	del: Sonic 136		Serial I	Number:	006YLP	Freque	Frequency: 2.25 MHz			
Ser	ial Number: 136P1200G081456	3	Size: 0	.50"		Shape:	Round			
Line	earity Sheet No.: LDS2		# of Ele	ements:		Configi	uration: Single			
	Instrument Set	ings	Refrac	ted Angle	e: 60°	Measu	red Angle: 59°			
111	Range: 14.0" Sound Path	□Depth	Skew A	Angle: N/	Α	Measu	red Skew Angl	le: N/A		
RANGE	Delay: 0.594"		Mode:	Shear		Radius	: Flat			
œ	Velocity: 0.127 in / μS		Cable	Type: RC	3-174 Length: 6'	Interme	ediate Connec	tors: 0		
	Display: Filt2				Verifi	cation Blo	ck			
RCVR	Frequency: 2.25MHz		Type: (	CS Romp	as	S/N: 7914	N: 791413			
	Reject: Off		Ref	Reflector: 2" Reflector			14" Reflector			
	Pulse Width: 222nS		S	Sweep: 1.4 div.			10.0 div.			
j	Damping: 500Ω			Amplitude: 80 %FSH			80 %FSH			
	Mode: ⊠Pulse Echo □Du	al		Gain: 26.2 dB			56.6 dB			
PULSER	Rep Rate: 2kHz			Basic Calibration Block						
PUL	Pulser: ☐150V ☐300V (*9	onic 137 only)	. Block I	Block ID: BF-18			Material: Clad CS			
	*Pulser voltage adjustable with the	Sonic 137 instrument only	Thickn	Thickness: 6.0" with 0.125" clad			Diameter: Flat			
	*Pulser voltage adjustable with the Sonic 137 instrument only.  The Sonic 136 has a fixed pulser voltage.			Temperature: 73 °F			Therm. SN: VH-9520			
			Coupla	Couplant: Ultragel II E			atch No.: 05325			
		Refere	ence Sen	sitivity	Information					
Ref	lector: (See Verification)	Sweep: (See Verificat	tion)	n) Amplitude: (See Verification		on) Gai	n) Gain: (See Verification)			
Cal	In: Date 03/16/07 Time 0830	Check: Date N/A Time	N/A	N/A Check: Date N/A Time N/A			Out: Date 03/16/07 Time 1133			
			Co	mments		<u> </u>		***		
Thi	s full volume calibration used to	locate and character	rize flaw in	dication	prior to sizing.					
	miner: Bret Flesner	·.	e: 03/16/0	7 Exam	niner: N/A		Level: N/A	Date: N/A		
AR	EVA Review: Adam Conti nature:		e: 03/16/ <b>0</b>		. , -			Page 23 of 27		



