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

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: Brunswick Steam Electric Plant, Unit Nos. 1 and 2
Renewed Facility Operating License Nos. DPR-71 and DPR-62
Docket Nos. 50-325 and 50-324
Proposed Alternative for the Fourth 10-Year Inservice Inspection Program

Reference: Letter from Randy C. Ivey (Progress Energy) to the the U.S. Nuclear Regulatory Commission, *Inservice Inspection Plan for the Fourth 10-Year Inspection Interval*, dated May 21, 2008, ADAMS Accession Number ML081500243.

Ladies and Gentlemen:

By letter dated May 21, 2008 (i.e., Reference), Duke Energy Progress, LLC (Duke Energy), submitted the Inservice Inspection Plan for the fourth 10-year inspection interval for the Brunswick Steam Electric Plant (BSEP), Units 1 and 2. During the fourth inspection interval, the 2001 Edition through 2003 Addenda of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, was used for Class 1, 2, and 3 components, unless otherwise permitted.

During the fourth 10-year interval, Duke Energy completed the required inservice examinations for BSEP, Units 1 and 2, in accordance with the plan, except that certain components could not fully meet the examination requirements specified in the 2001 ASME Code with 2003 Addenda, Section XI, including the clarifications provided in ASME Code Case N-460. Duke Energy has determined that conformance to the Code requirement of essentially 100 percent coverage of weld volume or area examined was impractical due to various constraints and limitations. Accordingly, in accordance with 10 CFR 50.55a(g)(5)(iii), Duke Energy requests NRC approval of the 10 CFR 50.55a relief requests for the locations identified in Table 1 and Table 2 of Enclosure 1, for BSEP Unit 1 and Unit 2, respectively. Non-destruction examination (NDE) data and coverage plots for Unit 1 and Unit 2 are provided in Enclosure 2 and 3, respectively.

The fourth 10-year inservice inspection interval for both BSEP Unit 1 and Unit 2 began on May 11, 2008, and ended on May 10, 2018. This submittal is being provided to the NRC within 12 months after the expiration of the 10-year inservice inspection interval.

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No regulatory commitments are contained in this letter. Please refer any questions regarding this submittal to Mr. Art Zaremba, Director – Nuclear Fleet Licensing, at (980) 373-2062.

Sincerely,

M. Christopher Nolan

Vice President – Nuclear Regulatory Affairs,
Policy, & Emergency Preparedness

LJG/ljg

Enclosures:

1. Relief Request ISI-12, Relief Requested in Accordance with 10 CFR 50.55a(g)(5)(iii) for Volumetric Examination of Class 1 and 2 Components
2. Relief Request ISI-12, Brunswick Steam Electric Plant, Unit 1 Fourth Inservice Inspection (ISI) Interval Limited Coverage Non-Destruction Examination (NDE) Data and Coverage Plots
3. Relief Request ISI-12, Brunswick Steam Electric Plant, Unit 2 Fourth Inservice Inspection (ISI) Interval Limited Coverage Non-Destruction Examination (NDE) Data and Coverage Plots

cc (with Enclosures):

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Enclosure 1

Duke Energy Progress, LLC

Brunswick Steam Electric Plant, Units 1 and 2

Relief Request ISI-12

Relief Requested in Accordance with 10 CFR 50.55a(g)(5)(iii) for Volumetric Examination of Class 1 and 2 Components

1.0 ASME CODE COMPONENTS AFFECTED:

Code Class:	1 & 2
References:	IWB-2500, Table IWB-2500-1 IWC-2500, Table IWC-2500-1 ASME Code Case N-460 ASME Code Case N-578-1, Table 1
Examination Categories:	B-D, C-B, C-F-2, R-A
Item Numbers:	B3.90, C2.21, C2.22, C5.51, R1.14
Description:	Limited Volumetric Examination Coverage
Component Number:	See Tables 1 and 2 for a List of Component IDs

2.0 APPLICABLE CODE EDITION AND ADDENDA:

The Brunswick Steam Electric Plant (BSEP), Units 1 and 2 Fourth Inservice Inspection Interval is based on the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, 2001 Edition through the 2003 Addenda.

3.0 APPLICABLE CODE REQUIREMENTS:

3.1 Examination Category B-D

The extent of examination requirement for Examination Category B-D, Item Number B3.90, per Table IWB-2500-1, requires a volumetric examination of all nozzle-to-vessel welds as shown in Figure IWB-2500-7(b). During the fourth interval, BSEP Units 1 and 2, was approved to use ASME Code Case N-702 in a Safety Evaluation (SE) dated January 31, 2011 (ADAMS Accession Number ML110060504), for Relief Request ISI-05. Also, as allowed by ASME Code Case N-613-1, BSEP Units 1 and 2 performed a volumetric examination using a reduced examination volume (A-B-C-D-E-F-G-H) of Figure 2 of the Code Case in lieu of the previous examination volumes of ASME Section XI, Figure IWB-2500-7(b).

3.2 Examination Category C-B

The extent of examination requirement for Examination Category C-B, Item Number C2.21, per Table IWC-2500-1, requires a volumetric and surface examination of the nozzle-to-shell weld as shown in Figure IWC-2500-4(b). Note 4 in Table IWC-2500-1 states, in the case of multiple vessels of similar design, size, and service (such as steam generators, heat exchangers), the required examinations may be limited to one vessel or distributed among the vessels.

The extent of examination requirement for Examination Category C-B, Item Number C2.22, per Table IWC-2500-1, requires a volumetric examination of the nozzle inside radius section as shown in Figure IWC-2500-4(b). Note 4 in Table IWC-2500-1 states, in the case of multiple vessels of similar design, size, and service (such as steam generators,

heat exchangers), the required examinations may be limited to one vessel or distributed among the vessels.

3.3 Examination Category C-F-2

The extent of examination requirement for Examination Category C-F-2, Item Number C5.51 requires that 100% of each weld requiring examination receive a surface and volumetric exam as shown in Figure IWC-2500-7(a). ASME Code Case N-663, as an alternative for use by the NRC Regulatory Guide (RG) 1.147, Revision 15, states that in lieu of the surface examination requirements for the piping welds of Examination Category B-F (NPS 4 and larger), B-J (NPS 4 and larger), C-F-1, and C-F-2, surface examinations may be limited to areas identified by the Owner as susceptible to outside surface attack. The requirement for a surface examination was addressed by an ASME Code Case N-663 evaluation which determined that both BSEP units had no locations that were susceptible.

3.4 Examination Category R-A

The extent of examination requirement for Examination Category R-A, Item Number R1.14, per Table 1 of ASME Code Case N-578-1, requirements a volumetric examination of essentially 100% of the length of the Risk Informed Inservice Inspection (RI-ISI) weld. Relief Request ISI-02 was submitted and was approved by the NRC in a SE dated November 4, 2008 (ADAMS Accession Number ML082600075), in order to utilize Electric Power Research Institute (EPRI) Topical Report (TR) 112657, Revision B-A, as supplemented by ASME Code Case N-578-1. The RI-ISI program scope only included Code Class 1, Category B-J and B-F welds.

3.5 ASME Code Case N-460

BSEP Units 1 and 2 adopted ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1," which defines "essentially 100%" as greater than 90% coverage of the examination volume or surface area, as applicable. The greater than 90% minimum coverage was applied to all surface and volumetric examinations required by ASME Section XI.

4.0 IMPRACTICALITY OF COMPLIANCE:

Pursuant to 10 CFR 50.55a(g)(5)(iii), relief is requested on the basis that conformance with these ASME Section XI Code requirements is impractical as conformance would require extensive structural modifications to the component or surrounding structure.

BSEP Units 1 and 2 systems and components were designed and fabricated before the examination requirements of the ASME Section XI Code were formalized and published. Therefore, the BSEP was not specifically designed to meet the requirements of the ASME Section XI Code and full compliance is not feasible or practical within the limits of the current plant design. 10 CFR 50.55a(g)(1) recognizes the limitations to inservice inspection of components in accordance with the ASME Section XI Code that are

imposed due to early plants' design and construction.

Due to the original design of these components, it is not feasible to effectively perform the examination to the extent required (i.e. greater than 90% of the required volume and/or area). Therefore, relief is requested on the basis that the ASME Section XI Code requirements to examine these components are impractical due to physical obstructions and/or component configuration.

Tables 1 and 2 provide a summary of the examination limitations for each component for which relief is requested. The tables also indicate the outage the component was examined, the coverage percentage obtained for each component, and other pertinent design information. These tables are the cumulative lists of the limited ASME Section XI examinations performed during the fourth ISI interval. Enclosures 2 and 3 provide non-destructive examination (NDE) data and coverage plots that detail the examination limitations.

Accordingly, pursuant to 10 CFR 50.55a(g)(5)(iii), Duke Energy has determined that conformance with the code requirement of essentially 100% coverage of weld volume or area examined was impractical due to various constraints and limitations as stated above. Duke Energy requests NRC approval of the proposed alternative as stated below.

5.0 BURDEN CAUSED BY COMPLIANCE:

Compliance with the applicable ASME Section XI Code volumetric examination requirements can only be accomplished by redesigning and refabricating the subject and/or surrounding components. Based on this, the ASME Section XI Code requirements are deemed impractical in accordance with 10 CFR 50.55a(g)(5)(iii).

6.0 PROPOSED ALTERNATIVE AND BASIS FOR USE:

On the basis that obtaining the required examination coverage is impractical due to physical obstructions and limitations imposed by original plant design and fabrication, no alternative examination for additional ultrasonic (UT) examination coverage is proposed. Radiography (RT) is not a desired option because RT is limited in the ability to detect service induced flaws. BSEP / Duke Energy has determined the completed UT examinations are an acceptable alternative that provides reasonable assurance of continued structural integrity.

6.1 Examination Category B-D

BSEP Units 1 and 2 have performed the ASME Section XI Code required examinations to the maximum extent practical (Code Coverage), which are documented in Tables 1 and 2. In most cases, examination for axially-oriented flaws was limited from the nozzle side of the weld due to the configuration of the nozzle. Acceptable examination coverage (> 90%) of circumferentially-oriented flaws was typically obtained for these welds. The

volume of coverage obtained during the UT examination along with ongoing leakage tests each refueling outage provide reasonable assurance that structural integrity is being maintained.

6.2 Examination Category C-B

BSEP Units 1 and 2 have performed the ASME Section XI Code required examinations to the maximum extent practical (Code Coverage), which are documented in Tables 1 and 2. Due to the component configurations causing these limitations, there are no alternative examination techniques currently available to increase coverage. In addition, VT-2 visual examinations associated with the Class 2 leakage test are performed each inspection period. The volume of coverage obtained during the UT examination along with ongoing leakage tests once every inspection period provides reasonable assurance that structural integrity is being maintained.

6.3 Examination Category C-F-2

BSEP Unit 1 has performed the ASME Section XI Code required examinations to the maximum extent practical (Code Coverage), which are documented in Table 1. Due to the component configurations causing these limitations, there are no alternative examination techniques currently available to increase coverage. In addition, VT-2 visual examinations associated with the Class 2 leakage test are performed each inspection period for these welds except for pipe-to-valve weld, 1E41IX226-1-FW22, which is exempt from periodic system pressure testing via IWA-5110(c). However, this section of piping within the High Pressure Coolant Injection (HPCI) system receives an integrated leak test in accordance with Technical Specification 5.5.2 every 24 months. Therefore, the volume of coverage obtained during the UT examinations along with ongoing leakage tests provide reasonable assurance that structural integrity is being maintained.

6.4 Examination Category R-A

BSEP Unit 1 has performed the ASME Section XI Code required examinations to the maximum extent practical (Code Coverage), which are documented in Table 1. Due to the component configuration causing these limitations, there are no alternative examination techniques currently available to increase coverage. In addition, VT-2 visual examinations associated with the Class 1 leakage test are performed each refueling outage. The volume of coverage obtained during the UT examinations along with ongoing leakage tests every refueling outage provide adequate assurance that structural integrity is being maintained.

7.0 DURATION OF PROPOSED ALTERNATIVE:

This request is proposed for the BSEP Units 1 and 2, Fourth Inservice Inspection Intervals identified below:

BSEP Units 1 and 2, Fourth Inservice Inspection Interval:

Start Date: May 11, 2008 End Date: May 10, 2018

8.0 PRECEDENTS:

8.1 Brunswick, Unit 1 – Relief Requests RR-47, RR-48, RR-49, and RR-50 for the Third 10-Year Interval Inservice Inspection Program Plan (ADAMS Accession Number ML11175A173).

8.2 Brunswick, Unit 2 – Relief Requests RR-47, RR-48, RR-49, and RR-50 for the Third 10-Year Interval Inservice Inspection Program Plan (ADAMS Accession Number ML11175A173).

8.3 Edwin I. Hatch Nuclear Plant, Unit NOS. 1 and 2 – Relief Requests ISI-RR-13, ISI-RR-14, ISI-RR-18, ISI-RR-19, ISI-RR-23, and ISI-RR-24 for Relief from Inservice Inspection Requirements (ADAMS Accession Number ML17279A045).

8.4 Oyster Creek Generating Station, Fourth 10-Year Interval Inservice Inspection Program Plan Request for Relief R-44 and R-45 (ADAMS Accession Number ML15097A153).

9.0 REFERENCES:

9.1 2001 Edition through 2003 Addenda, ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components."

9.2 ASME Code Case N-460, Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1.

9.3 Electric Power Research Institute (EPRI) Topical Report 112657, Revision B-A, "Revised-Risk Informed Inservice Inspection Evaluation" (ADAMS Accession Number ML013470102).

9.4 ASME Code Case N-578-1, Risk-Informed Requirement for Class 1, 2, or 3 Piping, Method B Section XI, Division 1.

9.5 ASME Code Case N-702, Alternative Requirements for Boiling Water Reactor (BWR) Nozzle Inner Radius and Nozzle-to-Shell Welds Section XI, Division 1.

9.6 Brunswick, Units 1 and 2, Relief Request ISI-02 Regarding the Continued Use of the Risk-Informed Inservice Inspection Program (ADAMS Accession Number ML082600075).

9.7 Brunswick Steam Electric Plant, Units 1 and 2 – Relief Request Alternative to Reactor Pressure Vessel Nozzle-to-Vessel Weld and Inner Radius Examinations (ADAMS Accession Number ML110060504).

Table 1
Brunswick Steam Electric Plant, Unit 1
List of Components with Limited Examination Coverage

Exam Category / Item Number	Component ID (Summary #)	Exam Requirements Figure No. and (Method)	Component Description (System)[Note 1]	Outage Examined	Material of Construction	Nominal Pipe Size (Thickness)	Exam Angle / Frequency (MHz) / Mode	Percent Coverage Obtained	Appendix VIII Qualified Exam	Remarks (NDE Data, Coverage Plots, and Calculations)
B-D B3.90	1B11-RPV-N1A (1-B11-1058)	[See Note 2] Volumetric (UT)	Nozzle N1A to Reactor Vessel Weld (RPV)	B1R18	A-508 Cl. 2 (Nozzle) SA-533 Gr. B (Shell)	26.125" ID (5.5" @ RPV Shell)	45° / 2.25 / Shear 60° / 2.0 / R. Long	80.35%	Yes	The examination was limited due to nozzle taper configuration. No unacceptable indications were noted. **(Enclosure 2, Pg. No. 1)**
B-D B3.90	1B11-RPV-N1B (1-B11-1060)	[See Note 2] Volumetric (UT)	Nozzle N1B to Reactor Vessel Weld (RPV)	B1R18	A-508 Cl. 2 (Nozzle) SA-533 Gr. B (Shell)	26.125" ID (5.5" @ RPV Shell)	45° / 2.25 / Shear 60° / 2.0 / R. Long	80.35%	Yes	The examination was limited due to nozzle taper configuration. No unacceptable indications were noted. **(Enclosure 2, Pg. No. 1)**
B-D B3.90	2B11-RPV-N5B (2-B11-1100)	[See Note 2] Volumetric (UT)	Nozzle N5B to Reactor Vessel Weld (RPV)	B1R18	A-508 Cl. 2 (Nozzle) SA-533 Gr. B (Shell)	14.25" ID (5.5" @ RPV Shell)	45° / 2.25 / Shear 60° / 2.0 / R. Long	74.2%	Yes	The examination was limited due to nozzle taper configuration. No unacceptable indications were noted. **(Enclosure 2, Pg. No. 2)**
C-B C2.21	1E11HX-1A-SWN3 (1-E11-3814)	IWC-2500-4(b) Surface and Volumetric (MT & UT)	Heat Exchanger 1A Inlet Nozzle to Head (RHR)	B1R22	SA-105 Gr. LF2 (Nozzle) SA-516 Gr. 70 (Shell Head)	20.0" (0.875" @ HX Shell)	45° / 2.25 / Shear 70° / 2.25 / Shear	100% - MT 40.1% - UT	No	Single sided exam. Limitation due to Nozzle / Shell configuration. 100% coverage was achieved for surface (MT) examination. No unacceptable indications were noted. **(Enclosure 2, Pg. Nos. 3 – 7)**

Table 1
Brunswick Steam Electric Plant, Unit 1
List of Components with Limited Examination Coverage

Exam Category / Item Number	Component ID (Summary #)	Exam Requirements Figure No. and (Method)	Component Description (System)[Note 1]	Outage Examined	Material of Construction	Nominal Pipe Size (Thickness)	Exam Angle / Frequency (MHz) / Mode	Percent Coverage Obtained	Appendix VIII Qualified Exam	Remarks (NDE Data, Coverage Plots, and Calculations)
C-B C2.22	1E11HX-1A-N4NIR (1-E11-3806)	IWC-2500-4(b) Volumetric (UT)	Heat Exchanger 1A Outlet Nozzle Inner Radius (RHR)	B1R18	SA-105 Gr. LF2 (Nozzle) SA-516 Gr. 70 (Shell Head)	20.0" (1.125" @ HX Shell)	55° / 2.25 / Shear 60° / 2.25 / Shear 65° / 2.25 / Shear	55.0%	Yes	Limitation due to Nozzle / Shell configuration. No unacceptable indications were noted. **(Enclosure 2, Pg. Nos. 8 – 11)**
C-F-2 C5.51	1E1145-15-FW58 (1-E11-3483)	IWC-2500-7(a) Surface and Volumetric (MT & UT)	Valve 1-E11-F031D to Pipe (RHR)	B1R21	SA-106 Gr. B (Pipe) A-216 WCC (Valve)	16" (0.375")	45° / 5.0 / Shear 60° / 5.0 / Shear	87.6% - UT MT [See Note 3]	Yes	The examination was limited due to physical limitations with circumferential scans on the downstream side of the weld (valve side only). No unacceptable indications were noted. **(Enclosure 2, Pg. Nos. 12 – 16)**
C-F-2 C5.51	1E1173-30-FW102 (1-E11-3616)	IWC-2500-7(a) Surface and Volumetric (MT & UT)	Pipe to Valve 1-E11-F017B (RHR)	B1R21	SA-106 Gr. B (Pipe) A-216 WCC (Valve)	24" (0.562")	45° / 2.25 / Shear 60° / 2.25 / Shear	87.3% - UT MT [See Note 3]	Yes	The examination was limited due to physical limitations with circumferential scans on the downstream side of the weld (valve side only). No unacceptable indications were noted. **(Enclosure 2, Pg. Nos. 17 – 22)**

Table 1
Brunswick Steam Electric Plant, Unit 1
List of Components with Limited Examination Coverage

Exam Category / Item Number	Component ID (Summary #)	Exam Requirements Figure No. and (Method)	Component Description (System)[Note 1]	Outage Examined	Material of Construction	Nominal Pipe Size (Thickness)	Exam Angle / Frequency (MHz) / Mode	Percent Coverage Obtained	Appendix VIII Qualified Exam	Remarks (NDE Data, Coverage Plots, and Calculations)
C-F-2 C5.51	1E215-39-FW4 (1-E21-4015)	IWC-2500-7(a) Surface and Volumetric (MT & UT)	Valve 1-E21-F001A to Pipe (CS)	B1R18	SA-106 Gr. B (Pipe) A-216 WCB/WCC (Valve)	14" (0.375")	45° / 5.0 / Shear 60° / 5.0 / Shear	90.0% - UT MT [See Note 3]	Yes	The examination was limited due to physical limitations with circumferential scans on the upstream side of the weld (valve side only). Indications from previous interval data verified (Report # 39-FW4, dated 4/18/2001, no changes observed). See NDE report in Enclosure 2, Page 22 for details related to indications. **(Enclosure 2, Pg. Nos. 23 – 33)**
C-F-2 C5.51	1E411X226-1-FW22 (1-E41-4152)	IWC-2500-7(a) Surface and Volumetric (MT & UT)	Pipe to Valve 1-E41-F042 (HPCI)	B1R21	SA-106 Gr. B (Pipe) A-216 WCB	16" (0.375")	45° / 5.0 / Shear 60° / 5.0 / Shear 70° / 5.0 / Shear	70.5% - UT MT [See Note 3]	Yes	The examination was limited due to physical limitations with circumferential scans on the upstream and downstream side of the weld. 100% axial coverage for circumferential flaws was achieved. No unacceptable indications were noted. **(Enclosure 2, Pg. Nos. 34 – 40)**
R-A R1.14	1B11N2D-RPV-FWABA (1-RCR-011-RI)	Code Case N-578-1 Table 1, Note (7)	RPV Nozzle 2D to Safe End Weld (RCR)	B1R18	A-508 Cl. 2 (Nozzle) Alloy 82/182 (DM Weld) SB-166 (Safe End)	12" (0.688")	35°-65° / 1.5 / Shear 25°-70° / 1.5 / R. Long (phased array)	86.9%	Yes	Limitations due to N2D nozzle configuration. 100% axial coverage for circumferential flaws was achieved. Observed previously recorded geometric reflectors with no change. **(Enclosure 2, Pg. Nos. 41 – 42)**

Table 1
Brunswick Steam Electric Plant, Unit 1
List of Components with Limited Examination Coverage

Exam Category / Item Number	Component ID (Summary #)	Exam Requirements Figure No. and (Method)	Component Description (System)[Note 1]	Outage Examined	Material of Construction	Nominal Pipe Size (Thickness)	Exam Angle / Frequency (MHz) / Mode	Percent Coverage Obtained	Appendix VIII Qualified Exam	Remarks (NDE Data, Coverage Plots, and Calculations)
R-A R1.14	1B11N5B-RPV-FWRNB16A (1-CS-027-RI)	Code Case N-578-1 Table 1, Note (7)	RPV Nozzle N5B to Safe End Weld (CS)	B1R22	A-508 Cl. 2 (Nozzle) Alloy 82/182 (DM Weld) SA-336 Cl. F8 (Safe End)	15.50" (0.90")	[See Note 4]	87.9%	Yes	Limitations due to N5B nozzle configuration. 100% axial coverage for circumferential flaws was achieved. No IGSCC/SCC flaws were detected. **(Enclosure 2, Pg. Nos. 43 – 52)**

NOTES:

1. The following systems and their abbreviations are listed here:
   - Core Spray (CS)
   - High Pressure Coolant Injection (HPCI)
   - Reactor Coolant Recirculation (RCR)
   - Residual Heat Removal (RHR)
2. The examination was performed using the alternative examination volume defined in ASME Code Case N-613-1, which reduces the area to be examined per IWB-2500-7(b) to the weld plus ½" on each side.
3. ASME Code Case N-663 applied.
4. Circumferential flaw detection exams were performed from both sides of the weld using refracted longitudinal wave beam angles of 30°, 45°, 60°, and 70° along with refracted shear wave beam angles of 45° and 60°. In addition to the automated examinations, manual scans were performed utilizing 45° and 60° refracted longitudinal wave and 45° shear wave probes. Axial flaw detection exams were performed across the examination volume in both circumferential beam directions (CW/CCW) using refracted longitudinal wave beam angles of 25°, 35°, 45°, and 55° along with shear wave beam angles of 35°, 45°, and 55°. Each of the beam angles were additionally programmed to produce beam skews from -30° to +30° at a 2.5° skew angle resolution. In addition to the automated examination manual scans were performed utilizing a 45° shear wave probe to achieve additional coverage on the nozzle side of the weld.

Table 2
Brunswick Steam Electric Plant, Unit 2
List of Components with Limited Examination Coverage

Exam Category / Item Number	Component ID (Summary #)	Exam Requirements Figure No. and (Method)	Component Description (System)[Note 1]	Outage Examined	Material of Construction	Nominal Pipe Size (Thickness)	Exam Angle / Frequency (MHz) / Mode	Percent Coverage Obtained	Appendix VIII Qualified Exam	Remarks (NDE Data, Coverage Plots, and Calculations)
B-D B3.90	2B11-RPV-N1A (2-B11-1078)	[See Note 2] Volumetric (UT)	Nozzle N1A to Reactor Vessel Weld (RPV)	B2R23	A-508 Cl. 2 (Nozzle) SA-533 Gr. B (Shell)	26.125" ID (5.5" @ RPV Shell)	[See Note 3]	76.5%	Yes	The examination was limited due to nozzle taper configuration. No unacceptable indications were noted. **(Enclosure 3, Pg. Nos. 1 – 8)**
B-D B3.90	2B11-RPV-N1B (2-B11-1080)	[See Note 2] Volumetric (UT)	Nozzle N1B to Reactor Vessel Weld (RPV)	B2R23	A-508 Cl. 2 (Nozzle) SA-533 Gr. B (Shell)	26.125" ID (5.5" @ RPV Shell)	[See Note 3]	76.5%	Yes	The examination was limited due to nozzle taper configuration. No unacceptable indications were noted. **(Enclosure 3, Pg. Nos. 9 – 16)**
B-D B3.90	2B11-RPV-N2B (2-B11-1084)	[See Note 2] Volumetric (UT)	Nozzle N2B to Reactor Vessel Weld (RPV)	B2R23	A-508 Cl. 2 (Nozzle) SA-533 Gr. B (Shell)	14.125" ID (5.5" @ RPV Shell)	[See Note 3]	72.8%	Yes	The examination was limited due to nozzle taper configuration. No unacceptable indications were noted. **(Enclosure 3, Pg. Nos. 17 – 24)**
B-D B3.90	2B11-RPV-N2C (2-B11-1086)	[See Note 2] Volumetric (UT)	Nozzle N2C to Reactor Vessel Weld (RPV)	B2R23	A-508 Cl. 2 (Nozzle) SA-533 Gr. B (Shell)	14.125" ID (5.5" @ RPV Shell)	[See Note 3]	72.8%	Yes	The examination was limited due to nozzle taper configuration. No unacceptable indications were noted. **(Enclosure 3, Pg. Nos. 25 – 32)**
B-D B3.90	2B11-RPV-N2D (2-B11-1088)	[See Note 2] Volumetric (UT)	Nozzle N2D to Reactor Vessel Weld (RPV)	B2R23	A-508 Cl. 2 (Nozzle) SA-533 Gr. B (Shell)	14.125" ID (5.5" @ RPV Shell)	[See Note 3]	72.8%	Yes	The examination was limited due to nozzle taper configuration. No unacceptable indications were noted. **(Enclosure 3, Pg. Nos. 33 – 40)**

Table 2
Brunswick Steam Electric Plant, Unit 2
List of Components with Limited Examination Coverage

Exam Category / Item Number	Component ID (Summary #)	Exam Requirements Figure No. and (Method)	Component Description (System)[Note 1]	Outage Examined	Material of Construction	Nominal Pipe Size (Thickness)	Exam Angle / Frequency (MHz) / Mode	Percent Coverage Obtained	Appendix VIII Qualified Exam	Remarks (NDE Data, Coverage Plots, and Calculations)
B-D B3.90	2B11-RPV-N5B (2-B11-1120)	[See Note 2] Volumetric (UT)	Nozzle N5B to Reactor Vessel Weld (RPV)	B2R23	A-508 Cl. 2 (Nozzle) SA-533 Gr. B (Shell)	14.25" ID (5.5" @ RPV Shell)	[See Note 3]	72.8%	Yes	The examination was limited due to nozzle taper configuration. No unacceptable indications were noted. **(Enclosure 3, Pg. Nos. 41 – 48)**
B-D B3.90	2B11-RPV-N8B (2-B11-1137)	[See Note 2] Volumetric (UT)	Nozzle N8B to Reactor Vessel Weld (RPV)	B2R23	A-508 Cl. 2 (Nozzle) SA-533 Gr. B (Shell)	4.2" ID (5.5" @ RPV Shell)	[See Note 3]	72.8%	Yes	The examination was limited due to nozzle taper configuration. No unacceptable indications were noted. **(Enclosure 3, Pg. Nos. 49 – 56)**
B-D B3.90	2B11-RPV-N9 (2-B11-1140)	[See Note 2] Volumetric (UT)	Nozzle N9 to Reactor Vessel Weld (RPV)	B2R23	A-508 Cl. 2 (Nozzle) SA-533 Gr. B (Shell)	4.125" ID (5.5" @ RPV Shell)	[See Note 3]	72.8%	Yes	The examination was limited due to nozzle taper configuration. No unacceptable indications were noted. **(Enclosure 3, Pg. Nos. 57 – 64)**
C-B C2.21	2E11HX-2A-SWN3 (2-E11-3756)	IWC-2500-4(b) Surface and Volumetric (MT & UT)	Heat Exchanger 2A Inlet Nozzle to Head (RHR)	B2R23	SA-105 Gr. LF2 (Nozzle) SA-516 Gr. 70 (Shell Head)	20.0" (0.875" @ HX Shell)	45° / 2.25 / Shear 70° / 2.25 / Shear	100% - MT 50% - UT	No	Limitation due to Nozzle / Shell configuration. 100% coverage was achieved for surface (MT) examination. 100% axial coverage for circumferential flaws was achieved. No unacceptable indications were noted. **(Enclosure 3, Pg. Nos. 65 – 69)**

Table 2
Brunswick Steam Electric Plant, Unit 2
List of Components with Limited Examination Coverage

Exam Category / Item Number	Component ID (Summary #)	Exam Requirements Figure No. and (Method)	Component Description (System)[Note 1]	Outage Examined	Material of Construction	Nominal Pipe Size (Thickness)	Exam Angle / Frequency (MHz) / Mode	Percent Coverage Obtained	Appendix VIII Qualified Exam	Remarks (NDE Data, Coverage Plots, and Calculations)
C-B C2.21	2E11HX-2A-SWN4 (2-E11-3757)	IWC-2500-4(b) Surface and Volumetric (MT & UT)	Heat Exchanger 2A Outlet Nozzle to Shell (RHR)	B2R22	SA-105 Gr. LF2 (Nozzle) SA-516 Gr. 70 (Shell Head)	20.0" (1.125" @ HX Shell)	45° / 2.25 / Shear 60° / 2.25 / Shear	100% - MT 75% - UT	No	Limitation due to Nozzle / Shell configuration. 100% coverage was achieved for surface (MT) examination. 86% axial coverage for circumferential flaws was achieved. No unacceptable indications were noted. **(Enclosure 3, Pg. Nos. 70 – 80)**
C-B C2.22	2E11HX-2A-N4NIR (2-E11-3748)	IWC-2500-4(b) Volumetric (UT)	Heat Exchanger 2A Outlet Nozzle Inner Radius (RHR)	B2R22	SA-105 Gr. LF2 (Nozzle) SA-516 Gr. 70 (Shell Head)	20.0" (1.125" @ HX Shell)	55° / 2.25 / Shear 60° / 2.25 / Shear 65° / 2.25 / Shear	55.0%	Yes	Limitation due to Nozzle / Shell configuration. No unacceptable indications were noted. **(Enclosure 3, Pg. Nos. 81 – 88)**

NOTES:

1. The following systems and their abbreviations are listed here:
   - Residual Heat Removal (RHR)
   - Reactor Pressure Vessel (RPV)
2. The examination was performed using the alternative examination volume defined in ASME Code Case N-613-1, which reduces the area to be examined per IWB-2500-7(b) to the weld plus ½" on each side.

3. 60° Longitudinal wave examinations were performed from the vessel surface in both the radial and circumferential scan directions. In accordance with UT Procedure 54-ISI-850-008 and the EPRI Model No. IR-2017-680 the following examinations were performed.

Recirculation Outlet Nozzle (N1A, N1B) Nozzle Modeling Parameters		
Probe	Probe Skew	Scan Surface
50° Shear	± (59° to 82°)	Vessel
Recirculation Inlet Nozzle (N2B, N2C, N2D) Nozzle Modeling Parameters		
Probe	Probe Skew	Scan Surface
50° Shear	± (51° to 76°)	Vessel
Core Spray Nozzle (N5B) Nozzle Modeling Parameters		
Probe	Probe Skew	Scan Surface
50° Shear	± (51° to 77°)	Vessel
Jet Pump Instrumentation (N8B) Nozzle Modeling Parameters		
Probe	Probe Skew	Scan Surface
50° Shear	± (43° to 65°)	Vessel
CRD-HYD System Return (N9) Nozzle Modeling Parameters		
Probe	Probe Skew	Scan Surface
50° Shear	± (44° to 65°)	Vessel

Enclosure 2

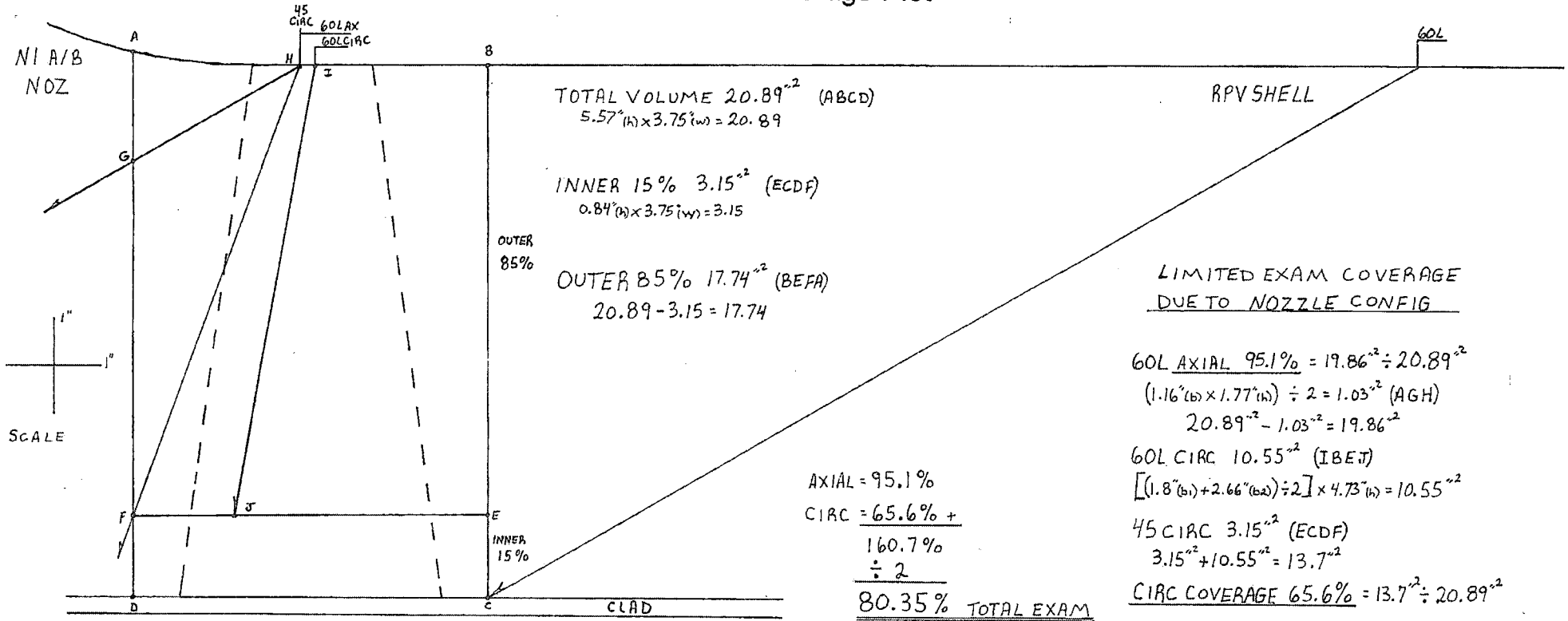
Relief Request ISI-12

Brunswick Steam Electric Plant, Unit 1 Fourth Inservice Inspection (ISI) Interval Limited Coverage Non-Destruction Examination (NDE) Data and Coverage Plots

1B11-RPV-N1A / 1B11-RPV-N1B

Nozzle to Reactor Vessel Weld

Examination Coverage Plot



TOTAL VOLUME $20.89^{"2}$ (ABCD)
$5.57"(h) \times 3.75"(w) = 20.89$

INNER 15% $3.15^{"2}$ (ECDF)
$0.84"(h) \times 3.75"(w) = 3.15$

OUTER 85% $17.74^{"2}$ (BEFA)
$20.89 - 3.15 = 17.74$

AXIAL = 95.1%
CIRC = 65.6% +
160.7%
÷ 2
80.35% TOTAL EXAM COVERAGE

LIMITED EXAM COVERAGE DUE TO NOZZLE CONFIG

60L AXIAL 95.1% = $19.86^{"2} \div 20.89^{"2}$
$(1.16"(b) \times 1.77"(h)) \div 2 = 1.03^{"2}$ (AGH)
$20.89^{"2} - 1.03^{"2} = 19.86^{"2}$

60L CIRC $10.55^{"2}$ (IBEJ)
$[(1.8"(b_1) + 2.66"(b_2)) \div 2] \times 4.73"(h) = 10.55^{"2}$

45 CIRC $3.15^{"2}$ (ECDF)
$3.15^{"2} + 10.55^{"2} = 13.7^{"2}$

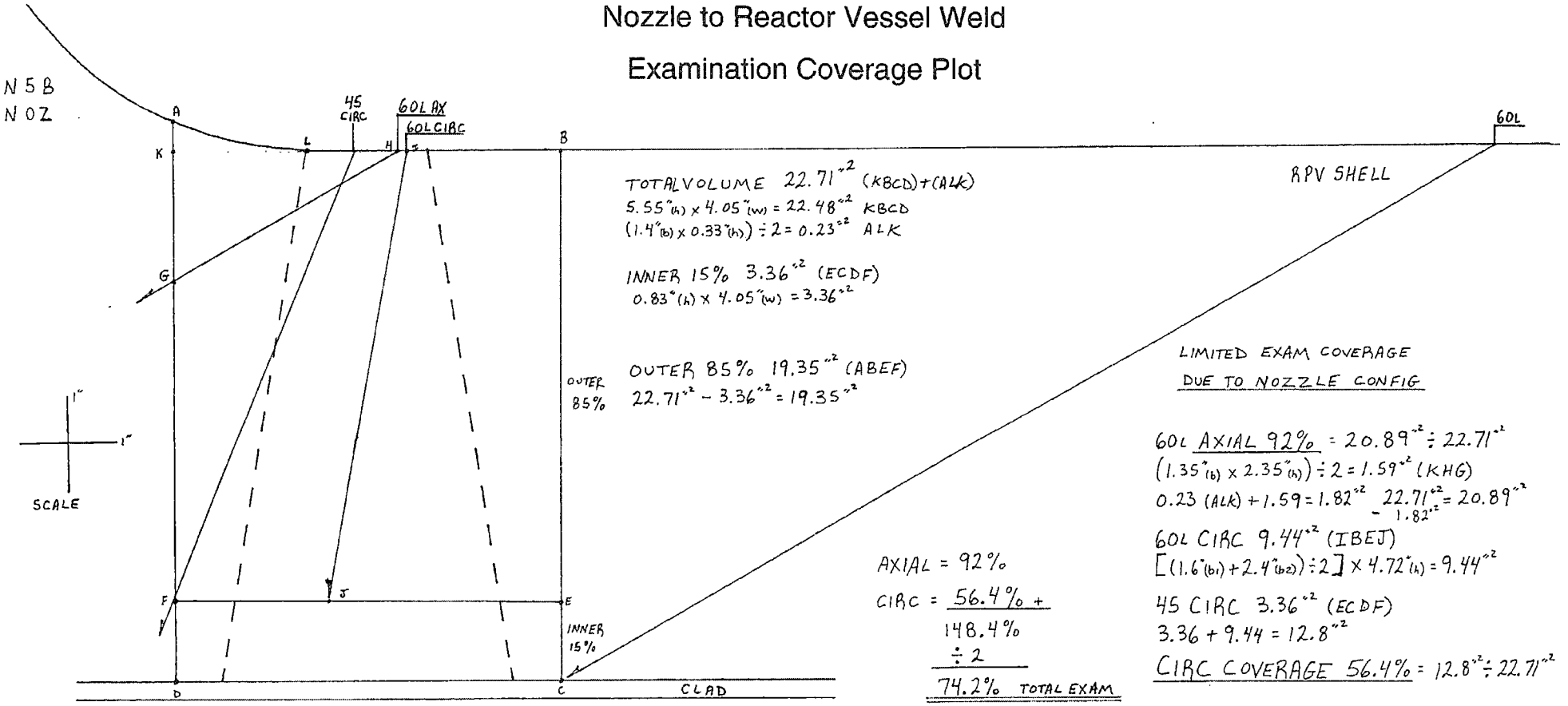
CIRC COVERAGE 65.6% = $13.7^{"2} \div 20.89^{"2}$

DRAWN AND REVIEWED BY: JASON POLISENSKY UT L-III, 4/9/19
Reviewed by: Steven Dean UT L-III 4/10/19

1B11-RPV-N5B

Nozzle to Reactor Vessel Weld

Examination Coverage Plot



TOTAL VOLUME 22.71^{in^2} (KBCD)+(ALK)
$5.55^{in}(h) \times 4.05^{in}(w) = 22.48^{in^2}$ KBCD
$(1.4^{in}(b) \times 0.33^{in}(h)) \div 2 = 0.23^{in^2}$ ALK

INNER 15% 3.36^{in^2} (ECDF)
$0.83^{in}(h) \times 4.05^{in}(w) = 3.36^{in^2}$

OUTER 85% 19.35^{in^2} (ABEF)
$22.71^{in^2} - 3.36^{in^2} = 19.35^{in^2}$

LIMITED EXAM COVERAGE
DUE TO NOZZLE CONFIG

60L AXIAL 92% = $20.89^{in^2} \div 22.71^{in^2}$
$(1.35^{in}(b) \times 2.35^{in}(h)) \div 2 = 1.59^{in^2}$ (KHG)
0.23 (ALK) $+ 1.59 = 1.82^{in^2}$ $22.71^{in^2} - 1.82^{in^2} = 20.89^{in^2}$

60L CIRC 9.44^{in^2} (IBEJ)
$[(1.6^{in}(b_1) + 2.4^{in}(b_2)) \div 2] \times 4.72^{in}(h) = 9.44^{in^2}$

45 CIRC 3.36^{in^2} (ECDF)
$3.36 + 9.44 = 12.8^{in^2}$

CIRC COVERAGE 56.4% = $12.8^{in^2} \div 22.71^{in^2}$

AXIAL = 92%
CIRC = 56.4% + 148.4%
$\div 2$
74.2% TOTAL EXAM COVERAGE

DRAWN AND REVIEWED BY: JASON POLISENSKY UT L III, 4/16/19
Reviewed by: D.B King UT Level III 4/17/19

NGG Nuclear Generation Group

Magnetic Particle Examination

Site/Unit: BNP / 1 | Procedure: NDE-NE-ALL-3101 | Outage No.: B122R1
Summary No.: 1-E11-3814 | Procedure Rev.: 0 | Report No.: MT-18-007
Workscope: ISI | Work Order No.: 20170837 | Page: 1 of 3

Code: 2001 EDITION/2003 ADDENDA | Cat./Item: C-B/C2.21 | Location: Reactor Building
Drawing No.: C-24004 Sht. 075-1 | Description: RHR HTX 1A INLET NOZZLE TO HEAD
System ID: 2045
Component ID: 1E11HX-1A-SWN3 | Mat./Thickness: CS / 0.875"
Limitations: None

Light Meter Mfg.: N/A - EPRI Character Card | Serial No.: 0904130016 | Illumination: Adequate
Temp. Tool Mfg.: Fluke | Serial No.: G503098 | Surface Temp.: 72 °F
Resolution: 0.044" Character Card
Lift Block Serial No.: G502277 | Surface Condition: Ground Smooth
Lo/Wo Location: N/A | Field Orientation: Two Perpendicular

Magnetic Particle Material

Brand: Parker | Wet ☐ | Dry ☑ | Visible ☑ | Fluorescent ☐ | Mixed: Yes ☐ No ☑ | With: N/A
Type: 8A Red
Batch No.: 19946
Equipment: MAGNAFLUX | Serial No.: 16-04

Applied By: Dusting ☑ Spraying ☐ Flooding ☐

Head Shot ☐ N/A Amperes | Fixed Spacing ☐ | AC ☑ DC ☐
Adj. Spacing ☑ 3" - 6" inches | Encircling Coils ☐ N/A Turns
Prods. Spacing ☐ N/A inches | Current (machine setting) ☐ N/A Amperes

Indication No.	Loc L	Loc W	Diameter	Length	Type R/L	Remarks
NRI						N/A

Comments:
Yoke technique, Attachment 13, Figure 13.1.
Lift test and illumination verified before and after exam.