## Reactor Pressure Vessel 636453 Manual Ultrasonic Calibration Data Sheet

Uti	ity: TVA	Site: Brown	s Ferry Nu	clear Plan	ıt !	Unit: 2		Outage:	Cycle 14 RFO	
Ca	ibration Data Sheet Number:	N9NV-CDS10		ISI Report	t Numl	per: R	117	<del></del>	<del></del>	
Component ID: N9-NV				Component Description: N9 Nozzle-to-Vessel Weld						
Exa	amination Procedure: N-UT-7	9 Revision 1	1	Applicable	SDCN	(s): N/A				
	Ultrasonic Inst	rument				Tr	ansducer		<del></del>	
Ма	nufacture: Staveley		Manufa	cture: KB	A		Model	Model: Benchmark 113-242-591		
Мо	del: Sonic 136		Serial N	Number: 0	06YLP		Frequency: 2.25 MHz			
Sei	ial Number: 136P1200G0814	56	Size: 0.	50"			Shape:	Shape: Round		
Lin	earity Sheet No.: LDS2		# of Ele	ments: 1			Configu	uration: Single		
	Instrument Se	ttings	Refract	ed Angle:	60°		Measu	red Angle: 59°	•	
ш	Range: 8.00" Sound Par	th Depth	Skew A	ngle: N/A			Measu	red Skew Ang	le: N/A	
RANGE	Delay: 4.44"		Mode: 8	Shear			Radius	Radius: Flat		
oc.	Velocity: 0.127 in / µS		Cable T	ype: RG-	174 L	ength: 6'	Interme	ediate Connec	tors: 0	
~	Display: Filt2					Verifi	cation Blo	ck	~, •.	
RCVR	Frequency: 2.25MHz		Type: C	Type: CS Rompas			S/N: 79141	/N: 791413		
_	Reject: Off		Refle	Reflector: 5" Reflecto		" Reflector		11" Reflector		
	Pulse Width: 222nS		Sv	veep:	1.3 div.			8.8 div.		
	Damping: 500Ω			tude:	80 %FSH			15 %FSH		
	Mode: ⊠Pulse Echo □Dual			Gain:		39.8 dB		39.8 dB		
PULSER	Rep Rate: 2kHz			Basic Calibration Block						
₽.	Pulser: 150V 300V (	*Sonic 137 only)	Block II	Block ID: BF-18			Material: Clad CS			
	*Pulser voltage adjustable with the	Sonic 137 instrument only	Thickne	Thickness: 6.0" with 0.125" clad			Diameter: Flat			
	The Sonic 136 has a fix			ature: 73	°F		Therm. SN: VH-9520			
			Couplar	Couplant: Ultragel II			Batch No.:	Batch No.: 05325		
		Refere	nce Sens	sitivity In	iforma	ition				
Ref	lector: (See Comments)	Sweep: (See Commer	nts)	s) Amplitude: (See Commen			nts) Gair	Gain: (See Comments)		
Cal	In: Date 03/16/07 Time 0831	Check: Date N/A Time	N/A	Check: C	)ate N/A	A Time N/A	Out	Out: Date 03/16/07 Time 1133		
			Con	nments						
Thi	s "depth zone" calibration use	d for sizing information	. 4" sound	tpath dela	yed off	screen to	display 4" to	12" on A-sca	n.	
	t SDH in basic calibration bloc t SDH in basic calibration bloc									
	miner: Bret Flesner		e: 03/16/07	Examiner: N/A Signature Level: N/A D			Date: N/A			
	EVA Review Adam Conti nature: Ten Conti		e: 03/16/07						Page 24 of 27	



# Reactor Pressure Vessel Manual Ultrasonic Calibration Data Sheet 0454

Util	ity: TVA	Site: Browns	Ferry Nucle	ar Plant Unit:	2	Outage: 0	Cycle 14 RFO				
Calibration Data Sheet Number: N9NV-CDS11			ISI	ISI Report Number: R117							
Col	mponent ID: N9-NV	Cor	Component Description: N9 Nozzle-to-Vessel Weld								
Exa	amination Procedure: N-UT-7	9 Revision 1	Apr	olicable SDCN(s):	N/A						
	Ultrasonic Inst		Transducer								
Ma	nufacture: Staveley		Manufactu	ure: KBA	N	Model: Gamma RHP	242-043				
Мо	del: Sonic 136		Serial Nur	mber: 00YH67	F	Frequency: 2.25 MHz					
Serial Number: 136P1200G081456			Size: 0.50	11	5	Shape: Round					
Lin	earity Sheet No.: LDS2		# of Eleme	ents: 1		Configuration: Single	· .				
	Instrument Se	ettings	Refracted	Angle: 0°	ħ	Measured Angle: N/A	<del>\</del>				
ш	Range: 10.0" Sound Par	th ⊠Depth	Skew Ang	le: N/A	N	Measured Skew Ang	le: N/A				
RANGE	Delay: 0.101"		Mode: Lor	ngitudinal	F	Radius: N/A					
œ. 	Velocity: 0.229 in / µS		Cable Typ	e: RG-174 Lengt	h: 6' I	ntermediate Connec	etors: 0				
~	Display: Filt2				Verificatio	n Block					
RCVR	Frequency: 2.25MHz		Type: CS Rompas			S/N: 791413					
_	Reject: Off	Reflect	ector: 1" Backwa		all 10" Backwall						
,	Pulse Width: 222nS	Sweep: 1.0 div.		div.	10.0 div.						
	Damping: $500\Omega$		Amplitud	Amplitude: N/		, , , , , , , , , , , , , , , , , , ,	√A				
	Mode: ⊠Pulse Echo □□	Mode: ⊠Pulse Echo □Dual			I/A	N/A					
PULSER	Rep Rate: 2kHz	Rep Rate: 2kHz			Basic Calibration Block						
₹	Pulser: ☐150V ☐300V	Block ID:	BF-18	Mate	erial: Clad CS						
	*Pulser voltage adjustable with th	e Sonic 137 instrument only.	Thickness: 6.0" with 0.125" clad			Diameter: Flat					
		The Sonic 136 has a fixed pulser voltage.			The	Therm. SN: VH-9520					
			Couplant: Ultragel II			Batch No.: 05325					
		Referen	nce Sensit	ivity Informatio	n						
Re	flector: N/A	Sweep: N/A		Amplitude: N/A		Gain: N/A					
Cal	In: Date 03/16/07 Time 0833	Check: Date N/A Time	N/A C	Check: Date N/A Ti	me·N/A	Out: Date 03/16/0	7 Time 1137				
Ca	libration used for thickness me	easurments only.	Comm	nents							
	aminer: Bret Flesner Inature: A. Tilasma		: 03/16/07	Examiner: N/A Signature		Level: N/A	Date: N/A				
AR	EVA Review Adam Comi		: 03/16/07	·			Page 25 of 2				