Results: Sat ☑ Unsat ☐ Eval ☐

Percent Of Coverage Obtained > 90%: 100% | Reviewed Previous Data: N/A | Exam Time: 1620

Examiner Level II-N May, Richard C.	Signature [signature]	Date 3/8/2018	Reviewer J.D. Shepard, NDE LIII
Examiner Level II-N Ransom, Greg J.	Signature [signature]	Date 3/8/2018	Site Review CHRIS WINSLOW
Other Level IIL-N Williams, Christopher D	Signature [signature]	Date 3/8/2018	ANII Review DAVID M. REYNOLDS

Reviewer Signature [signature] Date 3/14/18 CRW
Site Review Signature [signature] Date 3/13/18
ANII Review Signature [signature] Date 3/13/2018

UT Calibration/Examination

NGG Nuclear Generation Group

Site/Unit:	BNP / 1	Procedure:	NDEP-0448	Outage No.:	B122R1
Summary No.:	1-E11-3814	Procedure Rev.:	4	Report No.:	UT-18-006
Workscope:	ISI	Work Order No.:	20170837	Page:	1 of 6

Code:	2001 EDITION/2003 ADDENDA	Cat./Item:	C-B/C2.21	Location:	Reactor Building
Drawing No.:	C-24004 Sht. 075-1	Description:	RHR HTX 1A INLET NOZZLE TO HEAD		
System ID:	2045				
Component ID:	1E11HX-1A-SWN3	Size/Length:	1.2" / 81.5"	Thickness/Diameter:	CS/0.875"/26.0"
Limitations:	Single side exam due to nozzle	Start Time:	1600	Finish Time:	1645

Instrument Settings

Serial No.:	15A024PE		
Manufacturer:	GE		
Model:	USN 60 SW	Linearity:	L-18-004
Delay:	6.3712	Range:	2.0
M'tl Cal/Vel:	0.1271	Pulser Type:	Square
Damping:	500 Ohms	Reject:	0%
PRF:	Auto High	SU Freq.:	2.25 MHz
Frequency:	2.25 MHz	Rectify:	Fullwave
Voltage:	450	Pulse Width:	220

Ax. Gain (dB): 26.4 Circ. Gain (dB): N/A

1 Screen Div. = .200 in. of Sound Path

Calibration Block

Cal. Block No.: 071B

Thickness: .875 Dia.: Flat

Cal. Blk. Temp.: 70 Temp. Tool: G503098

Comp. Temp.: 72 Temp. Tool: G503098

Search Unit

Serial No.:	0105LM		
Manufacturer:	KBA		
Size:	0.50"	Model:	Comp- G
Freq.:	2.25 MHz	Center Freq.:	N/A
Exam Angle:	45°	Squint Angle:	N/A
Measured Angle:	45°	Mode:	Shear
Exit Point:	0.5"	# of Elements:	1
Config.:	Single	Focus:	N/A
Shape:	Round	Contour:	Flat
Wedge Style:	MSWQC		

Search Unit Cable

Type: RG-174 Length: 6' No. Conn.: 0

Scan Coverage

Upstream ☐ Downstream ☑ Scan dB: 32.5

CW ☑ CCW ☑ Scan dB: 32.5

Exam Surface: OD

Surface Condition: Smooth

Cal. Checks	Time	Date
Initial Cal.	1145	3/8/2018
Inter. Cal.	1555	3/8/2018
Inter. Cal.	N/A	
Inter. Cal.	N/A	
Final Cal.	1730	3/8/2018

Couplant

Cal. Batch:	14M076
Type:	Ultragel II
Mfg.:	Magnaflux
Exam Batch:	14M076
Type:	Ultragel II
Mfg.:	Magnaflux

Reference Block

Serial No.: 16-4112

Type: CS Rompas

Axial Oriented Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
1/4" Hole	80	1.0	0.189
1/2" Hole	68	2.8	0.552
3/4" Hole	67	4.5	0.908
ID Notch	40	6.2	1.240

Circumferential Oriented Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A	N/A	N/A	N/A

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
26.4	FSDH	60	5.4	1.08

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)

Results: Sat ☑ Unsat ☐ Eval ☐ NCR 02190316

Percent Of Coverage Obtained > 90%: 40.1% Reviewed Previous Data: Yes

Comments: No examination from nozzle side due to configuration.
Circ scan limitation due to nozzle and weld configuration.

Examiner	Level	Signature	Date	Reviewer		Signature	Date
Hancock, David R.	II-PDI		3/8/2018	Jason Polisensky LV III			3/13/18
Examiner	Level	Signature	Date	Site Review		Signature	Date
N/A	N/A			CHRIS WINSLOW			3/14/18
Other	Level	Signature	Date	ANII Review		Signature	Date
N/A	N/A			Elmostafa Erkoun			3/15/18

UT Calibration/Examination

NGG Nuclear Generation Group

Site/Unit:	BNP / 1	Procedure:	NDEP-0448	Outage No.:	B122R1
Summary No.:	1-E11-3814	Procedure Rev.:	4	Report No.:	UT-18-006
Workscope:	ISI	Work Order No.:	20170837	Page:	2 of 6

Code: 2001 EDITION/2003 ADDENDA | Cat./Item: C-B/C2.21 | Location: Reactor Building

Drawing No.: C-24004 Sht. 075-1 | Description: RHR HTX 1A INLET NOZZLE TO HEAD

System ID: 2045

Component ID: 1E11HX-1A-SWN3 | Size/Length: 1.2" / 81.5" | Thickness/Diameter: CS/0.875"/26.0"

Limitations: Single side exam due to nozzle | Start Time: 1600 | Finish Time: 1645

Instrument Settings

Serial No.:	15A024PE		
Manufacturer:	GE		
Model:	USN 60 SW	Linearity:	L-18-004
Delay:	9.2794	Range:	3.0
M'tl Cal/Vel:	0.1268	Pulser Type:	Square
Damping:	500 Ohms	Reject:	0%
PRF:	Auto High	SU Freq.:	2.25 MHz
Frequency:	2.25 MHz	Rectify:	Fullwave
Voltage:	450	Pulse Width:	220

Ax. Gain (dB): 30.0 | Circ. Gain (dB): N/A

1 Screen Div. = .300 in. of Sound Path

Calibration Block

Cal. Block No.: 071B

Thickness: .875 | Dia.: Flat

Cal. Blk. Temp.: 70 | Temp. Tool: G503098

Comp. Temp.: 72 | Temp. Tool: G503098

Search Unit

Serial No.:	0105LJ		
Manufacturer:	KBA		
Size:	0.5"	Model:	Comp - G
Freq.:	2.25 MHz	Center Freq.:	N/A
Exam Angle:	70°	Squint Angle:	N/A
Measured Angle:	70°	Mode:	Shear
Exit Point:	0.700"	# of Elements:	1
Config.:	Single	Focus:	N/A
Shape:	Round	Contour:	Flat

Wedge Style: MSWQC

Search Unit Cable

Type: RG-174 | Length: 6' | No. Conn.: 0

Scan Coverage

Upstream ☐ | Downstream ☑ | Scan dB: 36.0

CW ☑ | CCW ☑ | Scan dB: 36.0

Exam Surface: OD

Surface Condition: Smooth

Cal. Checks	Time	Date
Initial Cal.	1205	3/8/2018
Inter. Cal.	1623	3/8/2018
Inter. Cal.	N/A	
Inter. Cal.	N/A	
Final Cal.	1720	3/8/2018

Couplant

Cal. Batch: 14M076

Type: Ultragel II

Mfg.: Magnaflux

Exam Batch: 14M076

Type: Ultragel II

Mfg.: Magnaflux

Reference Block

Serial No.: 16-4112

Type: CS Rompas

Axial Oriented Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
1/4" Hole	80	2.2	0.662
1/2" Hole	40	4.5	1.32
3/4" Hole	25	6.3	1.379
ID Notch	10	8.6	2.56	

Circumferential Oriented Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A	N/A	N/A	N/A

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
30.0	NSDH	53	3.2	0.960

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)

Results: Sat ☑ Unsat ☐ Eval ☐

Comments: Supplemental exam for coverage

Percent Of Coverage Obtained > 90%: 40.1% | Reviewed Previous Data:

Examiner	Level	II-PDI	Signature	Date	Reviewer	Signature	Date
Hancock, David R.				3/8/2018	Jason Polisensky LV III	Jason Polisensky	3/13/18
Examiner	Level	N/A	Signature	Date	Site Review	Signature	Date
N/A					CHRIS WINSLOW		3/14/18
Other	Level	N/A	Signature	Date	ANII Review	Signature	Date
N/A					El mostafa Kouu	EEKouu	3/15/18

NGG Nuclear Generation Group

Supplemental Report

Report No.: UT-18-006

Page: 3 of 6

Summary No.: 1-E11-3814

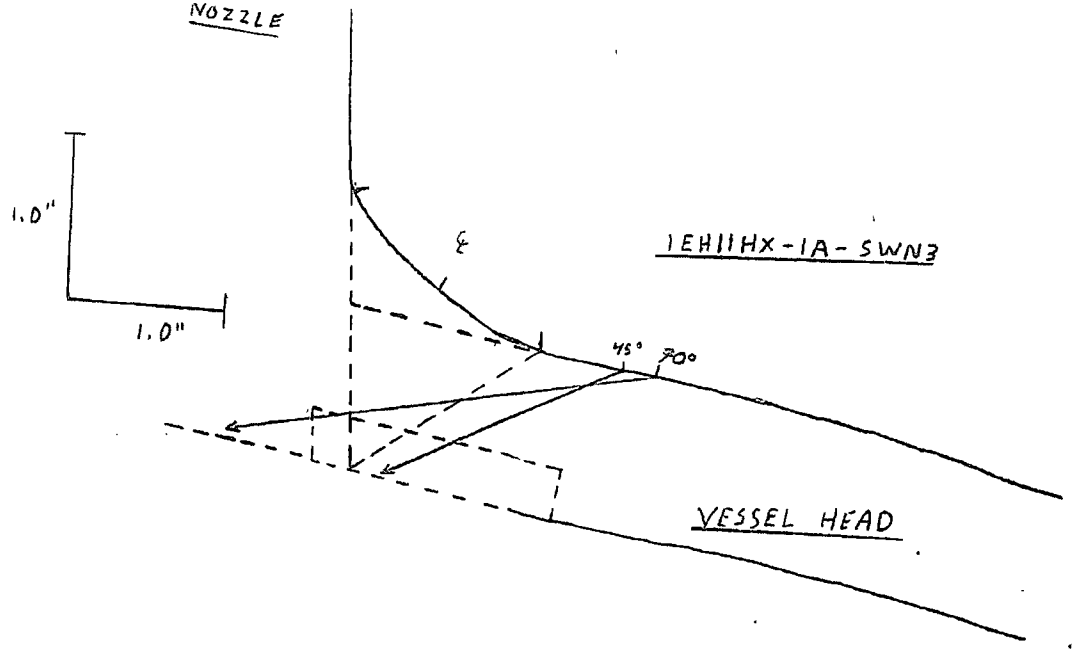
Examiner: Hancock, David R. Level: II-PDI Reviewer: J. POLISENSKY L-III Date: 3/13/18

Examiner: N/A Level: N/A Site Review: CHRIS WINSLOW Date: 3/14/18

Other: N/A Level: N/A ANII Review: Elmostafa Elkoun Date: 3/15/18

Comments: **Thicknes Profile / Coverage Plot**

Sketch or Photo: Z:\NDEess\UT\OUTAGES\BNP\Unit 1\B122R1\IDDEAL Modified Supplement Scans\1E11HX-1A-SWN3\1E11HX-1A-SWN3 (1).bmp



NGG Nuclear Generation Group

Supplemental Report

Report No.: UT-18-006

Page: 4 of 6

Summary No.: 1-E11-3814

Examiner: Hancock, David R. Level: II-PDI Reviewer: J. POLISENSKY LTIII Date: 3/13/18

Examiner: N/A Level: N/A Site Review: CHRIS WINSLOW Date: 3/14/18

Other: N/A Level: N/A ANII Review: Date: 3/15/18

Reviewed by: D.B. King UT Level III 3/13/18

Comments: **Coverage Calculations**

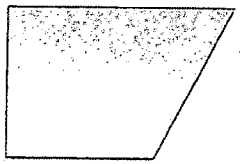
Sketch or Photo: Z:\NDEss\UT\OUTAGES\BNP\Unit 1\B122R1\IDDEAL Modified Supplement Scans\1E11HX-1A-SWN3\1E11HX-1A-SWN3 (2).bmp

1EH11HX-1A-SWN3

Examination Coverage Caculation

Total Volume
0.561"²

$1.7"_b \times .33"_h = 0.561"^2$



45° Vessel Head side missing volume

$[(0.9"_{b1}+0.45"_{b2}) \div 2] \times 0.33"_h = 0.222"^2$

0.222 ÷ 0.561 = 39.6% missing coverage

100% - 39.6% = 60.4% Total 45°Vessel Head side Coverage

60.4% = 45° Vessel Head Side

100% = 70° Vessel Head Side

160.4 ÷ 2 = 80.2% Axial coverage

Circ Scans performed from Head side and skewed into the weld from weld toes.

No coverage claimed on circ scans due to width of transducer and as welded Weld Crown. 0% = Circ coverage

80.2% + 0% = 80.2% ÷ 2 = 40.1% Total Examination Coverage Achieved

UT Calibration Examination

Nuclear Generation Group

Site/Unit:	BNP / 1	Procedure:	NDEP-0456	Outage No.:	B118R1
Summary No.:	1-E11-3806	Procedure Rev.:	003	Report No.:	UT-10-053
Workscope:	ISI	Work Order No.:	1549261	Page:	1 of 4

Code:	2001 Edition, 2003 Addenda	Cat./Item:	C-B/C2.22	Location:	See ISO
Drawing No.:	C-24004 Sht. 75-1	Description:	RHR HTX 1A OUTLET NOZZLE INNER RADIUS		
System ID:	2045				
Component ID:	1E11HX-1A-N4NIR	Size/Length:	75"	Thickness/Diameter:	2.5"
Limitations:	Nozzle / Shell Configuration	Start Time:	1605	Finish Time:	1617

Instrument Settings

Serial No.:	00FXBC		
Manufacturer:	Krautkramer		
Model:	USN-52R		
Delay:	0.000	Range:	9.0"
M'tl Cal/Vel:	11.379	Pulser:	Single
Damping:	1000 Ω	Reject:	0%
Rep. Rate:	High	Freq.:	2-8 MHz
Filter:	Fixed	Mode:	P/E
Voltage:	Fixed	Other:	Full Wave
Ax. Gain (dB):	N/A	Circ. Gain (dB):	49.0

1 Screen Div. = 0.90 In. of Sound Path

Linearity Report No.: L-10-001

Calibration Block

Cal. Block No.:	045BR		
Thickness:	3.0"	Dia.:	Flat
Cal. Blk. Temp.:	72°	Temp. Tool:	95500813
Comp. Temp.:	70°	Temp. Tool:	95500813

Search Unit

Serial No.:	00YJYX		
Manufacturer:	KBA		
Size:	.5"	Shape:	Round
Freq.:	2.25 MHz	Style:	Comp-G
Exam Angle:	55°	# of Elements:	1
Mode:	Shear		
Measured Angle:	55°		
Wedge Style:	Non-Integral		

Search Unit Cable

Type: RG-174 Length: 12' No. Conn.: 0

Scan Coverage

Upstream ☐ Downstream ☐ Scan dB: N/A
CW ☑ CCW ☑ Scan dB: 55
Exam Surface: OD
Surface Condition: As Ground

Cal. Checks	Time	Date
Initial Cal.	1440	3/11/2010
Inter. Cal.	1606	3/11/2010
Inter. Cal.	1618	3/11/2010
Inter. Cal.		
Final Cal.	1850	3/11/2010

Couplant

Cal. Batch:	09225
Type:	Ultragel II
Mfg.:	Sonotech, Inc.
Exam Batch:	09225
Type:	Ultragel II
Mfg.:	Sonotech, Inc.

Reference Block

Serial No.: A01330
Type: CS Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
ID Notch	80%	5.7	5.122"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A	N/A	N/A	N/A

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
25	2" Rad.	80%	2.2	1.999"

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)

Results: Sat ☑ Unsat ☐ Eval ☐

Comments: NRI
Probe Zero = 11.091

Percent Of Coverage Obtained > 90%: No - ~ 55% Reviewed Previous Data: Yes

Examiner	Level	Signature	Date	Reviewer		Signature	Date
Smith, Kenneth	III-PDI	Kenneth R Smith	3/11/2010	James Delbusso Level III			3/22/2010
Examiner	Level	Signature	Date	Site Review		Signature	Date
N/A	N/A			Damon Priestley NDE Level III			3/22/2010
Other	Level	Signature	Date	ANII Review		Signature	Date
N/A	N/A			Nancy C. Ritchie-Slaughter		Nancy C Ritchie Slaughter	3/23/2010

UT Calibration Examination

Nuclear Generation Group

Site/Unit: BNP / 1 | Procedure: NDEP-0456 | Outage No.: B118R1
Summary No.: 1-E11-3806 | Procedure Rev.: 003 | Report No.: UT-10-053
Workscope: ISI | Work Order No.: 1549261 | Page: 3 of 4

Code: 2001 Edition, 2003 Addenda | Cat./Item: C-B/C2.22 | Location: See ISO
Drawing No.: C-24004 Sht. 75-1 | Description: RHR HTX 1A OUTLET NOZZLE INNER RADIUS
System ID: 2045
Component ID: 1E11HX-1A-N4NIR | Size/Length: 75" | Thickness/Diameter: 2.5"
Limitations: Nozzle / Shell Configuration | Start Time: 1637 | Finish Time: 1649

Instrument Settings

Serial No.:	00FXBC		
Manufacturer:	Krautkramer		
Model:	USN-52R		
Delay:	0.000	Range:	10.0"
M'tl Cal/Vel:	0.1288	Pulser:	Single
Damping:	1000 Ω	Reject:	0%
Rep. Rate:	High	Freq.:	2-8 MHz
Filter:	Fixed	Mode:	P/E
Voltage:	Fixed	Other:	Full Wave
Ax. Gain (dB):	N/A	Circ. Gain (dB):	63.0

1 Screen Div. = 1.0 in. of Sound Path
Linearity Report No.: L-10-001

Calibration Block

Cal. Block No.:	045BR		
Thickness:	3.0"	Dia.:	Flat
Cal. Blk. Temp.:	72°	Temp. Tool:	95500813
Comp. Temp.:	70°	Temp. Tool:	95500813

Search Unit

Serial No.:	00YJYX		
Manufacturer:	KBA		
Size:	.5"	Shape:	Round
Freq.:	2.25 MHz	Style:	Comp-G
Exam Angle:	65°	# of Elements:	1
Mode:	Shear		
Measured Angle:	65°		
Wedge Style:	Non-Integral		

Search Unit Cable

Type: RG-174
Length: 12' No. Conn.: 0

Scan Coverage

Upstream ☐ Downstream ☐ Scan dB: N/A
CW ☑ CCW ☑ Scan dB: 65
Exam Surface: OD
Surface Condition: As Ground

Cal. Checks	Time	Date
Initial Cal.	1505	3/11/2010
Inter. Cal.	1635	3/11/2010
Inter. Cal.	1650	3/11/2010
Inter. Cal.		
Final Cal.	1853	3/11/2010

Couplant

Cal. Batch: 09225
Type: Ultragel II
Mfg.: Sonotech, Inc.
Exam Batch: 09225
Type: Ultragel II
Mfg.: Sonotech, Inc.

Reference Block

Serial No.: A01330
Type: CS Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
ID Notch	80%	7.7	7.741"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A	N/A	N/A	N/A

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
26	2" Rad.	80%	2.0	2.004"

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)

Results: Sat ☑ Unsat ☐ Eval ☐

Comments: NRI
Probe Zero = 10.507

Percent Of Coverage Obtained > 90%: No - ~55% Reviewed Previous Data: Yes

	Level		Signature	Date
Examiner	III-PDI	Smith, Kenneth	Kenneth R Smith	3/11/2010
Examiner	N/A	N/A		
Other	N/A	N/A		

		Signature	Date
Reviewer	James Delbusso Level III		3/22/2010
Site Review	Damon Priestley NDE Level III		3/22/2010
ANII Review	Nancy C. Ritchie-Slaughter	Nancy C Ritchie Slaughter	3/23/2010

UT Calibration Examination

NGG Nuclear Generation Group

Site/Unit:	BNP / 1	Procedure:	NDEP-0456	Outage No.:	B118R1
Summary No.:	1-E11-3806	Procedure Rev.:	003	Report No.:	UT-10-053
Workscope:	ISI	Work Order No.:	1549261	Page:	2 of 4

Code: 2001 Edition, 2003 Addenda | Cat./Item: C-B/C2.22 | Location: See ISO

Drawing No.: C-24004 Sht. 75-1 | Description: RHR HTX 1A OUTLET NOZZLE INNER RADIUS

System ID: 2045

Component ID: 1E11HX-1A-N4NIR | Size/Length: 75" | Thickness/Diameter: 2.5"

Limitations: Nozzle / Shell Configuration | Start Time: 1621 | Finish Time: 1632

Instrument Settings

Serial No.:	00FXBC		
Manufacturer:	Krautkramer		
Model:	USN-52R		
Delay:	0.000	Range:	11.0"
M'tl Cal/Vel:	0.1288	Pulser:	Single
Damping:	1000 Ω	Reject:	0%
Rep. Rate:	High	Freq.:	2-8 MHz
Filter:	Fixed	Mode:	P/E
Voltage:	Fixed	Other:	Full Wave
Ax. Gain (dB):	N/A	Circ. Gain (dB):	51.0

1 Screen Div. = 1.10 in. of Sound Path

Linearity Report No.: L-10-001

Calibration Block

Cal. Block No.:	045BR		
Thickness:	3.0"	Dia.:	Flat
Cal. Blk. Temp.:	72°	Temp. Tool:	95500813
Comp. Temp.:	70°	Temp. Tool:	95500813

Search Unit

Serial No.:	00YJYX		
Manufacturer:	KBA		
Size:	.5"	Shape:	Round
Freq.:	2.25 MHz	Style:	Comp-G
Exam Angle:	60°	# of Elements:	1
Mode:	Shear		
Measured Angle:	60°		
Wedge Style:	Non-Integral		

Search Unit Cable

Type: RG-174 | Length: 12' | No. Conn.: 0

Scan Coverage

Upstream ☐ Downstream ☐ Scan dB: N/A

CW ☑ CCW ☑ Scan dB: 56

Exam Surface: OD

Surface Condition: As Ground

Cal. Checks	Time	Date
Initial Cal.	1455	3/11/2010
Inter. Cal.	1620	3/11/2010
Inter. Cal.	1633	3/11/2010
Inter. Cal.		
Final Cal.	1852	3/11/2010

Couplant

Cal. Batch:	09225
Type:	Ultragel II
Mfg.:	Sonotech, Inc.
Exam Batch:	09225
Type:	Ultragel II
Mfg.:	Sonotech, Inc.