# Reactor Pressure Vessel 000455 Manual Ultrasonic Calibration Data Sheet

Util	ty: TVA	Site: B	rowns F	erry Nucle	ear Plant	Unit: 2		Outage:	Cycle 14 RFO	
Calibration Data Sheet Number: N9NV-CDS12				ISI Report Number: R117						
Component ID: N9-NV					Component Description: N9 Nozzle-to-Vessel Weld					
Exε	mination Procedure: N-UT-78 Re	Applicable SDCN(s): N/A								
	Ultrasonic Instrum	nent		Transducer						
Mai	nufacture: Staveley			Manufactu	ıre: RTD		Model:	TRL2-ST		
Mo	del: Sonic 136			Serial Number: 07-305			Freque	Frequency: 2 MHz		
Ser	ial Number: 136P1200G081456	-		Angle: 60	0		Measur	Measured Angle: 60°		
Line	earity Sheet No.: LDS2			Mode: Re	fracted Lo	ongitudinal	Size: 2(	24x42)mm		
	Instrument Settin	ıgs		Focus: FS	S~125mm		Squint	Angle: 5°		
E	Range: 8.00" Sound Path	□Depth		# of Elem	ents: 2	Shape: Rec	t. Configu	ration: Dual	- SBS	
RANGE	Delay: 1.34"			Cable Typ	e: RG-17	4 Length: 1	2' Interme	diate Conne	ctors: 0	
Œ	Velocity: 0.227 in / μS					Verifi	cation Blo	k		
	Display: Filt 2	_		Type: N/A			S/N: N/A	N: N/A		
RCVR	Frequency: 2.25 MHz			Reflector: N/A		N/A	N//		N/A	
_	Reject: Off			Swe	/eep: N/A			N/A		
	Pulse Width: 222 nS			Amplitu	de: N/A			N/A		
	Damping: 500 Ω			. Ga	iin: N/A			N/A		
24	Mode: □Pulse Echo ☑Dual			Basic Calibration Block						
PULSER	Rep Rate: 2kHz			Block ID: BF-18			Material: C	Material: CS		
Ь	Pulser: ☐150V ☐300V (*Son	ic 137 only)		Thickness: 6.0" with 0.125" Clad			Diameter: I	Diameter: Flat		
	*Probe voltage is adjustable with the So		nt. The	Temperature: 73 °F			Therm. SN: VH-9520			
	Sonic 136 has a fixed pulser voltage.			Couplant: Ultragel II			Batch No.: 05325			
		Re	eferenc	ce Sensit	ivity Info	rmation				
Ref	lector: 1/4-t SDH	Sweep: 3.7	div	Amplitude: 80 %FSH			l	Gain: 58.4 dB		
Cal	In: Date 03/16/07 Time 0820	Check: Date	N/A Tin	ne N/A	Check	c Date N/A Tim	e N/A	Out: Date 03/16/07 Time 1135		
				Comn	nents					
Zor	e 1 - Near Surface calibration.									
Pric	or to sizing.								ļ	
	nminer: Bret Flesner nature:	Level: II	Date: 0	3/16/07	Examine Signature	r: George Chap	oman	Level: II	Date: 03/16/07	
				3/16/07					Page 26 of 27	