Reference Block

Serial No.: A01330

Type: CS Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
ID Notch	80%	5.2	5.720"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A	N/A	N/A	N/A

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
20	2" Rad.	80%	1.8	2.005"

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)

Results: Sat ☑ Unsat ☐ Eval ☐

Comments: NRI
Probe Zero = 9.191

Percent Of Coverage Obtained > 90%: No - ~55% | Reviewed Previous Data: Yes

Examiner	Level	Signature	Date	Reviewer		Signature	Date
Smith, Kenneth	III-PDI	Kenneth R Smith	3/11/2010	James Delbusso Level III			3/22/2010
Examiner	Level	Signature	Date	Site Review		Signature	Date
N/A	N/A			Damon Priestley NDE Level III			3/22/2010
Other	Level	Signature	Date	ANII Review		Signature	Date
N/A	N/A			Nancy C. Ritchie-Slaughter		Nancy C Ritchie Slaughter	3/23/2010

NGG Nuclear Generation Group

Supplemental Report

Report No.: UT-10-053

Page: 4 of 4

Summary No.: 1-E11-3806

Examiner:	Smith, Kenneth	Level:	III-PDI	Reviewer:	James Delbusso Level III	Date:	3/22/2010
Examiner:	N/A	Level:	N/A	Site Review:	Damon Priestley NDE Level III	Date:	3/22/2010
Other:	N/A	Level:	N/A	ANII Review:	Nancy C. Ritchie-Slaughter	Date:	3/23/2010

Comments: **Reference Scan Plan WDI-PJF-1304723-EPP-004, Rev. 0 (Table Parameters Below)**

The 70 Degree Exam prescribed by EPRI model Report # IR-2010-396 was not performed. Due to excessive R-Dimensions and Metal Paths, it was deemed impractical and ineffective as the beam would have to complete as many as eight (8) legs (bounces) in order to cover the volume. This is a result of the relatively thin shell wall in contrast to the thicker walled nozzle.

PGN's conclusion of the 70 degree shell-side prescription in IR-2010-396 was discussed with the EPRI Project Manager that was responsible for the IR. The EPRI project manager agreed with the conclusion that this angle would be ineffective based on beam spread at such distances.

Sketch or Photo: K:\Shared\lddeal\B118R1 Scanned Data\UT-10-053.jpg

Parameters	Xducer # 1	Xducer # 2
Refracted Angle	55°	60°
Incident Angle	70°	70°
Skew Angle	± 123°	± 118° to 132°
Misorientation Angle (Max)	9°	22°
Inspection Zone	A	A
Scan Area ("Z")	29.90" - 30.42"	29.87" - 30.60"
Scan Area ("Z") from shell OD surface	2.15" - 2.66"	2.12" – 2.85"
Min. Metal Path	~7.09"	~6.89"
Max. Metal Path	~8.11"	~10.23"

Parameters	Xducer # 3	Xducer # 4
Refracted Angle	65°	70°
Incident Angle	70°	70°
Skew Angle	± 128°	± 17° to 37°
Misorientation Angle (Max)	22°	14°
Inspection Zone	A	A
Scan Area ("Z / R")	Z = 28.87" – 30.17"	R = 14.91" – 24.97"
Scan Area ("Z / R") from shell OD or Boss OD surface	Z = 2.12" – 2.42"	R = 3.03"-13.11"
Min. Metal Path	~6.80"	~10.68"
Max. Metal Path	~9.57"	~23.07"

NGG Nuclear Generation Group

UT Calibration/Examination

Site/Unit: BNP / 1 | Procedure: NDEP-0437 | Outage No.: B121R1
Summary No.: 1-E11-3483 | Procedure Rev.: 8 | Report No.: UT-16-036
Workscope: ISI | Work Order No.: 13472397 | Page: 1 of 7

Code: 2001 Edition, 2003 Addenda | Cat./Item: C-F-2/C5.51 | Location: REACTOR BUILDING
Drawing No.: C-24004 Sht. 072-1 | Description: VALVE 1-E11-F031D TO PIPE
System ID: 2045
Component ID: 1E1145-15-FW58 | Size/Length: 16"/50.265" | Thickness/Diameter: CS/0.375"/16"
Limitations: Yes - Valve | Start Time: 1228 | Finish Time: 1407

Instrument Settings

Serial No.: 13G00172
Manufacturer: GE
Model: USN 60 SW | Linearity: L-16-005
Delay: 3.5866 | Range: 1.00"
M'tl Cal/Vel: 0.1266 | Pulser Type: Square
Damping: 500 Ohms | Reject: 0%
PRF: Auto High | SU Freq.: 5 MHz
Frequency: 5.0 MHz | Rectify: Fullwave
Voltage: 450 | Pulse Width: 100

Ax. Gain (dB): 21.0 | Circ. Gain (dB): 21.0
1 Screen Div. = 0.1 in. of Sound Path

Calibration Block

Cal. Block No.: CB-02-85
Thickness: 0.5" - 2.0" | Dia.: Flat
Cal. Blk. Temp.: 73 | Temp. Tool: MCNDE40135
Comp. Temp.: 76 | Temp. Tool: MCNDE40135

Search Unit

Serial No.: SC3094
Manufacturer: GE
Size: 0.25" | Model: Comp - G
Freq.: 5 MHz | Center Freq.: N/A
Exam Angle: 45 | Squint Angle: N/A
Measured Angle: 44 | Mode: Shear
Exit Point: 0.3" | # of Elements: 1
Config.: Single | Focus: N/A
Shape: Round | Contour: Flat
Wedge Style: MSWQC

Search Unit Cable

Type: RG-174 | Length: 6' | No. Conn.: 0

Scan Coverage

Upstream ☑ | Downstream ☑ | Scan dB: 28.0
CW ☑ | CCW ☑ | Scan dB: 28.0
Exam Surface: O.D.
Surface Condition: Ground

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)
Results: Sat ☑ Unsat ☐ Eval ☐ NCR # 02011145 & 02011150

Percent Of Coverage Obtained > 90%: 87.6% | Reviewed Previous Data: Yes

Cal. Checks	Time	Date
Initial Cal.	0820	3/15/2016
Inter. Cal.	N/A	
Inter. Cal.	1328	3/15/2016
Inter. Cal.	N/A	
Final Cal.	1450	3/15/2016

Couplant

Cal. Batch: 14H073
Type: Ultragel II
Mfg.: Sonotech, Inc.
Exam Batch: 14H073
Type: Ultragel II
Mfg.: Sonotech, Inc.

Reference Block

Serial No.: 14-3684
Type: Rompas

Comments: N/A

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
0.5" Notch	80	6.8	0.681"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
See Axial			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
19.0	1" Radius	80	10.0	1.00"

Examiner	Level II-N	Signature	Date	Reviewer		Signature	Date
Jaschke, Ryan A.			3/15/2016	Steven Dean L-III			3/16/16
Examiner	Level N/A	Signature	Date	Site Review		Signature	Date
N/A				John Sullivan			3.16.16
Other	Level N/A	Signature	Date	ANII Review		Signature	Date
~~N/A~~ Zu Cline			3/16/16	David M. Reynolds			3-16-2016

NGG Nuclear Generation Group

UT Calibration/Examination

Site/Unit:	BNP / 1	Procedure:	NDEP-0437	Outage No.:	B121R1
Summary No.:	1-E11-3483	Procedure Rev.:	8	Report No.:	UT-16-036
Workscope:	ISI	Work Order No.:	13472397	Page:	2 of 7

Code:	2001 Edition, 2003 Addenda	Cat./Item:	C-F-2/C5.51	Location:	REACTOR BUILDING
Drawing No.:	C-24004 Sht. 072-1	Description:	VALVE 1-E11-F031D TO PIPE		
System ID:	2045				
Component ID:	1E1145-15-FW58	Size/Length:	16"/50.265"	Thickness/Diameter:	CS/0.375"/16"
Limitations:	Yes - Valve	Start Time:	1228	Finish Time:	1407

Instrument Settings

Serial No.:	13G00172		
Manufacturer:	GE		
Model:	USN 60 SW	Linearity:	L-16-005
Delay:	4.745	Range:	1.5"
M'tl Cal/Vel:	0.1268	Pulser Type:	Square
Damping:	500 Ohms	Reject:	0%
PRF:	Auto High	SU Freq.:	5 MHz
Frequency:	5.0 MHz	Rectify:	Fullwave
Voltage:	450	Pulse Width:	100
Ax. Gain (dB):	40.0	Circ. Gain (dB):	N/A

1 Screen Div. = .15 in. of Sound Path

Calibration Block

Cal. Block No.:	CB-02-85		
Thickness:	0.5" - 2.0"	Dia.:	Flat
Cal. Blk. Temp.:	73	Temp. Tool:	MCNDE40135
Comp. Temp.:	76	Temp. Tool:	MCNDE40135

Recordable Indication(s): Yes ☐ No ☑

Results: Sat ☑ Unsat ☐ Eval ☐

Search Unit

Serial No.:	SC2843		
Manufacturer:	GE		
Size:	0.25"	Model:	Comp-G
Freq.:	5 MHz	Center Freq.:	N/A
Exam Angle:	60	Squint Angle:	N/A
Measured Angle:	60	Mode:	Shear
Exit Point:	0.3"	# of Elements:	1
Config.:	Single	Focus:	N/A
Shape:	Round	Contour:	Flat
Wedge Style:	MSWQC		

Search Unit Cable

Type: RG-174 Length: 6' No. Conn.: 0

Scan Coverage

Upstream ☑ Downstream ☑ Scan dB: 45.0

CW ☐ CCW ☐ Scan dB: N/A

Exam Surface: O.D.

Surface Condition: Ground

(If Yes, Ref. Attached Ultrasonic Indication Report.)

Cal. Checks	Time	Date
Initial Cal.	0826	3/15/2016
Inter. Cal.	N/A	
Inter. Cal.	1340	3/15/2016
Inter. Cal.	N/A	
Final Cal.	1447	3/15/2016

Couplant

Cal. Batch:	14H073
Type:	Ultragel II
Mfg.:	Sonotech, Inc.
Exam Batch:	14H073
Type:	Ultragel II
Mfg.:	Sonotech, Inc.

Reference Block

Serial No.:	14-3684
Type:	Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
0.5" Notch	80	6.1	0.911"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
21.8	1" Radius	80	6.7	1.00"

Comments: N/A

Percent Of Coverage Obtained > 90%: 87.6% Reviewed Previous Data: Yes

Examiner: Jaschke, Ryan A.	Level: II-N	Signature:	Date: 3/15/2016	Reviewer: Steven Dean L-III		Signature:	Date: 3/16/16
Examiner: N/A	Level: N/A	Signature:	Date:	Site Review: John Sullivan		Signature:	Date: 3.16.16
Other: ~~N/A~~	Level: N/A	Signature: R CLINE	Date: 3/16/16	ANII Review: DAVID M. REYNOLDS		Signature:	Date: 3-16-2016

NGG Nuclear Generation Group

UT Calibration/Examination

Site/Unit: BNP / 1 | Procedure: NDEP-0408 | Outage No.: B121R1
Summary No.: 1-E11-3483 | Procedure Rev.: 14 | Report No.: UT-16-036
Workscope: ISI | Work Order No.: 13472397 | Page: 3 of 7

Code: 2001 Edition, 2003 Addenda | Cat./Item: C-F-2/C5.51 | Location: REACTOR BUILDING
Drawing No.: C-24004 Sht. 072-1 | Description: VALVE 1-E11-F031D TO PIPE
System ID: 2045
Component ID: 1E1145-15-FW58 | Size/Length: 16"/50.265" | Thickness/Diameter: CS/0.375"/16"
Limitations: Yes - Valve | Start Time: 1228 | Finish Time: 1407

Instrument Settings

Serial No.:	13G00172		
Manufacturer:	GE		
Model:	USN 60 SW	Linearity:	L-16-005
Delay:	9.0334	Range:	1.00"
M'tl Cal/Vel:	0.2343	Pulser Type:	Square
Damping:	500 Ohms	Reject:	0%
PRF:	Auto High	SU Freq.:	4.0 MHz
Frequency:	4.0 MHz	Rectify:	Fullwave
Voltage:	450	Pulse Width:	130

Ax. Gain (dB): * | Circ. Gain (dB): N/A
1 Screen Div. = 0.1 in. of Sound Path

Calibration Block

Cal. Block No.: 12-4228
Thickness: 0.250" - 1.00" | Dia.: Flat
Cal. Blk. Temp.: 70 | Temp. Tool: MCNDE40135
Comp. Temp.: 76 | Temp. Tool: MCNDE40135

Search Unit

Serial No.:	57463-1708		
Manufacturer:	KBA		
Size:	3.5 X 10mm	Model:	MSEB
Freq.:	4.0 MHz	Center Freq.:	N/A
Exam Angle:	0	Squint Angle:	N/A
Measured Angle:	N/A	Mode:	Long.
Exit Point:	N/A	# of Elements:	2
Config.:	Dual	Focus:	N/A
Shape:	Rect.	Contour:	Flat

Wedge Style: Integral

Search Unit Cable

Type: RG-174 | Length: 6' | No. Conn.: 0

Scan Coverage

Upstream ☑ Downstream ☑ Scan dB: *
CW ☐ CCW ☐ Scan dB: N/A
Exam Surface: O.D.
Surface Condition: Ground

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)

Results: Sat ☑ Unsat ☐ Eval ☐

Percent Of Coverage Obtained > 90%: N/A | Reviewed Previous Data: Yes

Cal. Checks	Time	Date
Initial Cal.	0730	3/15/2016
Inter. Cal.	N/A	
Inter. Cal.	1228	3/15/2016
Inter. Cal.	N/A	
Final Cal.	1242	3/15/2016

Couplant

Cal. Batch: 14H073
Type: Ultragel II
Mfg.: Sonotech, Inc.
Exam Batch: 14H073
Type: Ultragel II
Mfg.: Sonotech, Inc.

Reference Block

Serial No.: 14-3684
Type: Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
0.250	80	2.5	0.254"
0.500	80	5.0	0.500"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
40.9	1" Side	80	10.0	1.00"

Comments: T & C - For information only.
*Gain adjusted to 80%.

Examiner	Level	II-N	Signature	Date	Reviewer	Signature	Date
Jaschke, Ryan A.				3/15/2016	Steven Dean L-III		3/16/16
Examiner	Level	N/A	Signature	Date	Site Review	Signature	Date
N/A					John Sullivan		3.16.16
Other	Level	N/A	Signature	Date	ANII Review	Signature	Date
~~N/A~~				3/16/16	DAVID M. REYNOLDS		3-16-2016

NGG Nuclear Generation Group

Supplemental Report

Report No.: UT-16-036

Page: 4 of 7

Summary No.: 1-E11-3483

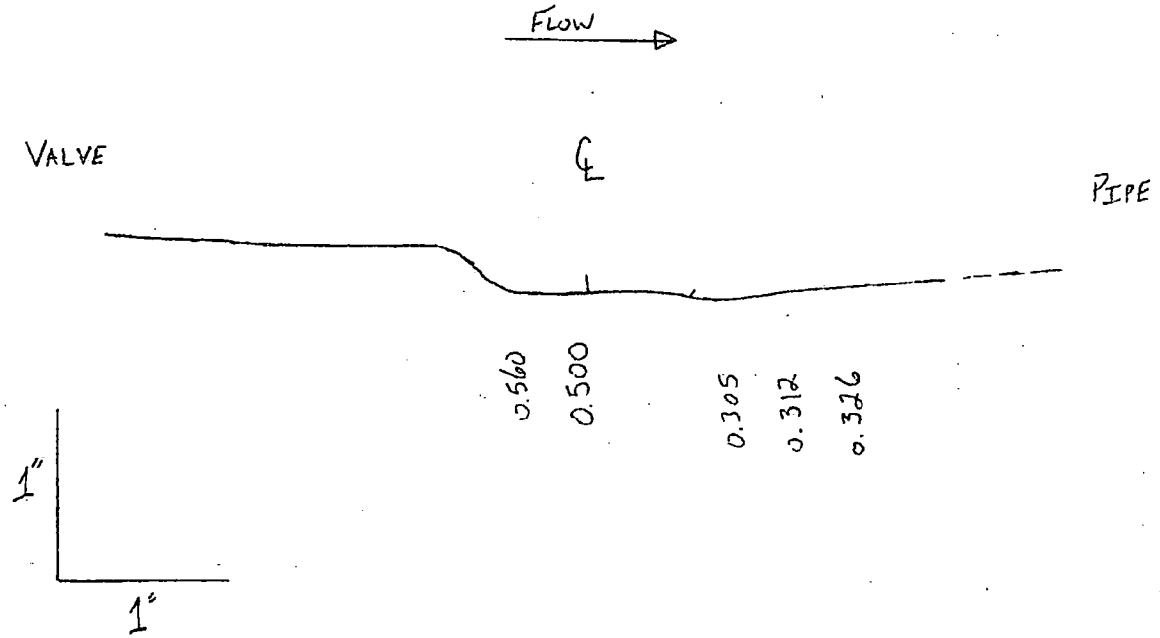
Examiner: Jaschke, Ryan A. Level: II-N Reviewer: Steven Dean L-III Date: 3/16/16

Examiner: N/A Level: N/A Site Review: John Sullivan Date: 3.16.16

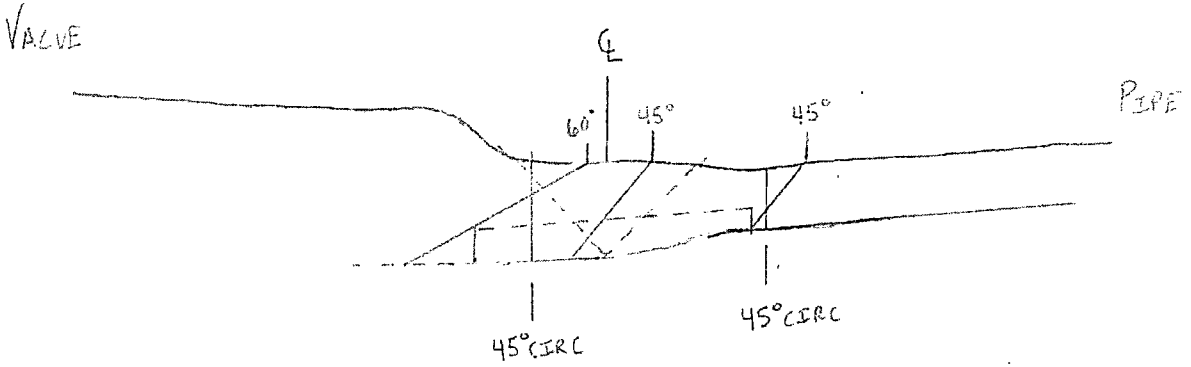
Other: ~~N/A~~ R. CLINE Level: N/A ANII Review: David M. Reynolds Date: 3-16-2016

Comments: T & C

Sketch or Photo: K:\Shared\Integrated Inspections\B121R1\Contours & Profiles\1E1145-15-FW58_Page_1.jpg



FLOW →



AXIAL COVERAGE = 100%

CIRC COVERAGE =

0.145 x 1.5 = 0.2175 in² (TOTAL VOLUME)

0.3 x 0.18 = 0.054 in² (MISSED CIRC VOLUME)

0.054 ÷ 0.2175 = 0.248

0.248 x 100 = 24.8%

100% - 24.8% = 75.2%

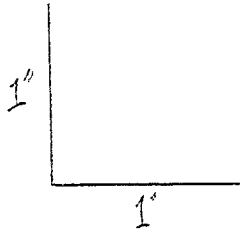
A1 = 100%

A2 = 100%

C1 = 75.2%

C2 = 75.2%

COVERAGE PLOT



TOTAL COVERAGE OBTAINED = 87.6%

Enclosure 2

BSEP, Unit 1 4th ISI Interval Limited NDE Data and Coverage Plots

UT Calibration/Examination

Nuclear Generation Group

Site/Unit:	BNP / 1	Procedure:	NDEP-0437	Outage No.:	B121R1
Summary No.:	1-E11-3616	Procedure Rev.:	8	Report No.:	UT-16-038
Workscope:	ISI	Work Order No.:	13472399	Page:	1 of 9

Code: 2001 Edition, 2003 Addenda | Cat./Item: C-F-2/C5.51 | Location: REACTOR BUILDING

Drawing No.: C-24004 Sht. 077-1 | Description: PIPE TO VALVE 1-E11-F017B

System ID: 2045

Component ID: 1E1173-30-FW102 | Size/Length: 24"/75.398" | Thickness/Diameter: CS/0.562"/24"

Limitations: Yes - single sided exam due to valve | Start Time: 2300 | Finish Time: 0100

Instrument Settings

Serial No.: 0242D3
Manufacturer: GE
Model: USN-60 SW | Linearity: L-16-009
Delay: 4.7878 | Range: 3.0"
M'tl Cal/Vel: 0.1244 | Pulser Type: Square
Damping: 500 Ohms | Reject: 0%
PRF: Auto High | SU Freq.: 2.25 MHz
Frequency: 2.25 MHz | Rectify: Fullwave
Voltage: 450 | Pulse Width: 220

Ax. Gain (dB): 16.5 | Circ. Gain (dB): 16.5
1 Screen Div. = 0.3 in. of Sound Path

Calibration Block

Cal. Block No.: CB-02-85
Thickness: 0.5" - 2.0" | Dia.: Flat
Cal. Blk. Temp.: 73 | Temp. Tool: G502480
Comp. Temp.: 83 | Temp. Tool: G502480

Search Unit

Serial No.: 01VT81
Manufacturer: KBA
Size: 0.375" | Model: Comp - G
Freq.: 2.25 MHz | Center Freq.: N/A
Exam Angle: 45 | Squint Angle: N/A
Measured Angle: 43 | Mode: Shear
Exit Point: 0.3" | # of Elements: 1
Config.: Single | Focus: N/A
Shape: Round | Contour: Flat
Wedge Style: MSWQC

Search Unit Cable

Type: RG-174 | Length: 6' | No. Conn.: 0

Scan Coverage

Upstream ☑ | Downstream ☐ | Scan dB: 21.5
CW ☑ | CCW ☑ | Scan dB: 28.5
Exam Surface: OD
Surface Condition: Ground

Cal. Checks	Time	Date
Initial Cal.	1915	3/15/2016
Inter. Cal.	N/A	
Inter. Cal.	2310	3/15/2016
Inter. Cal.	N/A	
Final Cal.	0244	3/15/2016

Couplant

Cal. Batch: 14H073
Type: Ultragel II
Mfg.: Sonotech, Inc.
Exam Batch: 14H073
Type: Ultragel II
Mfg.: Sonotech, Inc.