# Reactor Pressure Vessel 50456 Manual Ultrasonic Calibration Data Sheet

Utility: TVA Site: Browns			uclear Plant	Unit: 2		Outage:	Cycle 14 RFO		
Calibration Data Sheet Number: N9NV-CDS13			ISI Report Number: RIIT						
mponent ID: N9-NV		Component Description: N9 Nozzle-to-Vessel Weld.							
amination Procedure: N-UT-78 R		Applicable SDCN(s): N/A							
Ultrasonic Instrur	nent		Transducer						
nufacture: Staveley		Manuf	acture: RTD		Model	: TRL2-ST			
del: Sonic 136		Serial	Number: 07-30	5	Frequ	ency: 2 MHz			
ial Number: 136P1200G081456		Angle:	60°		Measu	ured Angle: 60	)°		
earity Sheet No.: LDS2		Mode:	Refracted Lon	gitudinal	Size: 2	2(24x42)mm	· ·		
Instrument Setti	ngs	Focus	FS~125mm		Squint	t Angle: 5°			
Range: 18.0" Sound Path	□Depth	# of El	ements: 2	Shape: Rec	t. Config	guration: Dua	I - SBS		
Delay: 1.34"		Cable	Type: RG-174	Length: 1	2' Interm	ediate Conne	ctors: 0		
Velocity: 0.227 in / µS				Verifi	cation Blo	ock	de 765		
Display: Filt 2			N/A		S/N: N/A				
Frequency: 2.25 MHz			lector:	N/A		N/A			
Reject: Off			weep:	N/A		N/A			
Pulse Width: 222 nS			Amplitude:		N/A		N/A		
Damping: 500 Ω			Gain: N/A			N/A			
Mode: □Pulse Echo ☑Dual			Basic Calibration Block						
Rep Rate: 2kHz	**************************************	Block	Block ID: BF-18			Material: CS			
Pulser: ☐150V ☐300V (*Sor	nic 137 only)	Thickr	Thickness: 6.0" with 0.125" Clad			Diameter: Flat			
		Tempe	Temperature: 73 °F			Therm. SN: VH-9520			
Sonic 136 has a fixed pul	ser voltage.	Couple	Couplant: Ultragel II			Batch No.: 05325			
	Refere	nce Ser	sitivity Infor	mation					
flector: ID Notch	Sweep: 6.3 div		Amplitude: 80 %FSH		l	Gain: 73.2 dB			
In: Date 03/16/07 Time 0825	Check: Date N/A	Time N/A	ime N/A Check: Date N/A Time N/A			Out: Date 03/16/07 Time 1140			
		Co	mments						
ne 2 - Full Volume calibration.									
or to sizing.	•								
_	Level: II Date	: 03/16/0	7 Examiner: Signature	George Char	man	Level: II	Date: 03/16/07		
EVA Review: Atlam Copting	Level: III Date	: 03/16/0	7	-			Page 27 of 27		
	ibration Data Sheet Number: N9 Imponent ID: N9-NV Immination Procedure: N-UT-78 R  Ultrasonic Instrum Inufacture: Staveley Indeterment Setting Inufacture: Staveley Instrument Setting	ibration Data Sheet Number: N9NV-CDS13 Imponent ID: N9-NV Imination Procedure: N-UT-78 Revision 4  Ultrasonic Instrument Inufacture: Staveley Inufacture: Staveley Instrument Settings  Range: 18.0" Sound Path Depth  Delay: 1.34"  Velocity: 0.227 in / μS  Display: Filt 2  Frequency: 2.25 MHz  Reject: Off  Pulse Width: 222 nS  Damping: 500 Ω  Mode: Pulse Echo Dual  Rep Rate: 2kHz  Pulser: 150V 300V (*Sonic 137 only)  *Probe voltage is adjustable with the Sonic 137 instrument. The Sonic 136 has a fixed pulser voltage.  Reference The Company of the Sonic 137 instrument. The Sonic 136 has a fixed pulser voltage.  Reference The Company of the Sonic 137 instrument. The Sonic 136 has a fixed pulser voltage.  Reference The Company of the Sonic 137 instrument. The Sonic 136 has a fixed pulser voltage.  Reference The Company of the Sonic 137 instrument. The Sonic 136 has a fixed pulser voltage.  Reference The Company of the Sonic 137 instrument. The Sonic 136 has a fixed pulser voltage.  Reference The Company of the Sonic 137 instrument. The Sonic 136 has a fixed pulser voltage.  Reference The Company of the Sonic 137 instrument. The Sonic 136 has a fixed pulser voltage.  Reference The Company of the Sonic 137 instrument. The Sonic 136 has a fixed pulser voltage.  Reference The Company of the Sonic 137 instrument. The Sonic 136 has a fixed pulser voltage.  Reference The Company of the Sonic 137 instrument. The Sonic 136 has a fixed pulser voltage.  Reference The Company of the Sonic 137 instrument. The Sonic 136 has a fixed pulser voltage.  Reference The Company of the Sonic 137 instrument. The Sonic 136 has a fixed pulser voltage.	ibration Data Sheet Number: N9NV-CDS13 Imponent ID: N9-NV Imination Procedure: N-UT-78 Revision 4    Ultrasonic Instrument	ibration Data Sheet Number: N9NV-CDS13  ISI Report Number neprocedure: N-UT-78 Revision 4    Applicable SD0   Ultrasonic Instrument	Ist Report Number: R2   Ist Report Number: R2   Ist Report Number: R2   Ist Report Number: R2   Ist Report Number: R2   Ist Report Number: R2   Ist Report Number: R2   Ist Report Number: R2   Ist Report Number: R3   Ist Report Number: R4   Ist Report Number: R4   Ist Report Number: R5   Ist R5	Is Report Number:	Isl Report Number:		