Reference Block

Serial No.: 96-6521
Type: Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
1.5" Notch	80	7.0	2.060"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
See Axial			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
12.0	1" Radius	80	3.2	1.00"

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)

Results: Sat ☑ Unsat ☐ Eval ☐ NCR # 013472399

Percent Of Coverage Obtained > 90%: 87.3% | Reviewed Previous Data: Yes

Comments: Actual thickness is different from thickness listed. Adjusted screen range during exam, due to varying thickness. NCR # 0211199.

Examiner	Level	Signature	Date	Reviewer		Signature	Date
Nahory, W. Jason	II-N		3/1/2016	Steven Deal-III			3/16/16
Examiner	Level	Signature	Date	Site Review		Signature	Date
N/A	N/A			John Sullivan			3.16.16
Other	Level	Signature	Date	ANII Review		Signature	Date
~~N/A~~ R W Cline	N/A	R W Cline	3/16/16	David M. Reynolds		David M. Reynolds	3-16-2016

UT Calibration/Examination

NGG Nuclear Generation Group

Site/Unit: BNP / 1 | Procedure: NDEP-0437 | Outage No.: B121R1
Summary No.: 1-E11-3616 | Procedure Rev.: 8 | Report No.: UT-16-038
Workscope: ISI | Work Order No.: 13472399 | Page: 2 of 9

Code: 2001 Edition, 2003 Addenda | Cat./Item: C-F-2/C5.51 | Location: REACTOR BUILDING
Drawing No.: C-24004 Sht. 077-1 | Description: PIPE TO VALVE 1-E11-F017B
System ID: 2045
Component ID: 1E1173-30-FW102 | Size/Length: 24"/75.398" | Thickness/Diameter: CS/0.562"/24"
Limitations: Yes - single sided exam due to valve | Start Time: 2300 | Finish Time: 0100

Instrument Settings

Serial No.: 0242D3
Manufacturer: GE
Model: USN-60 SW | Linearity: L-16-009
Delay: 7.0628 | Range: 3.5"
M'll Cal/Vel: 0.1265 | Pulser Type: Square
Damping: 500 Ohms | Reject: 0%
PRF: Auto High | SU Freq.: 2.25 MHz
Frequency: 2.25 MHz | Rectify: Fullwave
Voltage: 450 | Pulse Width: 220

Ax. Gain (dB): 35.6 | Circ. Gain (dB): N/A
1 Screen Div. = .35 in. of Sound Path

Calibration Block

Cal. Block No.: CB-02-85
Thickness: 0.5" - 2.0" | Dia.: Flat
Cal. Blk. Temp.: 73 | Temp. Tool: G502480
Comp. Temp.: 83 | Temp. Tool: G502480

Search Unit

Serial No.: 01065Y
Manufacturer: KBA
Size: 0.375" | Model: Comp - G
Freq.: 2.25 MHz | Center Freq.: N/A
Exam Angle: 60 | Squint Angle: N/A
Measured Angle: 59 | Mode: Shear
Exit Point: 0.35" | # of Elements: 1
Config.: Single | Focus: N/A
Shape: Round | Contour: Flat
Wedge Style: MSWQC

Search Unit Cable

Type: RG-174 | Length: 6' | No. Conn.: 0

Scan Coverage

Upstream ☑ | Downstream ☐ | Scan dB: 41.6
CW ☐ | CCW ☐ | Scan dB: N/A
Exam Surface: O.D.
Surface Condition: Ground

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)
Results: Sat ☑ Unsat ☐ Eval ☐

Cal. Checks	Time	Date
Initial Cal.	1925	3/15/2016
Inter. Cal.	N/A	
Inter. Cal.	0033	3/16/2016
Inter. Cal.	N/A	
Final Cal.	0250	3/16/2016

Couplant

Cal. Batch: 14H073
Type: Ultragel II
Mfg.: Sonotech, Inc.
Exam Batch: 14H073
Type: Ultragel II
Mfg.: Sonotech, Inc.

Reference Block

Serial No.: 96-6521
Type: Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
1.5" Notch	80	7.5	2.622"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
15.0	1" Radius	80	2.8	1.00"

Comments: Actual thickness is different from thickness listed. NCR # 0211199.

Percent Of Coverage Obtained > 90%: 87.3% | Reviewed Previous Data: Yes

Examiner: Nahory, W. Jason	Level: II-N	Signature:	Date: 3/16/2016	Reviewer: Steven Dean L-III	Signature:	Date: 3/16/16
Examiner: N/A	Level: N/A	Signature:	Date:	Site Review: John Sullivan	Signature:	Date: 3.16.16
Other: ~~N/A~~ Zach Cline	Level: N/A	Signature:	Date: 3/16/16	ANII Review: David M. Reynolds	Signature:	Date: 3-16-2016

UT Calibration/Examination

NGG Nuclear Generation Group

Site/Unit: BNP / 1 | Procedure: NDEP-0408 | Outage No.: B121R1
Summary No.: 1-E11-3616 | Procedure Rev.: 14 | Report No.: UT-16-038
Workscope: ISI | Work Order No.: 13472399 | Page: 3 of 9

Code: 2001 Edition, 2003 Addenda | Cat./Item: C-F-2/C5.51 | Location: REACTOR BUILDING
Drawing No.: C-24004 Sht. 077-1 | Description: PIPE TO VALVE 1-E11-F017B
System ID: 2045
Component ID: 1E1173-30-FW102 | Size/Length: 24"/75.398" | Thickness/Diameter: CS/0.562"/24"
Limitations: Yes - single sided exam due to valve | Start Time: 2300 | Finish Time: 0100

Instrument Settings

Serial No.: 0242D3
Manufacturer: GE
Model: USN-60 SW | Linearity: L-16-009
Delay: 0.5575 | Range: 1.500"
M'tl Cal/Vel: 0.2338 | Pulser Type: Square
Damping: 500 Ohms | Reject: 0%
PRF: Auto High | SU Freq.: 2.25 MHz
Frequency: 2.25 MHz | Rectify: Fullwave
Voltage: 280 | Pulse Width: 220

Ax. Gain (dB): * | Circ. Gain (dB): N/A
1 Screen Div. = .15 in. of Sound Path

Calibration Block

Cal. Block No.: 12-4228
Thickness: 0.250" - 1.00" | Dia.: Flat
Cal. Blk. Temp.: 73 | Temp. Tool: G502480
Comp. Temp.: 83 | Temp. Tool: G502480

Search Unit

Serial No.: 15I00G9H
Manufacturer: GE
Size: 0.25" | Model: Benchmark
Freq.: 2.25 MHz | Center Freq.: N/A
Exam Angle: 0 | Squint Angle: N/A
Measured Angle: N/A | Mode: Shear
Exit Point: N/A | # of Elements: 1
Config.: Single | Focus: N/A
Shape: Round | Contour: Flat
Wedge Style: Integral

Search Unit Cable

Type: RG-174 | Length: 6' | No. Conn.: 0

Scan Coverage

Upstream ☑ | Downstream ☑ | Scan dB: *
CW ☐ | CCW ☐ | Scan dB: N/A
Exam Surface: O.D.
Surface Condition: Ground

Cal. Checks	Time	Date
Initial Cal.	1910	3/15/2016
Inter. Cal.	N/A	
Inter. Cal.	2300	3/15/2016
Inter. Cal.	N/A	
Final Cal.	0240	3/16/2016

Couplant

Cal. Batch: 14H073
Type: Ultragel II
Mfg.: Sonotech, Inc.
Exam Batch: 14H073
Type: Ultragel II
Mfg.: Sonotech, Inc.

Reference Block

Serial No.: 96-6521
Type: Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
0.25" Step	93	1.7	0.249"
1.00" Step	80	6.7	1.002"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
5.9	BW	80	6.6	1.002"

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)
Results: Sat ☑ Unsat ☐ Eval ☐
Percent Of Coverage Obtained > 90%: N/A | Reviewed Previous Data: Yes

Comments: T & C - For information only.
*Adjusted gain to maintain 80% FSH.

Examiner	Level	Signature	Date	Reviewer	Signature	Date
Nahory, W. Jason	II-N		3/16/2016	Steven Dean L-III		3/16/16
Examiner	Level	Signature	Date	Site Review	Signature	Date
N/A	N/A			John Sullivan		3.16.16
Other	Level	Signature	Date	ANII Review	Signature	Date
~~N/A~~ R H CLINE	N/A		3/16/16	David M. Reynolds		3-16-2016

NGG Nuclear Generation Group

Supplemental Report

Report No.: UT-16-038

Page: 4 of 9

Summary No.: 1-E11-3616

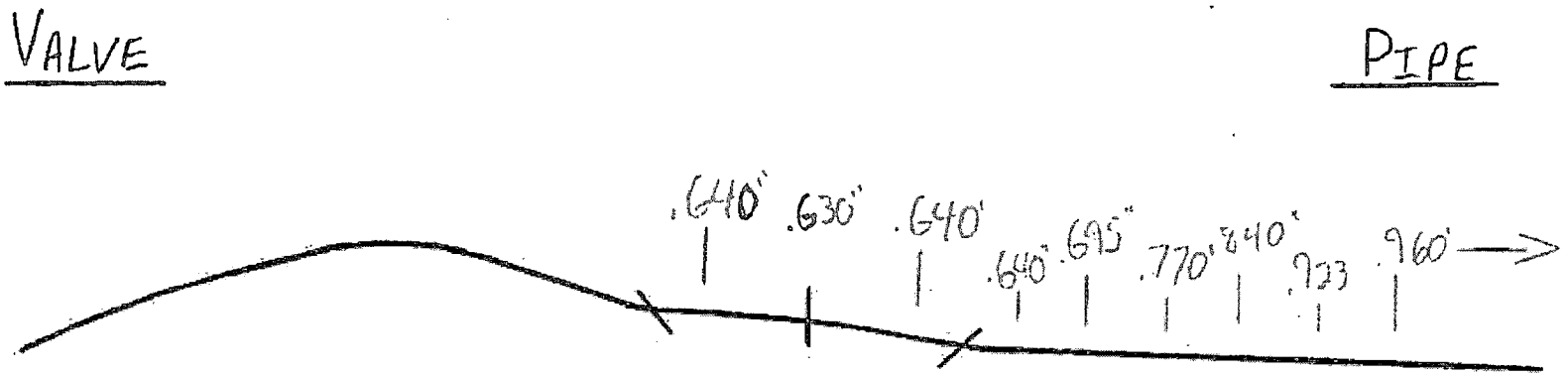
Examiner: Nahory, W. Jason Level: II-N Reviewer: Steven Daniel-III Date: 3/16/16

Examiner: N/A Level: N/A Site Review: John Sullivan Date: 3.16.16

Other: ~~N/A~~ McCLINE + Level: N/A ANII Review: David M. Reynolds David M. Reynolds Date: 3-16-2016

Comments: **Thickness and contour**

Sketch or Photo: K:\Shared\Integrated Inspections\B121R1\Contours & Profiles\1E1173-30-FW102_Page_1x.jpg



DOWNSTREAM

0.43" x 0.215" = 0.092 in² OBTAINED

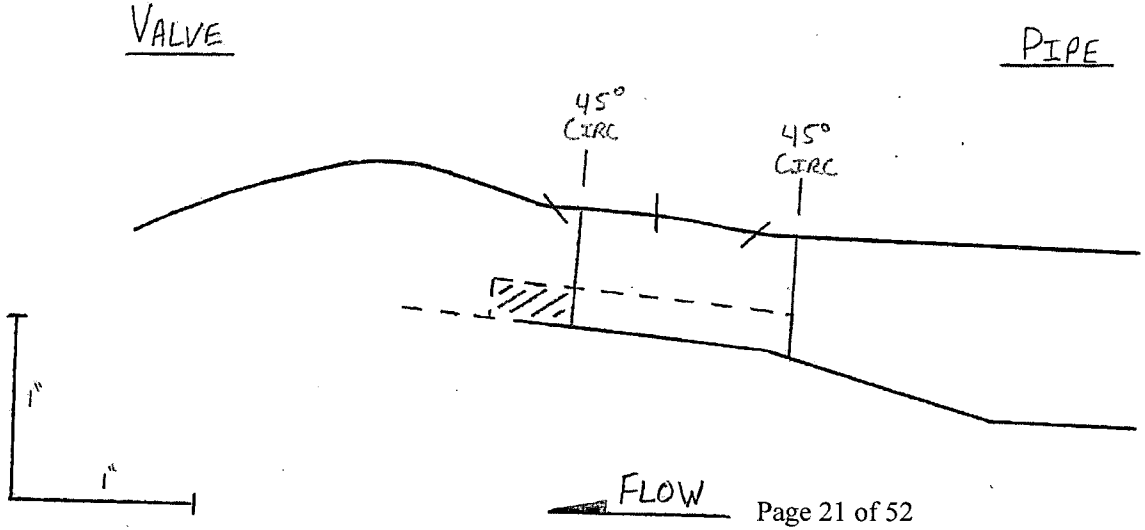
0.87" x 0.215" = 0.187 in² TOTAL

0.092/0.187 = 49.2 %

UPSTREAM

100 % COVERAGE OBTAINED

(49.2 + 100)/2 = **74.6 %**



NGG Nuclear Generation Group

Supplemental Report

Report No.: UT-16-038

Page: 6 of 9

Summary No.: 1-E11-3616

Examiner: Nahory, W. Jason Level: II-N

Examiner: N/A Level: N/A

Other: N/A Level: N/A

Reviewed by: D.B. King, UT Level III 3/16/16

Reviewer: Steven Dean III Date: 3/16/16

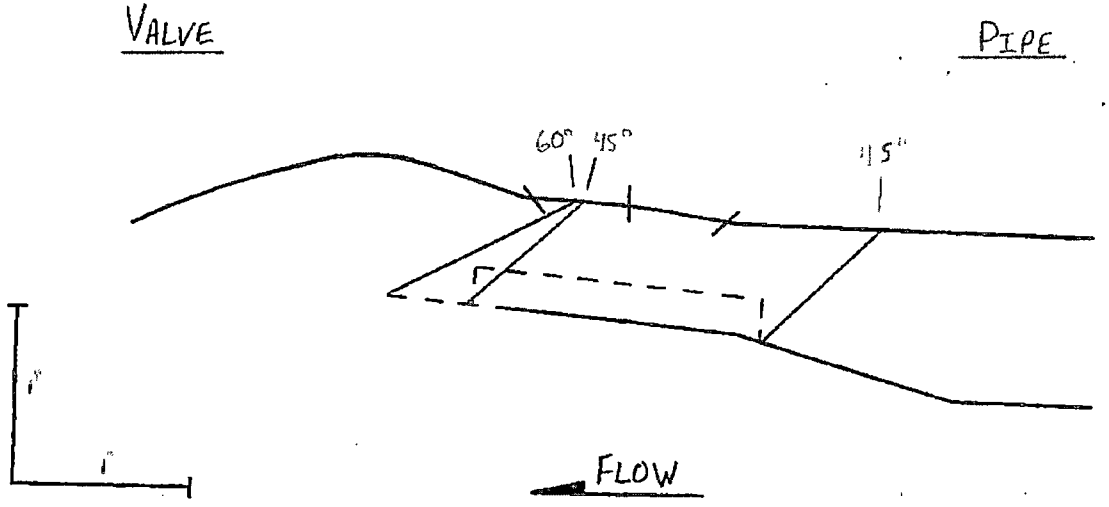
Site Review: John Sullivan Date: 3.16.16

ANII Review: David M. Reynolds Date: 3-16-2016

Comments: **Axial scan. 100% coverage obtained.**

Sketch or Photo: K:\Shared\Integrated Inspections\B121R1\Contours & Profiles\1E1173-30-FW102_Page_3.jpg

[100% (AXIAL) - 74.6% (CIRC)] / 2 = 87.3% TOTAL AGGREGATE COVERAGE



UT Calibration Examination

Site/Unit: BNP / 1 | Procedure: NDEP-0437 | Outage No.: B118R1
Summary No.: 1-E21-4015 | Procedure Rev.: 003 | Report No.: UT-10-019
Workscope: ISI | Work Order No.: 1549261 | Page: 1 of 2

Code: 2001 Edition, 2003 Addenda | Cat./Item: C-F-2/C5.51 | Location: See ISO
Drawing No.: C-24004 Sht. 98-1 | Description: VALVE TO PIPE
System ID: 2035
Component ID: 1E215-39-FW4 | Size/Length: 14"/43.982" | Thickness/Diameter: 0.375"/14"
Limitations: Single sided exam due to pipe to valve circ limitation due to valve. | Start Time: 1314 | Finish Time: 1334

Instrument Settings

Serial No.:	01H1LT		
Manufacturer:	Krautkramer		
Model:	USN 60 SW		
Delay:	3.5988	Range:	1.0"
M'tl Cal/Vel:	.1277	Pulser:	Square
Damping:	500 Ω	Reject:	0%
Rep. Rate:	Auto High	Freq.:	5.0
Filter:	N/A	Mode:	Dual Off
Voltage:	450	Other:	PW = 100
Ax. Gain (dB):	21.5	Circ. Gain (dB):	N/A

10 Screen Div. = 1 in. of Sound Path
Linearity Report No.: L-10-006

Calibration Block

Cal. Block No.:	CB-02-52		
Thickness:	2.0"	Dia.:	N/A
Cal. Blk. Temp.:	75°	Temp. Tool:	95500813
Comp. Temp.:	71°	Temp. Tool:	95500813

Search Unit

Serial No.:	00MXC7		
Manufacturer:	KBA		
Size:	.25"	Shape:	Round
Freq.:	5.0 MHz	Style:	Comp-G
Exam Angle:	45°	# of Elements:	1
Mode:	Shear		
Measured Angle:	45°		
Wedge Style:	MSWQC		

Search Unit Cable

Type: RG-174
Length: 6' No. Conn.: 0

Scan Coverage

Upstream ☐ Downstream ☑ Scan dB: 33.5
CW ☑ CCW ☑ Scan dB: 36
Exam Surface: OD
Surface Condition: As Found

Cal. Checks	Time	Date
Initial Cal.	1110	3/9/2010
Inter. Cal.	1313	3/9/2010
Inter. Cal.	1335	3/9/2010
Inter. Cal.		
Final Cal.	1505	3/9/2010

Couplant

Cal. Batch: 09225
Type: Ultragel II
Mfg.: Sonotech, Inc.
Exam Batch: 09225
Type: Ultragel II
Mfg.: Sonotech, Inc.

Reference Block

Serial No.: A10474
Type: CS Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
0.5" Notch	80%	7.0	.703"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A	N/A	N/A	N/A

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
21.5	.3" SDH	30%	4.1	.421"

Recordable Indication(s): Yes ☑ No ☐ (If Yes, Ref. Attached Ultrasonic Indication Report.)

Results: Sat ☑ Unsat ☐ Eval ☐

Comments: Rectify = Fullwave
Indications from previous data verified (Report # 39-FW4 Dated 4/18/2001), no change observed.

Percent Of Coverage Obtained > 90%: Yes- 90% | Reviewed Previous Data: Yes

Examiner	Level	Signature	Date	Reviewer	Signature	Date
Tauchen, Ryan J.	II-PDI		3/9/2010	James Delbusso Level III		3/10/2010
Examiner	Level	Signature	Date	Site Review	Signature	Date
N/A	N/A			Damon Priestley PGN NDE Coordinator		3/15/2010
Other	Level	Signature	Date	ANII Review	Signature	Date
N/A	N/A			Nancy C. Ritchie-Slaughter		3/15/2010

UT Calibration / Examination

NGG Nuclear Generation Group

Site/Unit:	BNP / 1	Procedure:	NDEP-0437	Outage No.:	B118R1
Summary No.:	1-E21-4015	Procedure Rev.:	003	Report No.:	UT-10-019
Workscope:	ISI	Work Order No.:	1549261	Page:	2 of 2

Code:	2001 Edition, 2003 Addenda	Cat./Item:	C-F-2/C5.51	Location:	See ISO
Drawing No.:	C-24004 Sht. 98-1	Description:	VALVE TO PIPE		
System ID:	2035				
Component ID:	1E215-39-FW4	Size/Length:	14"/43.982"	Thickness/Diameter:	0.375"/14"
Limitations:	°x248	Start Time:	1337	Finish Time:	1357

Instrument Settings

Serial No.:	01H1LT		
Manufacturer:	Krautkramer		
Model:	USN 60 SW		
Delay:	5.2522	Range:	1.25"
M'tl Cal/Vel:	0.1283	Pulser:	Square
Damping:	500 Ω	Reject:	0%
Rep. Rate:	Auto High	Freq.:	5.0
Filter:	N/A	Mode:	Dual Off
Voltage:	450	Other:	PW = 100
Ax. Gain (dB):	36.5	Circ. Gain (dB):	N/A

10 Screen Div. = 1.25 in. of Sound Path

Linearity Report No.: L-10-006

Calibration Block

Cal. Block No.:	CB-02-52		
Thickness:	2.0"	Dia.:	0
Cal. Blk. Temp.:	75°	Temp. Tool:	95500813
Comp. Temp.:	71°	Temp. Tool:	95500813

Search Unit

Serial No.:	00MM7N		
Manufacturer:	KBA		
Size:	.25"	Shape:	Round
Freq.:	5.0 MHz	Style:	Comp-G
Exam Angle:	60°	# of Elements:	1
Mode:	Shear		
Measured Angle:	60°		
Wedge Style:	MSWQC		

Search Unit Cable

Type:	RG-174		
Length:	6'	No. Conn.:	0

Scan Coverage

Upstream ☐	Downstream ☑	Scan dB:	48
CW ☐	CCW ☐	Scan dB:	N/A
Exam Surface:	OD		
Surface Condition:	As Found		

Cal. Checks	Time	Date
Initial Cal.	1110	3/9/2010
Inter. Cal.	1336	3/9/2010
Inter. Cal.	1358	3/9/2010
Inter. Cal.		
Final Cal.	1500	3/9/2010

Couplant

Cal. Batch:	09225
Type:	Ultragel II
Mfg.:	Sonotech, Inc.
Exam Batch:	09225
Type:	Ultragel II
Mfg.:	Sonotech, Inc.

Reference Block

Serial No.:	A10474
Type:	CS Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
.50" Notch	80%	7.1	.895"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A	N/A	N/A	N/A

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
32.4	.3" SDH	80%	4.9	.621"

Recordable Indication(s): Yes ☑ No ☐ (If Yes, Ref. Attached Ultrasonic Indication Report.)

Results: Sat ☑ Unsat ☐ Eval ☐

Percent Of Coverage Obtained > 90%: Yes - 90% Reviewed Previous Data: Yes

Comments: Rectify = Fullwave
Indications from previous data verified (Report # 39-FW4 Dated 4/18/2001), no change observed.

Examiner	Level	Signature	Date	Reviewer		Signature	Date
Tauchen, Ryan J.	II-PDI		3/9/2010	James Delbusso Level III			3/12/2010
Examiner	Level	Signature	Date	Site Review		Signature	Date
N/A	N/A			Damon Priestley PGN NDE Coordinator			3/15/2010
Other	Level	Signature	Date	ANII Review		Signature	Date
N/A	N/A			Nancy C. Ritchie-Slaughter			3/15/2010

NDE-30 REV 1

CAROLINA POWER & LIGHT COMPANY NDE REPORT/SUMMARY	Report No. 39-FW4 Page 1 Of 9
Plant/Unit: BNP / Unit 1	Component(s) or Item(s) Examined 1E215-39-FW4
Procedure(s) Used: NDEP-301, NDEP-1011, 0SP-00-001	

An MT inspection was performed on the above listed component, no indications where found.

Ultrasonic examination was performed on the above listed weld, using a 45* and 60* shear wave. One indication was recorded with the 45 degree exam that was not identified in prior exams. This indication plots to the intersection of the heat-affected zone and weld and is not ID or OD connected. The RT film for this weld was reviewed and 3 pores of porosity were located in this area.

Previous data for this weld was reviewed prior to this examination. Examination coverage was 100% for the MT examination and 90% for the UT examination.

Reported By	Level	Date
[signature]	II	4/18/01
Reviewed By Charles Bordeaux	Title QC SUPERVISOR	Date 4/20/2001

NGGM-PM-0011 APPENDIX A

QA MT-2 Rev 4

RECEIVED BY BNP
FEB 15 1999
NUCLEAR DOCUMENT CONTROL

CP&L

MAGNETIC PARTICLE NDE REPORT

Project: ☒ BNP ☐ RNP ☐ HNP WR/JO 119769 Unit: ☒ 1 ☐ 2 Date: 4/18/01

Drawing/ISO	System	Line	Identification Number
C24004Sh98-1	CS-A Loop 2035	39-14-152	1E21S-39-FW4

Design Class/Category	Acceptance Standard
ASME CLASS II	1989 ASME ARTICLE 3000 ☐ ASME III ☐ VIII ☒ XI ☒ Other SECT XI

Mtl. Type	Mtl. Thickness	OD/Length	Surface Finish	Procedure No.
☒ C/S ☐ S/S ☐ Other	.375"	14"	☒ Ground ☐ As-Welded ☐ Machined ☐ Other	301 Rev. 13 Attachment N/A

PSI ☐ ISI ☒	Stage of Mfg: ☒ Final ☐ N/A	Joint Design ☐ N/A ☐ BRN ☐ BKS ☐ Fillet ☐ INS ☒ Open BT ☐ Socket ☐ Other

CP&L Equipment Identification Number	Complete Following Equipment Info. if Subcontract MT
COIL #11	Mfg. N/A Model N/A Serial No. N/A

☒ AC ☐ DC	Prods ☐ Yoke ☒ Spacing 3"-6"	Coil ☐ Turns N/A	Heads ☐ N/A

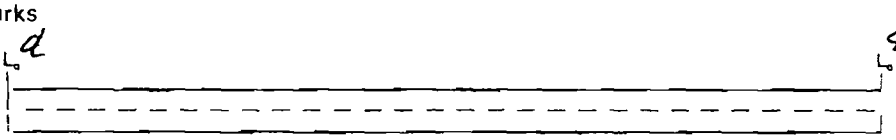
Amperage Used	Particles: ☒ Red ☐ Gray ☐ Black ☐ Fluorescent ☐ Wet ☒ Dry Fluorescent Concentration Test: ☐ Settling test ☐ Field Indicator
FIXED	

Test Weight No.	Particle Mfg.	Batch No.
WT-3	DETEK	63-12158

L_o Location RULE #1 UPSTREAM W$_o$ Location ~~TOP~~ ℄ OF WELD per SR 4-19-01

Indic. No.	L	Upstream W or Down	Type Indic. Round/Linear	Size Indic. Diameter/Length	Remarks
N/A	N/A	N/A	N/A	N/A	NO INDICATIONS NOTED

Sketch & Remarks



NOTE: EXAM WAS PERFORMED ON 4-17-01 & 4-19-01

PYROMETER PY-15 CAL DATE: 2/16/01 DUE: 8/16/01

Examination Area Limitations (If none, so state) NONE

Examination Coverage % (indicate percent of coverage) 100 % Accept ☒ Reject ☐

Examiner	Certification Level	Date
[signature]	II	4/19/01
Examiner [signature]	Certification Level II	Date 4-19-01

If Applicable CP&L QA Review	Date	If Applicable ANII [signature]	Date 5-2-01

NGGM-PM-0011 APPENDIX A

CPL UT-12 Rev 4

COMPANY
ULTRASONIC EXAMINATION DATA SHEET

Page 3 of 9

Plant: BNP Unit: 1
Calibration Sheet Number: 39-FW4 45, 39-FW4 45 1.5, 39-FW4 60

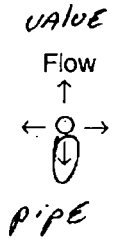
Report Number: 39-FW4
Date: 4 / 18 / 01

Procedure: 0SP-00-001 Rev.: 0
System: Core Spray
Weld ID: 1E215-39-FW4
Start Time: 09:40
Finish Time: 11:20

Pipe Diameter: 14" Scanning dB 28.0
Material Type ☒ CS ☐ SS ☐ Other
Exam Surface ☐ ID ☒ OD
Exam Surface Temp 75 deg F
Thermometer S/N: PY-15A
L_o Location Rule 1 W_o Location Weld CL

Examination Scanning Directions

1. Angle Beam Transverse
2. Angle Beam Parallel
   A. Clockwise
   B. Counterclockwise
3. Angle Beam Parrallel
   A. Clockwise
   B. Counterclockwise
4. Angle Beam Transverse
5. Base Metal L Wave
6. Weld Metal L Wave



	Performed	Exam Sens.
1.	☒	N/A
2.	☒	N/A
3.	☒	N/A
4.	☒	N/A
5.	☐	N/A
6.	☐	N/A

Indication No.	L In. From Ref			W In. From Ref			Amplitude	Sweep Reading			Exam 1-6	Detection Angle
	L_1	L_{MAX}	L_2	W_1	W_{MAX}	W_2	% Reference Sensitivity	SP_1	SP_{MAX}	SP_2		
1	N/A	1"	N/A	N/A	CL	N/A	60%	N/A	.28	N/A	1	45 Degree

Remarks: Scan 1 limited due to valve. Indication 1 could be seen with a 3T scan from exam 4 below recording levels.
The length and through wall size is 1/8 " for indication 1 and it is not ID or OD connected.
This PY-15 Cal Date 2/16/01 Cal Due 8/16/01

Examined By: _____ Level: II Date: 04 / 18 / 01
Examined By: _____ Level: IL Date: 04 / 18 / 01
Reviewed By: _____ Level: ANII Date: 5 / 2 / 01

QA NDE-CS-1 Rev 1

CP&L

NDE DRAWING ATTACHMENT

PROJECT BNP JOB NO. 119769 UNIT 1☒ 2☐ 3☐ 4☐ DATE 4-18-01

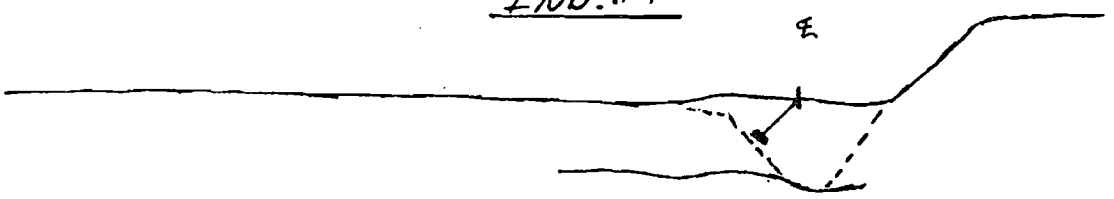
DRAWING C24004 SHT 98-1	SYSTEM CORE SPRAY	LINE 1E21-39-H-152	1E21S-39-FW4 WELD/ITEM NUMBER

← Flow

VALVE

PIPE

IND. #1



PROFILE - IS FROM NES 1988 DATA

Larry Sewell / LTD. 4/18/01

4-18-01

RECEIVED BY BNP

FEB 12 1999

NUCLEAR DOCUMENT CONTROL

SELECT DISTRIBUTION

NGGM-PM-0011 APPENDIX A

CPL UT-13 Rev 4

ULTRASONIC CALIBRATION DATA SHEET

Cal. Sheet No. 39-FW4 45
Page 5 of 9

Plant: BNP Unit: 1

Data Sheets: 39-FW4

Procedure No.: 0SP-00-001 Rev.: 0 Couplant Brand: ULTRAGEL II, 99-325 Cal Block Temp.: 75 Deg Therm. SN: PY-15

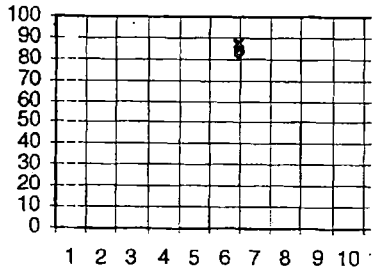
Instrument Mfg.: Krautkramer Branson Model: USK-7D S/N: 32810-4012 (UI-2)

Search Unit Mfg.: K-B Aerotech Model: Comp-g Shape: Round Size: .25" Freq.: 5.0 MHZ

Search Unit : Angle/Mode: 45 s Measured Angle: 45 Wedge Style : MSWQC S/N: 008NY6 (Single)/Dual

Cable Type: RG174 Length: 6' Connectors: BNC-MDOT Wedge Index to Front Meas.: .35

Calibration Block: Size: 14" Thickness: .375 S/N: 30B Other Block: IIW S/N: 96-6500 (SW-9)



X = Axial Scan, O = Circ. Scan
Scale Range: 0 - 10 = Metal Path 1"

Instrument Settings

Reference Sensitivity		Examination Sensitivity	
Gain - Axial Scan	20.5 dB	Gain - Axial Scan	28.0 dB
Gain - Circ. Scan	20.5 dB	Gain - Circ. Scan	28.0 dB
Freq.	1-5Mhz	*PRR/PRF	High
Range	1.0"	Pulser	High
Mtl. Cal/Vel.	127.0"	Damping	Fixed
Delay	3.3us	Reject	0
Filter	N/A	Jack	☒ R ☐ T
Mode	Shear		

*Pulse Repetition Rate/Pulse Repetition Frequency

Welds Examined ☒ Ferritic ☐ Austenitic

1E215-39-FW4

Calibration Verification

		Verification Times	
Initial Calibration Time	09:10		
Final Verification Time	12:50		

Comments : Miniature cal block. S/N: 5226 (SW-10)

Examiner: [signature] Level: II Date: 4 / 18 / 01

Examiner: [signature] Level: IL Date: 4 /18 / 01

Reviewed: [signature] Level: ANII Date: 5 12 01

NGGM-PM-0011 APPENDIX A

CPL UT-13 Rev 4

ULTRASONIC CALIBRATION DATA SHEET

Cal. Sheet No. 39-FW4 45 1.5
Page 6 of 9

Plant: BNP Unit: 1 Data Sheets: 39-FW4

Procedure No.: 0SP-00-001 Rev.: 0 Couplant Brand: ULTRAGEL II, 99-325 Cal Block Temp.: 75 Deg Therm. SN: PY-15

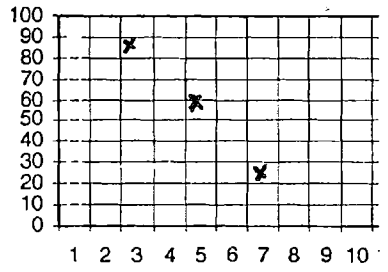
Instrument Mfg.: Krautkramer Branson Model: USK-7D S/N: 32810-4012 (UI-2)

Search Unit Mfg.: K-B Aerotech Model: Comp-g Shape: Round Size: .25" Freq.: 5.0 MHZ

Search Unit : Angle/Mode: 45 s Measured Angle: 45 Wedge Style : MSWQC S/N: 008NY6 (Single)/Dual

Cable Type: RG174 Length: 6' Connectors: BNC-MDOT Wedge Index to Front Meas.: .35

Calibration Block: Size: 14" Thickness: .375 S/N: 30B Other Block: IIW S/N: 96-6500 (SW-9)



X = Axial Scan, O = Circ. Scan
Scale Range: 0 - 10 = Metal Path 2.5"

Instrument Settings

Reference Sensitivity		Examination Sensitivity	
Gain - Axial Scan	20.5 dB	Gain - Axial Scan	31.5 dB
Gain - Circ. Scan	N/A dB	Gain - Circ. Scan	N/A dB
Freq.	1-5Mhz	*PRR/PRF	High
Range	2.5"	Pulser	High
Mtl. Cal/Vel.	127.0"	Damping	Fixed
Delay	3.3us	Reject	0
Filter	N/A	Jack	☒ R ☐ T
Mode	Shear		

*Pulse Repetition Rate/Pulse Repetition Frequency

Welds Examined ☒ Ferritic ☐ Austenitic

1E215-39-FW4

Calibration Verification

		Verification Times	
Initial Calibration Time	09:00		
Final Verification Time	12:50		

Comments : Miniature cal block. S/N: 5226 (SW-10)

Examiner: _____ Level: II Date: 4 / 18 / 01

Examiner: _____ Level: IL Date: 4 /18 / 01

Reviewed: _____ Level: ANII Date: 5 R 01

NGGM-PM-0011 APPENDIX A

CPL UT-13 Rev 4

ULTRASONIC CALIBRATION DATA SHEET

Cal. Sheet No. 39-FW4 60
Page 7 of 9

Plant: BNP Unit: 1

Data Sheets: 39-FW4

Procedure No.: 0SP-00-001 Rev.: 0 Couplant Brand: ULTRAGEL II, 99-325 Cal Block Temp.: 75 Deg Therm. SN: PY-15

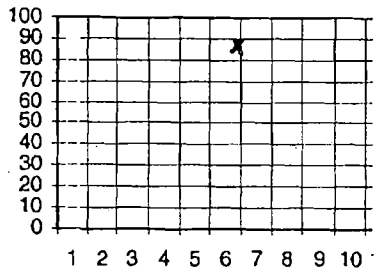
Instrument Mfg.: Krautkramer Branson Model: USK-7D S/N: 32810-4012 (UI-2)

Search Unit Mfg.: K-B Aerotech Model: GAMMA Shape: Round Size: .25" Freq.: 5.0 MHZ

Search Unit : Angle/Mode: 60 s Measured Angle: 60 Wedge Style : MSWS S/N: M09875 (Single)/Dual

Cable Type: RG174 Length: 6' Connectors: BNC-MDOT Wedge Index to Front Meas.: .3

Calibration Block: Size: 14" Thickness: .375 S/N: 30B Other Block: IIW S/N: 96-6500 (SW-9)



X = Axial Scan, O = Circ. Scan
Scale Range: 0 - 10 = Metal Path 1.25"

Instrument Settings

Reference Sensitivity		Examination Sensitivity	
Gain - Axial Scan	41.5 dB	Gain - Axial Scan	41.5 dB
Gain - Circ. Scan	N/A dB	Gain - Circ. Scan	N/A dB
Freq.	1-5Mhz	*PRR/PRF	High
Range	1.25"	Pulser	High
Mtl. Cal/Vel.	127.0"	Damping	Fixed
Delay	4.7us	Reject	0
Filter	N/A	Jack	☒ R ☐ T
Mode	Shear		

*Pulse Repetition Rate/Pulse Repetition Frequency

Welds Examined ☒ Ferritic ☐ Austenitic

1E215-39-FW4

Calibration Verification

		Verification Times	
Initial Calibration Time	09:00		
Final Verification Time	12:50		

Comments: Miniature cal block. S/N: 5226 (SW-10)

Examiner: Level: II Date: 4 / 18 / 01

Examiner: Level: IL Date: 4 /18 / 01

Reviewed: Level: ANII Date: 5 12 01

NGGM-PM-0011 APPENDIX A

EXHIBIT 2
Determination of Percent Coverage for Ultrasonic Examinations

Report No. 39-FW4

Unit 1 Procedure OSP-00-001 R/0 Page 8 of 9

Weld Number 1E21S-39-FW4

45 deg

Scan 1 100 % Length X 100 % volume of length/100 = 100 % total for Scan 1

Scan 2 100 % Length X 60 % volume of length/100 = 60 % total for Scan 2

Scan 3 100 % Length X 100 % volume of length/100 = 100 % total for Scan 3

Scan 4 100 % Length X 100 % volume of length/100 = 100 % total for Scan 4

Add totals and divide by # scans = 90 **% total for 45 deg**

Other deg - 60 (to be used for supplemental scans)

The data to be listed below is for coverage that was not obtained with the 45 deg scans.

Scan 1 N/A % Length X N/A % volume of length/100 = N/A % total for Scan 1

Scan 2 N/A % Length X N/A % volume of length/100 = N/A % total for Scan 2

Scan 3 N/A % Length X N/A % volume of length/100 = N/A % total for Scan 3

Scan 4 N/A % Length X N/A % volume of length/100 = N/A % total for Scan 4

Percent complete coverage

Add totals for each scan required and divide by # of scans to determine;

90 **% Total for complete exam**

Level III/NDE Program Manager L D Shelley Date 4/19/01

ANII REVIEW M 5-2-01

QA NDE-CS-1 Rev 1

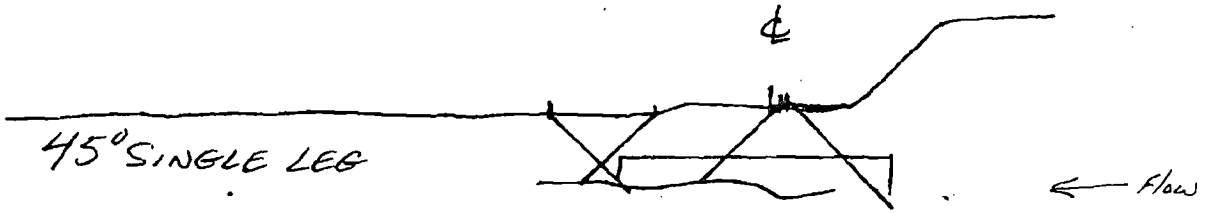
CP&L

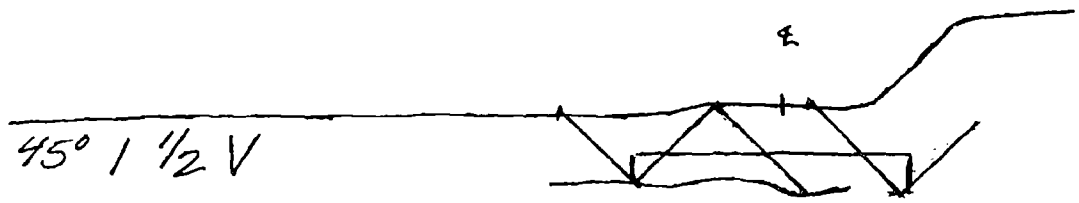
NDE DRAWING ATTACHMENT

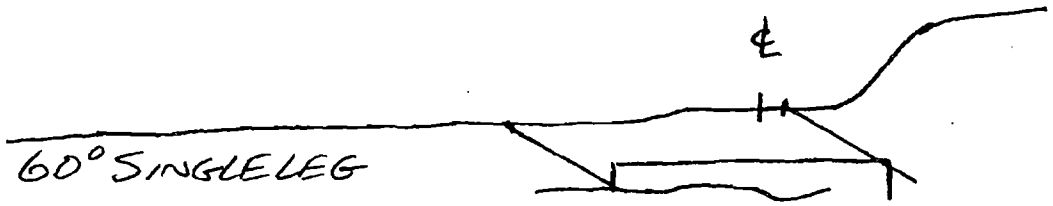
PAGE 9 OF 9

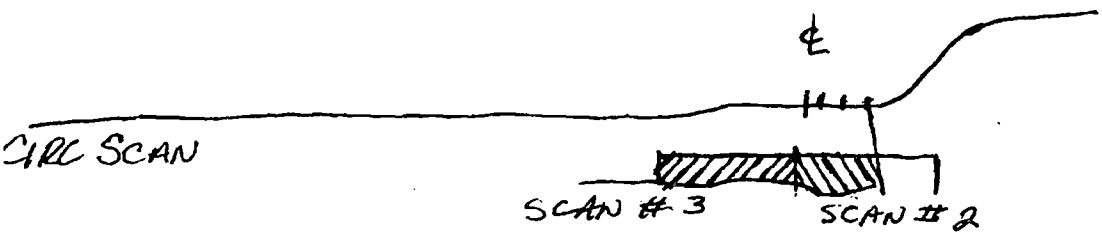
PROJECT BNP JOB NO. 119769 UNIT 1☒ 2☐ 3☐ 4☐ DATE 4-18-01