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#### NOTIFICATION OF INDICATION FORM

NOI No. U2C14-049 Plant/Unit BFN/2 ISI Dwg/Sh. No. 2-CHM-2046-C-01
Examination Report No. R117 Component ID N9~NV
Description of Indication (Sketch/Photograph if Required for Clarification): UNACCEPT ABLE PLANER FLAW IN RPV NO NOZZLE TO VESSEL WELD. PREUMINARY AREVA REPORT ATTACHED,
Signature of ISO Coordinator (Field Supervisor): Signature of ISI Program Owner:  Man Willd for BRET FLESNER LT /Date: 3/16/07  Man Willd LIT /Date: 3/16/07  From, Man Willd LIT /Date: 3/16/07
See attached.
Corrective Action Program or Administrative Control document number (PER, WO) if applicable:
ASME XI Subsection IWE Yes No If Yes, complete the supplemental information Parts II and III of Page 2 of this form in addition to Parts II, III, and IV, of Page 1. If No, completion of Parts II and III of Page 2 of this form is not required and attachment of Page 2 with Page 1 is not required.
Disposition Propared/Recorded By: Victor D. Alliana Org. SE-M/N Date: 05-10-2007
PART III - ADDITIONAL EXAMINATIONS  Additional Sample Required [IW(X)-2430]: Ves No Page 2 of 2 additional samples attached?  See attached.
(Attach list of items in additional sample, if yes.)  Statut, Wal 5/1107  ISVor CIS! Program Owner Date
Successive Examination Required: Yes No Stephic, Julius 5/11/07 Ref. Code Cure N-522
PART IV - VERIFICATION OF CLOSURE Reexamination Report number, if Applicable: Signature of ISO Coordinator: Date:
Finding resulted from performance of the General visual Examination    Yes   V   No   If Yes, concurrence of the Registered   Professional Engineer (RPE) or   Individual Responsible for performance   is required (N/A otherwise):
RPE/Responsible Engineer Date Comments:
Verification of Complete Corrective Action Required by Disposition (Including Page 2, if applicable) Signature of ISI or CISI Program Owner:

Ws/17/57

### NOTIFICATION OF INDICATION FORM SUBSECTION IWE

Complete this page in addition to Page 1 for findings affecting Class MC/Subsection IWE.
NOI No. UZCIH-049 Plant/Unit BFN/2
Examination Report No. R-117 Component ID N9-NV
PART II - DISPOSITION (Supplemental Information)
Evaluation of inaccessible areas as required by 10CFR50.55a(b)(2)(ix)(A) (Include (1) A description of the type and estimated extent of degradation, and the conditions that led to the degradation; (2) An evaluation of each area, and the result of the evaluation; and (3) A description of necessary corrective actions) [additional separate continuation sheets may be attached, as necessary].
<i>d</i>
Corrective Action Program or Administrative Control documber number (PER, WO) if applicable:
Disposition Prepared By: Date
Additional examinations required per 10CFR50.55a(b)(2)(ix)(D) ( es  No  No  No  No  No  No  No  No  No  N
<del></del>
Specified By: Org. Date:

000458

### NOTIFICATION OF INDICATION FORM ATTACHMENT

Joge 20f4

NOI No. U2C14-049

Plant/Unit BFN Unit 2

Examination Report No. R-117

Component ID N9-NV

#### Part II - Disposition

This NOI documents indications in the vicinity of Control Rod Drive (CRD) Hydraulic System Return Nozzle N9 that were identified during ultrasonic (UT) examination performed during the Unit 2 Cycle 14 Refueling Outage. The indications were in the weld between the vessel shell and the CRD Nozzle, N9, and provided signal responses indicative of multiple small fabrication-type defects. This examination was performed in accordance with ASME Section XI, Appendix VIII as amended by 10CFR50.55a final rule (Report Number R-117). The indications were conservatively treated as a single composite indication which exceeded the appropriate acceptance standards of IWB-3512-1. Consequently, it was determined that this composite indication must be evaluated per the guidelines of IWB-3610.

Structural Integrity Associates (SIA) was contacted to perform the evaluation of the composite indication. SIA Calculation Number TVA-56Q-301r0 concluded that the indication was acceptable and met the requirements of ASME Code, Section XI, IWB-3610. In addition, successive examinations as required by ASME Section XI, IWB-2420 (b) and (c) were not required per ASME Code, Section XI, Code Case N-526. TVA Calculation Number MDQ-2068-2007-0013 (EDMS Reference R14 070328 105) was issued to document the SIA evaluation.

Prepared By: Vita D. Silvera Org. SE-M/N Date 05-10-2007



630453 NoI#UZC14-049 Page 344

March 29, 2007

Victor Schiavone Tennessee Valley Authority (TVA) Browns Ferry Nuclear Plant PO Box 2000 Decatur, AL 35609-2000

Subject:

Ultrasonic Examination Results for the Manual ISI Expanded Scope of

(10) RPV Nozzle-to-Vessel Welds

Victor,

See the following table for the Ultrasonic Examination Results for the Expanded Scope of (10) RPV Nozzle-to-Vessel Welds during the U2C14 at Browns Ferry Nuclear Plant.

Component Identification	Component Description	ISI Exam	Ultrasonic Examination Results
N2B (Recirc. Inlet Nozzle)	Nozzle to Vessel Weld	UT	No Recordable UT Indications Acceptable
N2D (Recirc. Inlet Nozzle)	Nozzle to Vessel Weld	UT	No Recordable UT Indications Acceptable
N2K (Recirc. Inlet Nozzle)	Nozzle to Vessel Weld	UT	No Recordable UT Indications Acceptable
N8B (Jet Pump Instr. Nozzle)	Nozzle to Vessel Weld	UT	No Recordable UT Indications Acceptable
N4B (Feedwater Nozzle)	Nozzle to Vessel Weld	UT	No Recordable UT Indications Acceptable
N4C (Feedwater Nozzle)	Nozzle to Vessel Weld	UT	No Recordable UT Indications Acceptable
N4E (Feedwater Nozzle)	Nozzle to Vessel Weld	UT	No Recordable UT Indications Acceptable
N4F (Feedwater Nozzle)	Nozzie to Vessel Weld	UT	No Recordable UT Indications Acceptable
N3A (Main Steam Nozzle)	Nozzie to Vessel Weld	UT	No Recordable UT Indications Acceptable
N3C (Main Steam Nozzle)	Nozzie to Vessei Weld	UT	No Recordable UT Indications Acceptable

Thanks,

Dan Langenfeld Task Lead, MT/PT Level-III AREVA NP, INC.