DRAWING C24004 SHT 98-1	SYSTEM Core Spray	LINE 1E21-39-14-152	1E21S-39-FW4 WELD/ITEM NUMBER









4-19-01 4/19/01

NGGM-PM-0011 APPENDIX A

UT Calibration/Examination

NGG Nuclear Generation Group

Site/Unit: BNP / 1 | Procedure: NDEP-0437 | Outage No.: B121R1
Summary No.: 1-E41-4152 | Procedure Rev.: 8 | Report No.: UT-16-029
Workscope: ISI | Work Order No.: 13472402 | Page: 1 of 11

Code: 2001 Edition, 2003 Addenda | Cat./Item: C-F-2/C5.51 | Location: REACTOR BUILDING
Drawing No.: C-24004 Sht. 105-1 | Description: PIPE TO VALVE 1-E41-FO42
System ID: 2095
Component ID: 1E411X225-1-FW22 | Size/Length: 16"/43.982" | Thickness/Diameter: CS/0.375"/16"
Limitations: Yes - single sided due to valve | Start Time: 0348 | Finish Time: 0408

Instrument Settings

Serial No.: 13G00172
Manufacturer: GE
Model: USN 60 SW | Linearity: L-16-005
Delay: 3.5866 | Range: 1.00"
M'll Cal/Vel: 0.1266 | Pulser Type: Square
Damping: 500 Ohms | Reject: 0%
PRF: Auto High | SU Freq.: 5 MHz
Frequency: 5.0 MHz | Rectify: Fullwave
Voltage: 450 | Pulse Width: 100

Ax. Gain (dB): N/A | Circ. Gain (dB): 21.0
1 Screen Div. = 0.1 in. of Sound Path

Calibration Block

Cal. Block No.: CB-02-52
Thickness: 0.5" - 2.0" | Dia.: Flat
Cal. Blk. Temp.: 74 | Temp. Tool: G502480
Comp. Temp.: 75 | Temp. Tool: G502480

Search Unit

Serial No.: SC3094
Manufacturer: GE
Size: 0.25" | Model: Comp - G
Freq.: 5 MHz | Center Freq.: N/A
Exam Angle: 45 | Squint Angle: N/A
Measured Angle: 42.4 | Mode: Shear
Exit Point: 0.30" | # of Elements: 1
Config.: Single | Focus: N/A
Shape: Round | Contour: Flat
Wedge Style: MSWQC

Search Unit Cable

Type: RG-174 | Length: 6' | No. Conn.: 0

Scan Coverage

Upstream ☐ | Downstream ☐ | Scan dB: N/A
CW ☑ | CCW ☑ | Scan dB: 32.0
Exam Surface: O.D.
Surface Condition: Ground

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)
Results: Sat ☑ Unsat ☐ Eval ☐ NCR # 02009905

Percent Of Coverage Obtained > 90%: 70.5% | Reviewed Previous Data: Yes

Cal. Checks	Time	Date
Initial Cal.	2100	3/10/2016
Inter. Cal.	N/A	
Inter. Cal.	0347	3/11/2016
Inter. Cal.	N/A	
Final Cal.	0441	3/11/2016

Couplant

Cal. Batch: 14H073
Type: Ultragel II
Mfg.: Sonotech, Inc.
Exam Batch: 14H073
Type: Ultragel II
Mfg.: Sonotech, Inc.

Reference Block

Serial No.: 14-3684
Type: Rompas

Comments: N/A

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A			

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
0.5" Notch	80	6.8	0.677"

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
21.0	1" Radius	95	10.0	1.00"

Examiner	Level	Signature	Date	Reviewer	Signature	Date
Williams, Christopher D.	II-N		3/11/2016	D.B. King, UT Level III		3/15/16
Examiner	Level	Signature	Date	Site Review	Signature	Date
Nahory, W. Jason	II-N		3/11/2016			3.16.16
Other	Level	Signature	Date	ANII Review	Signature	Date
~~N/A~~ R. CLINE	N/A		3/16/16	David M. Reynolds		3-16-2016

UT Calibration/Examination

NGG Nuclear Generation Group

Site/Unit:	BNP / 1	Procedure:	NDEP-0437	Outage No.:	B121R1
Summary No.:	1-E41-4152	Procedure Rev.:	8	Report No.:	UT-16-029
Workscope:	ISI	Work Order No.:	13472402	Page:	2 of 11

Code: 2001 Edition, 2003 Addenda | Cat./Item: C-F-2/C5.51 | Location: REACTOR BUILDING

Drawing No.: C-24004 Sht. 105-1 | Description: PIPE TO VALVE 1-E41-FO42

System ID: 2095

Component ID: 1E411X226-1-FW22 | Size/Length: 16"/43.982" | Thickness/Diameter: CS/0.375"/16"

Limitations: Yes - single sided due to valve | Start Time: 0240 | Finish Time: 0335

Instrument Settings

Serial No.:	13G00172		
Manufacturer:	GE		
Model:	USN 60 SW	Linearity:	L-16-005
Delay:	3.5866	Range:	1.00"
M'tl Cal/Vel:	0.1266	Pulser Type:	Square
Damping:	500 Ohms	Reject:	0%
PRF:	Auto High	SU Freq.:	5 MHz
Frequency:	5.0 MHz	Rectify:	Fullwave
Voltage:	450	Pulse Width:	100
Ax. Gain (dB):	21.0	Circ. Gain (dB):	N/A

1 Screen Div. = 0.1 in. of Sound Path

Calibration Block

Cal. Block No.: CB-02-52
Thickness: 0.5" - 2.0" | Dia.: Flat
Cal. Blk. Temp.: 73 | Temp. Tool: G502480
Comp. Temp.: 75 | Temp. Tool: G502480
Recordable Indication(s): Yes ☐ No ☑
Results: Sat ☑ Unsat ☐ Eval ☐

Search Unit

Serial No.:	SC3094		
Manufacturer:	GE		
Size:	0.25"	Model:	Comp - G
Freq.:	5 MHz	Center Freq.:	N/A
Exam Angle:	45	Squint Angle:	N/A
Measured Angle:	42.4	Mode:	Shear
Exit Point:	0.30"	# of Elements:	1
Config.:	Single	Focus:	N/A
Shape:	Round	Contour:	Flat
Wedge Style:	MSWQC		

Search Unit Cable

Type: RG-174 | Length: 6' | No. Conn.: 0

Scan Coverage

Upstream ☐ Downstream ☑ Scan dB: 31.0
CW ☐ CCW ☐ Scan dB: N/A
Exam Surface: O.D.
Surface Condition: Ground
(If Yes, Ref. Attached Ultrasonic Indication Report.)

Cal. Checks	Time	Date
Initial Cal.	1128	3/7/2016
Inter. Cal.	N/A	
Inter. Cal.	0250	3/8/2016
Inter. Cal.	N/A	
Final Cal.	0512	3/8/2016

Couplant

Cal. Batch: 14H073
Type: Ultragel II
Mfg.: Sonotech, Inc.
Exam Batch: 14H073
Type: Ultragel II
Mfg.: Sonotech, Inc.

Reference Block

Serial No.: 14-3684
Type: Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
0.5" Notch	80	6.8	0.677"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
21.0	1" Radius	95	10.0	1.00"

Comments: N/A

Percent Of Coverage Obtained > 90%: 70.5% | Reviewed Previous Data: Yes

Examiner	Level II-N	Signature	Date	Reviewer		Signature	Date
Williams, Christopher D.			3/8/2016	D.A. King UT Level III			3/15/16
Examiner	Level II-N	Signature	Date	Site Review		Signature	Date
Nahory, W. Jason			3/8/2016	John Sullivan			3.16.16
Other	Level N/A	Signature	Date	ANII Review		Signature	Date
~~N/A~~ R.W. CLINE			3/16/16	David M. Reynolds			3-16-2016

UT Calibration/Examination

Nuclear Generation Group

Site/Unit:	BNP / 1	Procedure:	NDEP-0437	Outage No.:	B121R1
Summary No.:	1-E41-4152	Procedure Rev.:	8	Report No.:	UT-16-029
Workscope:	ISI	Work Order No.:	13472402	Page:	3 of 11

Code: 2001 Edition, 2003 Addenda | Cat./Item: C-F-2/C5.51 | Location: REACTOR BUILDING

Drawing No.: C-24004 Sht. 105-1 | Description: PIPE TO VALVE 1-E41-FO42

System ID: 2095

Component ID: 1E411X226-1-FW22 | Size/Length: 16"/43.982" | Thickness/Diameter: CS/0.375"/16"

Limitations: Yes - single sided due to valve | Start Time: 0240 | Finish Time: 0335

Instrument Settings

Serial No.:	13G00172		
Manufacturer:	GE		
Model:	USN 60 SW	Linearity:	L-16-005
Delay:	4.745	Range:	1.4"
M'tl Cal/Vel:	0.1268	Pulser Type:	Square
Damping:	500 Ohms	Reject:	0%
PRF:	Auto High	SU Freq.:	5 MHz
Frequency:	5.0 MHz	Rectify:	Fullwave
Voltage:	450	Pulse Width:	100
Ax. Gain (dB):	35.0	Circ. Gain (dB):	N/A

1 Screen Div. = .14 in. of Sound Path

Calibration Block

Cal. Block No.:	CB-02-52		
Thickness:	0.5" - 2.0"	Dia.:	Flat
Cal. Blk. Temp.:	73	Temp. Tool:	G502480
Comp. Temp.:	75	Temp. Tool:	G502480

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)

Results: Sat ☑ Unsat ☐ Eval ☐

Search Unit

Serial No.:	SC2843		
Manufacturer:	GE		
Size:	0.25"	Model:	Comp-G
Freq.:	5 MHz	Center Freq.:	N/A
Exam Angle:	60	Squint Angle:	N/A
Measured Angle:	60.4	Mode:	Shear
Exit Point:	0.3"	# of Elements:	1
Config.:	Single	Focus:	N/A
Shape:	Round	Contour:	Flat
Wedge Style:	MSWQC		

Search Unit Cable

Type: RG-174 Length: 6' No. Conn.: 0

Scan Coverage

Upstream ☐ Downstream ☑ Scan dB: 41.0

CW ☐ CCW ☐ Scan dB: N/A

Exam Surface: O.D.

Surface Condition: Ground

Cal. Checks	Time	Date
Initial Cal.	1135	3/7/2016
Inter. Cal.	N/A	
Inter. Cal.	0305	3/8/2016
Inter. Cal.	N/A	
Final Cal.	0517	3/8/2016

Couplant

Cal. Batch:	14H073
Type:	Ultragel II
Mfg.:	Sonotech, Inc.
Exam Batch:	14H073
Type:	Ultragel II
Mfg.:	Sonotech, Inc.

Reference Block

Serial No.:	14-3684
Type:	Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
0.5" Notch	80	6.5	0.911"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
21.0	1" Radius	80	7.1	1.00"

Comments: N/A

Percent Of Coverage Obtained > 90%: 70.5% Reviewed Previous Data: Yes

Examiner: Nahory, W. Jason	Level: II-N	Signature	Date: 3/8/2016	Reviewer: D.B. King, UT Level III	Signature	Date: 3/15/16
Examiner: Williams, Christopher D.	Level: II-N	Signature	Date: 3/8/2016	Site Review: John Sullivan	Signature	Date: 3.16.16
Other: N/A	Level: N/A	Signature	Date: 3/16/16	ANII Review: David M Reynolds	Signature	Date: 3-16-2016

UT Calibration/Examination

NGG Nuclear Generation Group

Site/Unit:	BNP / 1	Procedure:	NDEP-0437	Outage No.:	B121R1
Summary No.:	1-E41-4152	Procedure Rev.:	8	Report No.:	UT-16-029
Workscope:	ISI	Work Order No.:	13472402	Page:	4 of 11

Code: 2001 Edition, 2003 Addenda | Cat./Item: C-F-2/C5.51 | Location: REACTOR BUILDING

Drawing No.: C-24004 Sht. 105-1 | Description: PIPE TO VALVE 1-E41-FO42

System ID: 2095

Component ID: 1E411X226-1-FW22 | Size/Length: 16"/43.982" | Thickness/Diameter: CS/0.375"/16"

Limitations: Yes - single sided due to valve | Start Time: 0240 | Finish Time: 0335

Instrument Settings

Serial No.:	13G00172		
Manufacturer:	GE		
Model:	USN 60 SW	Linearity:	L-16-005
Delay:	6.4228	Range:	2.00"
M'tl Cal/Vel:	0.1275	Pulser Type:	Square
Damping:	500 Ohms	Reject:	0%
PRF:	Auto High	SU Freq.:	5 MHz
Frequency:	5.0 MHz	Rectify:	Fullwave
Voltage:	450	Pulse Width:	100

Ax. Gain (dB): 44.0 | Circ. Gain (dB): N/A

1 Screen Div. = .20 in. of Sound Path

Calibration Block

Cal. Block No.: CB-02-52

Thickness: 0.5" - 2.0" | Dia.: Flat

Cal. Blk. Temp.: 73 | Temp. Tool: G502480

Comp. Temp.: 75 | Temp. Tool: G502480

Recordable Indication(s): Yes ☐ No ☑

Results: Sat ☑ Unsat ☐ Eval ☐

Search Unit

Serial No.:	SC3068		
Manufacturer:	GE		
Size:	0.25"	Model:	Comp - G
Freq.:	5 MHz	Center Freq.:	N/A
Exam Angle:	70	Squint Angle:	N/A
Measured Angle:	71	Mode:	Shear
Exit Point:	0.45"	# of Elements:	1
Config.:	Single	Focus:	N/A
Shape:	Round	Contour:	Flat

Wedge Style: MSWQC

Search Unit Cable

Type: RG-174 | Length: 6' | No. Conn.: 0

Scan Coverage

Upstream ☐ Downstream ☑ Scan dB: 53.0

CW ☐ CCW ☐ Scan dB: N/A

Exam Surface: O.D.

Surface Condition: Ground

(If Yes, Ref. Attached Ultrasonic Indication Report.)

Cal. Checks	Time	Date
Initial Cal.	1141	3/7/2016
Inter. Cal.	N/A	
Inter. Cal.	0320	3/8/2016
Inter. Cal.	N/A	
Final Cal.	0522	3/8/2016

Couplant

Cal. Batch:	14H073
Type:	Ultragel II
Mfg.:	Sonotech, Inc.
Exam Batch:	14H073
Type:	Ultragel II
Mfg.:	Sonotech, Inc.

Reference Block

Serial No.: 14-3684

Type: Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
0.5" Notch	80	7.7	1.537"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
28.0	1" Radius	80	5.0	1.00"

Comments: N/A

Percent Of Coverage Obtained > 90%: 70.5% | Reviewed Previous Data: Yes

Examiner	Level II-N	Signature	Date	Reviewer		Signature	Date
Nahory, W. Jason			3/8/2016	D.B. King UT Level III			3/15/16
Examiner	Level II-N	Signature	Date	Site Review		Signature	Date
Williams, Christopher D.			3/8/2016	John Sullivan			3.16.16
Other	Level N/A	Signature	Date	ANII Review		Signature	Date
~~N/A~~ R H CLINE			3/16/16	David M. Reynolds			3-16-2016

UT Calibration/Examination

NGG Nuclear Generation Group

Site/Unit: BNP / 1 | Procedure: NDEP-0408 | Outage No.: B121R1
Summary No.: 1-E41-4152 | Procedure Rev.: 14 | Report No.: UT-16-029
Workscope: ISI | Work Order No.: 13472402 | Page: 5 of 11

Code: 2001 Edition, 2003 Addenda | Cat./Item: C-F-2/C5.51 | Location: REACTOR BUILDING
Drawing No.: C-24004 Sht. 105-1 | Description: PIPE TO VALVE 1-E41-FO42
System ID: 2095
Component ID: 1E411X226-1-FW22 | Size/Length: 16"/43.982" | Thickness/Diameter: CS/0.375"/16"
Limitations: Yes - single sided due to valve | Start Time: 0240 | Finish Time: 0335

Instrument Settings

Serial No.: 13G00172
Manufacturer: GE
Model: USN 60 SW | Linearity: L-16-005
Delay: 0.6009 | Range: 1.25"
M'tl Cal/Vel: 0.2331 | Pulser Type: Square
Damping: 500 Ohms | Reject: 0%
PRF: Auto High | SU Freq.: 5.0 MHz
Frequency: 5.0 MHz | Rectify: Fullwave
Voltage: 450 | Pulse Width: 100

Ax. Gain (dB): * | Circ. Gain (dB): N/A
1 Screen Div. = .125 in. of Sound Path

Calibration Block

Cal. Block No.: 11-5022
Thickness: 0.25"-1.0" | Dia.: Flat
Cal. Blk. Temp.: 73 | Temp. Tool: G502480
Comp. Temp.: 75 | Temp. Tool: G502480

Search Unit

Serial No.: B15027
Manufacturer: KBA
Size: 0.25" | Model: Gamma HP
Freq.: 5.0 MHz | Center Freq.: N/A
Exam Angle: 0 | Squint Angle: N/A
Measured Angle: N/A | Mode: Long.
Exit Point: N/A | # of Elements: 1
Config.: Single | Focus: N/A
Shape: Round | Contour: Flat
Wedge Style: Integral

Search Unit Cable

Type: RG-174 | Length: 6' | No. Conn.: 0

Scan Coverage

Upstream ☑ | Downstream ☑ | Scan dB: *
CW ☐ | CCW ☐ | Scan dB: N/A
Exam Surface: O.D.
Surface Condition: Ground

Cal. Checks	Time	Date
Initial Cal.	1123	3/7/2016
Inter. Cal.	N/A	
Inter. Cal.	0239	3/8/2016
Inter. Cal.	N/A	
Final Cal.	0508	3/8/2016

Couplant

Cal. Batch: 14H073
Type: Ultragel II
Mfg.: Sonotech, Inc.
Exam Batch: 14H073
Type: Ultragel II
Mfg.: Sonotech, Inc.

Reference Block

Serial No.: 14-3684
Type: Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
0.25" BW	80	2.0	0.25"
1.00" BW	80	8.0	1.00"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
10.0	NSDH	32.0	2.4	0.300"

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)
Results: Sat ☑ Unsat ☐ Eval ☐

Comments: T & C - For information only.
*Gain adjusted to maintain 80% FSH.

Percent Of Coverage Obtained > 90%: N/A | Reviewed Previous Data: Yes

Examiner	Level	Signature	Date	Reviewer	Signature	Date
Williams, Christopher D.	II-N		3/8/2016	D.B. King UT Level III		3/15/16
Examiner	Level	Signature	Date	Site Review	Signature	Date
Nahory, W. Jason	II-N		3/8/2016	John Sullivan		3.16.16
Other	Level	Signature	Date	ANII Review	Signature	Date
~~N/A~~ R. Cline	N/A		3/16/16	David M. Reynolds		3-16-2016

CIRC. COVERAGE

UPSTREAM

0.15" x 0.395" = 0.05925 in² OBTAINED

0.15" x 0.875" = 0.13125 in² TOTAL UPSTREAM

0.05925 / 0.13125 = 45% UPSTREAM OBTAINED

DOWNSTREAM

0.16" x 0.25" = 0.04 in² OBTAINED

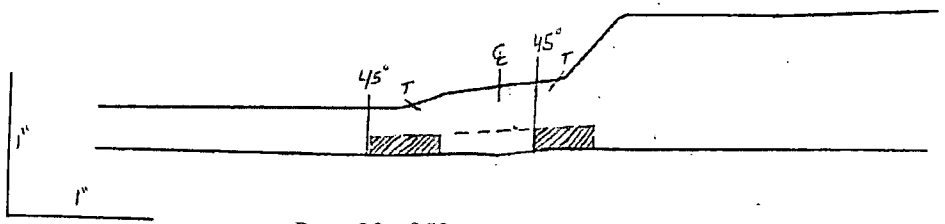
0.16" x 0.675" = 0.108 in² TOTAL DOWNSTREAM

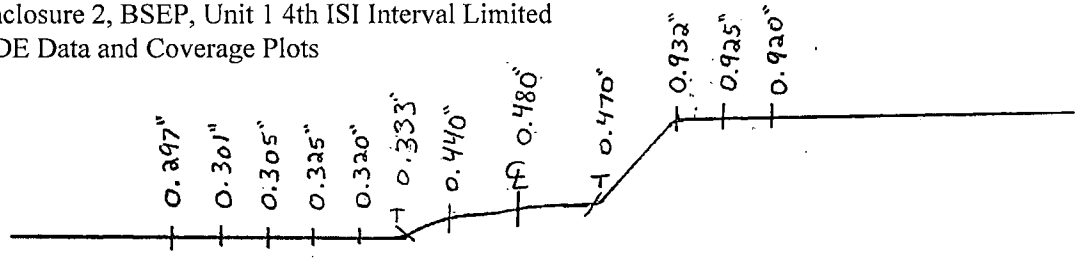
0.04 / 0.108 = 37% DOWNSTREAM OBTAINED

(45 + 37) / 2 = 41% TOTAL CIRC COVERAGE OBTAINED

PIPE

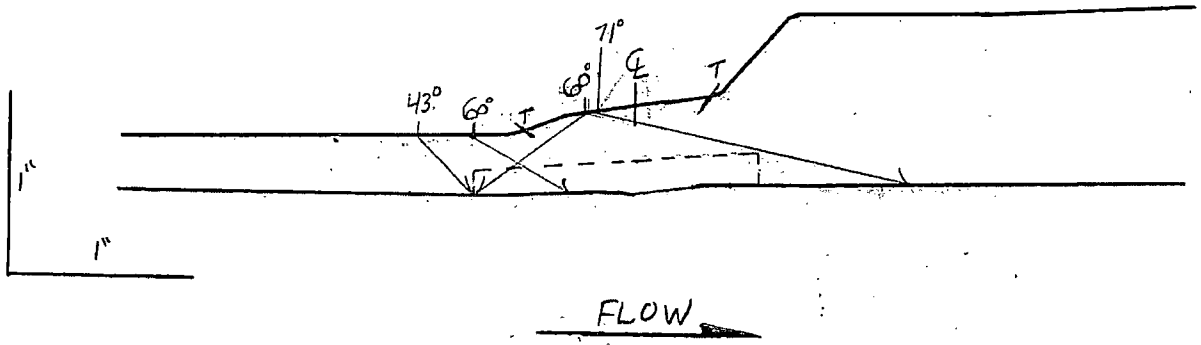
VALVE





PIPE SIDE

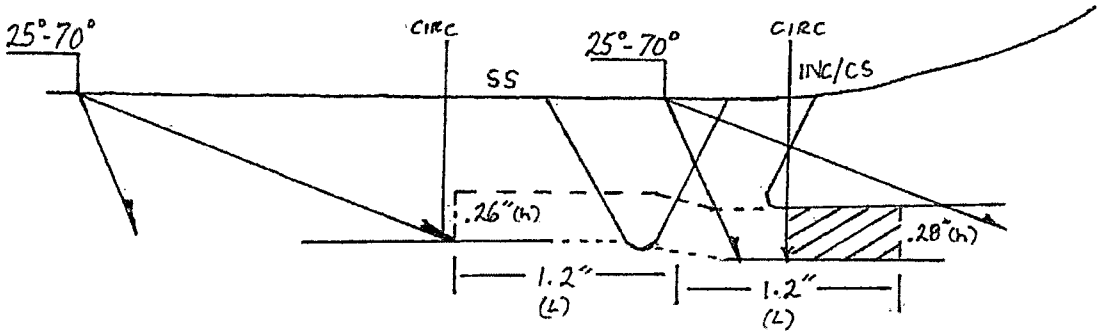
VALVE SIDE



TOTAL AGGREGATE COVERAGE:
(100 + 100 + 45 + 37)/4 = 70.5

IB11N2D-RPV-FWABA

FLOW →



1"
SCALE 1"

AXIAL = 100%

CIRC = 73.9% +

173.9 ÷ 2 = 86.9% TOTAL EXAM COVERAGE ACHIEVED

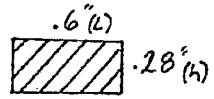
LOWER 1/3 COVERAGE

1.2"(L) X .26"(h) = .31"²

1.2"(L) X .28"(h) = .34"² +

TOTAL EXAM VOLUME .65"²

CIRC MISSED COVERAGE



.6"(L) X .28"(h) = .17"²

.17"² ÷ .65"² = 26.1% MISSED

100% - 26.1% = 73.9% TOTAL CIRC

PREPARED BY: Jason Polisensky Digitally signed by Jason Polisensky Date: 2019.03.27 15:00:24 -04'00'

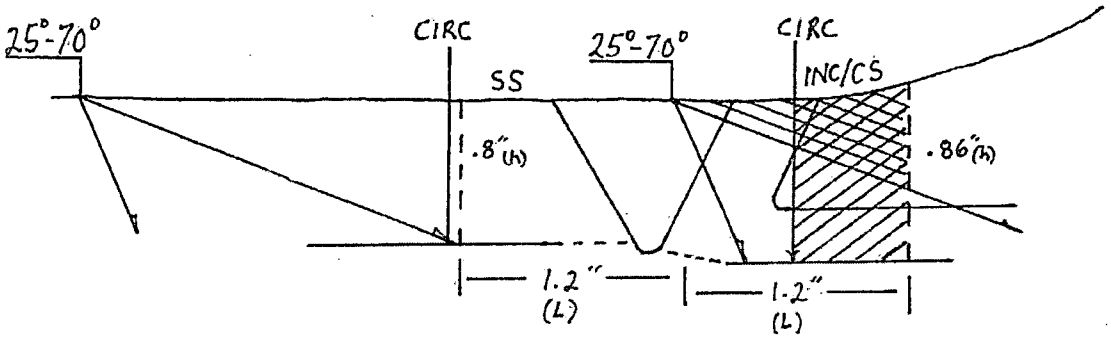
Jason Polisensky L-III 3/27/2019

REVIEWED BY: D.B. King Digitally signed by David King Date: 2019.03.27 15:22:50 -04'00'

D.B. King UT Level III 3/27/2019

1B11N2D-RPV-FWABA

FLOW



1"

SCALE 1"

AXIAL = 80.4%

CIRC = 73.9% +

154.3 ÷ 2 = 77.1% TOTAL EXAM COVERAGE ACHIEVED

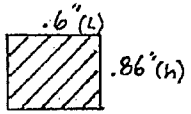
FULL VOLUME COVERAGE

1.2"(L) x .86"(h) = $1.03^{"2}$

1.2"(L) x .80"(h) = $0.96^{"2}$ +

TOTAL EXAM VOLUME $1.99^{"2}$

CIRC MISSED COVERAGE

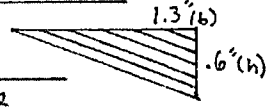


.6"(L) x .86"(h) = $.52^{"2}$

$.52^{"2} \div 1.99^{"2}$ = 26.1% MISSED

100% - 26.1% = 73.9% TOTAL CIRC

AXIAL MISSED COVERAGE



(1.3"b x .6"h) ÷ 2 = $.39^{"2}$

$.39^{"2} \div 1.99^{"2}$ = 19.6% MISSED

100% - 19.6% = 80.4% TOTAL AXIAL

PREPARED BY: Jason Polisensky

Digitally signed by Jason Polisensky
Date: 2019.03.27 15:03:24 -04'00'

Jason Polisensky L-III 3/27/2019

REVIEWED BY: D.B. King

Digitally signed by David King
Date: 2019.03.27 15:20:49 -04'00'

D.B. King UT Level III 3/27/2019

framatome	Automated Ultrasonic Phased Array Examination Summary Sheet			
Utility: Duke	**Site:** Brunswick	**Unit:** 1	**Outage:** B1R22	**Summary Number:** 1-CS-027-RI **Report Number:** BNP1-DM-2018-10
Weld Identification: 1B11N5B-RPV-FWRNB16A				**WO#:** 13468386
System: Core Spray	**Material:** SS/INC/CS		**Nominal Diameter:** 15.50"	**Nominal Thickness:** 0.90"
Category: R1.14-2	**Item No:** E-7		**Component Description:** Safe End to Nozzle DM Weld	
Class: 1	**Acceptance Criteria:** ASME IWB 3514-2			

Procedure Number: 54-ISI-869 **Revision:** 000 **SDCN:** NA
Procedure Title: Procedure for Encoded, Phased Array Ultrasonic Examination of Dissimilar Metal Piping Welds
Technique Sheets: RS-TOPAZ-STD-02

Procedure Number: 54-ISI-829 **Revision:** 013 **SDCN:** NA
Procedure Title: PDI Generic Procedure for then Ultrasonic Examination of Dissimilar Metal Welds PDI-UT-10

ASME Code, Section XI, Appendix VIII, Supplement 10 qualified automated ultrasonic phased array examination of weld 1B11N5B-RPV-FWRNB16A were performed by Framatome during the Brunswick Unit 1, B1R22 refueling outage. Final analysis of all examination data has identified:

- No IGSCC/SCC flaws were detected.

Typical inside surface geometry and weld material responses were also observed.

Circumferential flaw detection exams were performed from both sides of the weld using refracted longitudinal wave beam angles of 30°, 45°, 60° and 70° along with refracted shear wave beam angles of 45° and 60°. In addition to the automated examinations manual scans were performed utilizing 45° and 60° refracted longitudinal wave and 45° shear wave probes.

Axial flaw detection exams were performed across the examination volume in both circumferential beam directions (CW/CCW) using refracted longitudinal wave beam angles of 25°, 35°, 45° and 55° along with shear wave beam angles of 35°, 45° and 55°. Each of the beam angles was additionally programmed to produce beam skews from -30° to +30° at a 2.5° skew angle resolution. In addition to the automated examination manual scans were performed utilizing a 45° shear wave probe to achieve additional coverage on the nozzle side of the weld.

87.9% ASME code coverage was achieved with combining automated with manual pickups.
AR 02192258 WRITTEN TO DOCUMENT LIMITATION NRF 3-19-18
Previous UT examination data reports were reviewed prior to this summary. No discernible changes in any indication parameter have been observed. Examination overview images from the automated examination are provided in this report for future considerations.

This examination meets the requirements of the ASME Code, Section XI, 2001 Edition with Addenda through 2003 as modified by the PDI program description document and 10CFR 50.55a Industry Codes and Standards, amended requirements, Final Rule.

Prepared by: Jason Breza LVIII Signature:	Date: 03/13/2018	Reviewer: Nathan Bauman LVIII Signature:	Date: 03/13/2018
Duke Review: Ned Finney Signature:	Date: 3-18-18	ANII Review: DAVID M. REYNOLDS Signature:	Date: 3-18-2018

Summary No: 1-CS-027-RI

Page 1 of 38

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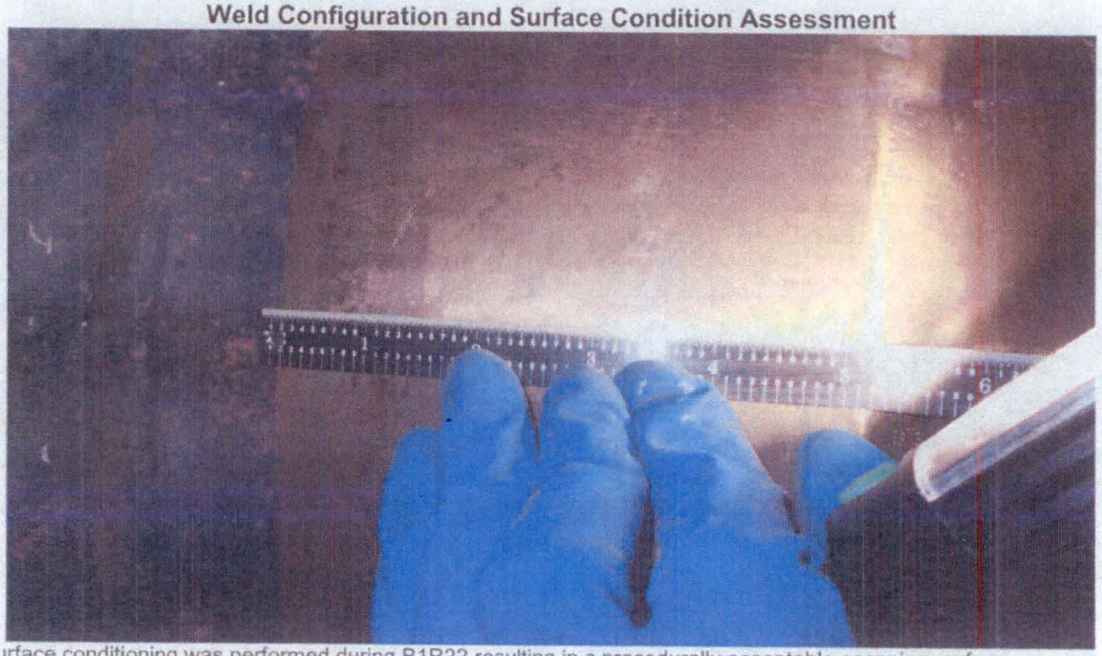
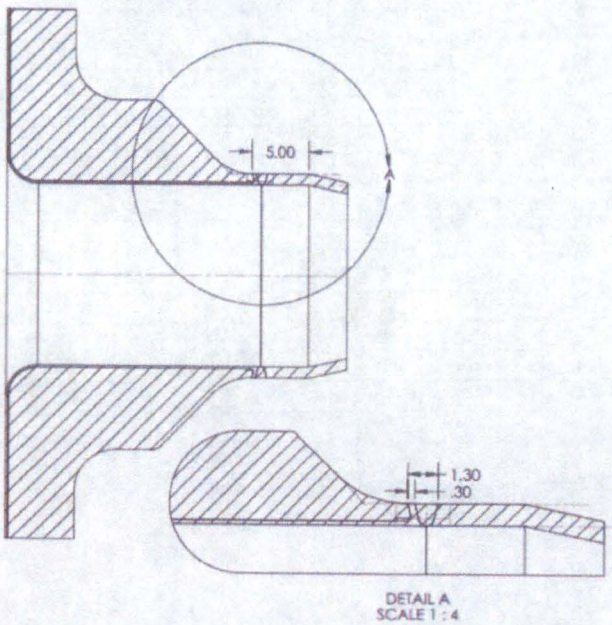
Automated Ultrasonic Phased Array Examination Summary Sheet

Weld Configuration and Surface Condition Assessment



Surface conditioning was performed during B1R22 resulting in a procedurally acceptable scanning surface.

Brunswick Unit 1 N5B



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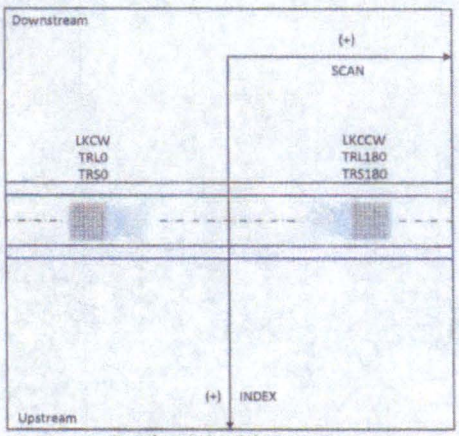
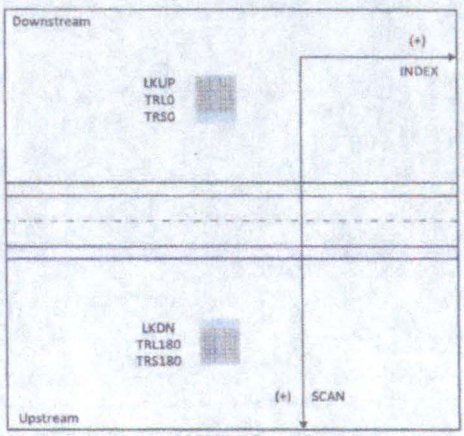
Automated DM Piping Weld Scan Plan

			mm	Inches
Procedure:	54-ISI-869-000	Pipe Thickness T:	22.9	0.90
Technique Sheet:	RS-TOPAZ-STD-02	Pipe OD:	393.2	15.48
Plant / Unit:	Brunswick / Unit 1	Weld Extent Upstream Side Wu:	13.97	0.55
Weld ID:	1B11N5B-RPV-FWRNB16A	Weld Extent Downstream Side Wd:	20.32	0.80
Dual Side Access:	Yes	Access Limitation UpStream Side Lu:	165.1	6.50
Complete Pipe:	Yes	Access Limitation Downstream Side Ld:	63.78	2.51
Add Exam Volume (mm):	6.35	Weld Length:	1235.20	48.63



Circumferential Scan Reference System



Axial Scan Reference System

SCANNING SEQUENCES AXIAL SCANS

Probe	Focal Law Group	Probe Type	Wedge Assembly	Scan			Index			Maximum Scan Speed mm	Done? (OK / NA)
				Start (mm)	End (mm)	Resol. (mm)	Start (mm)	End (mm)	Resol. (mm)		
LKUP	239_LKUP_TRL0_30-70	AS	360-152-239	-10.0	108.0	1.0	0.0	1260.0	2.0	50.0	OK
LKDN	239_LKDN_TRL180_30-70	AS	360-152-239	-43.9	71.1	1.0	-118.1	1141.9	2.0	50.0	OK
LKUP	239_LKUP_TRS0_45-80	AS	360-152-239	-10.0	108.0	1.0	0.0	1260.0	2.0	50.0	OK
LKDN	239_LKDN_TRS180_45-80	AS	360-152-239	-43.9	71.1	1.0	-118.1	1141.9	2.0	50.0	OK

SCANNING SEQUENCES CIRCUMFERENTAL SCANS

Probe	Focal Law Group	Probe Type	Wedge Assembly	Scan			Index			Maximum Scan Speed mm	Done? (OK / NA)
				Start (mm)	End (mm)	Resol. (mm)	Start (mm)	End (mm)	Resol. (mm)		
LKCW	103_LKCW_TRL0_25-55	AS	10027103	0.0	1260.0	1.0	-10.0	50.0	5.0	25.0	OK
LKCCW	103_LKCCW_TRL180_25-55	AS	10027103	-154.3	1105.7	1.0	-10.0	50.0	5.0	25.0	OK
LKCW	109_LKCW_TRS0_35-55	AS	10027109	0.0	1260.0	1.0	-10.0	50.0	5.0	25.0	OK
LKCCW	109_LKCCW_TRS180_35-55	AS	10027109	-154.6	1105.2	1.0	-10.0	50.0	5.0	25.0	OK

Highlighted values are actual mechanical scan parameters to be entered in motion control software prior to data collection

Data Analyst: Nathan Bauman **Signature:** NB

Date: 03/11/2018

NED FINNEY
DUKE ENERGY
UT L-III
3-18-18

AKII DAVID M. REYNOLDS
David M. Reynolds 3-18-2018

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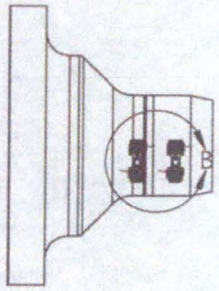
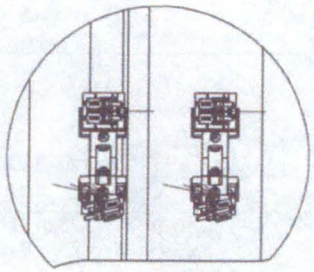
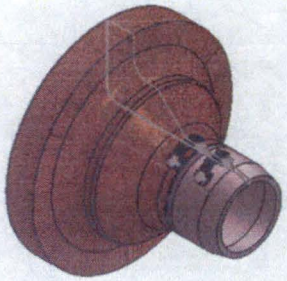
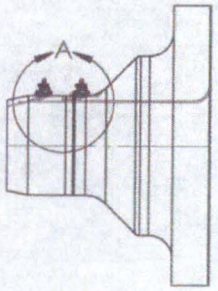
Brunswick Unit 1 N5 LKUP Axial Scan Plan

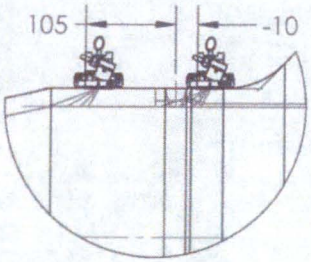




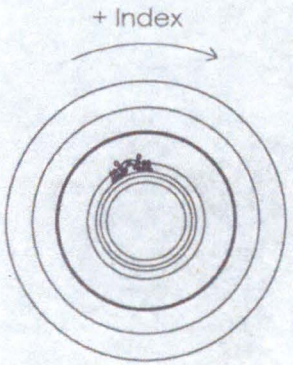
DETAIL B
SCALE 1 : 8







DETAIL A
SCALE 1 : 8



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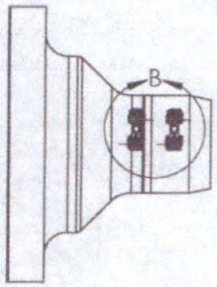
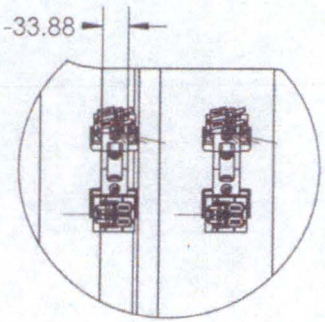
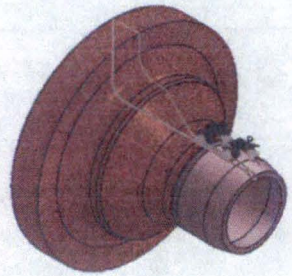
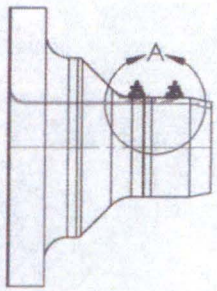
Brunswick Unit 1 N5 LKDN Axial Scan Plan

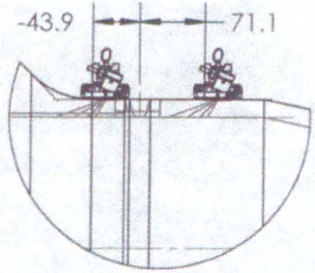




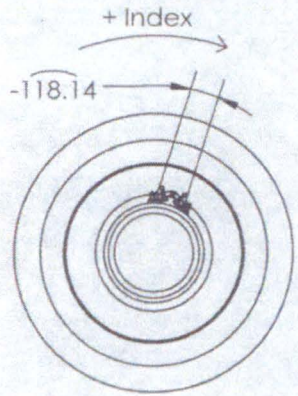
DETAIL B
SCALE 1 : 8







DETAIL A
SCALE 1 : 8



Axis	Offset
Axial	-33.88
Circ	-118.14

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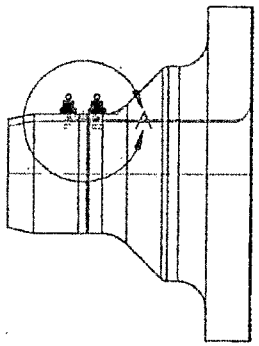
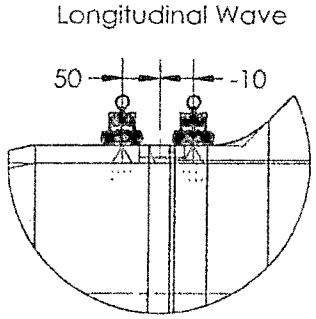
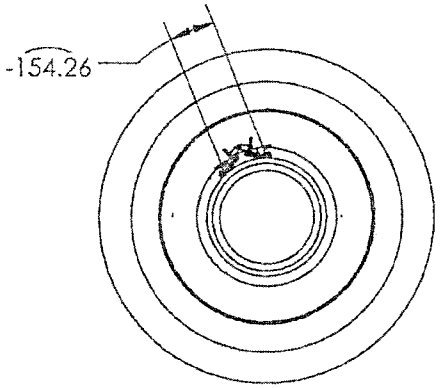
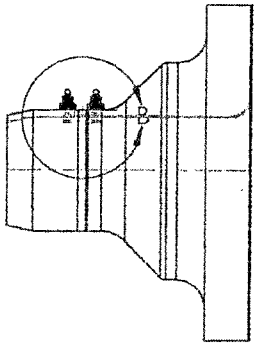
Brunswick Unit 2 N5 Circumferntial Scan Plan

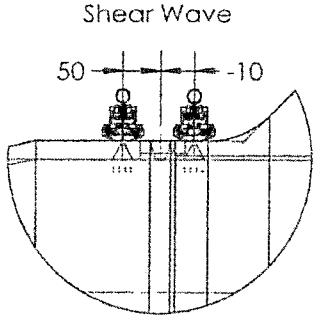




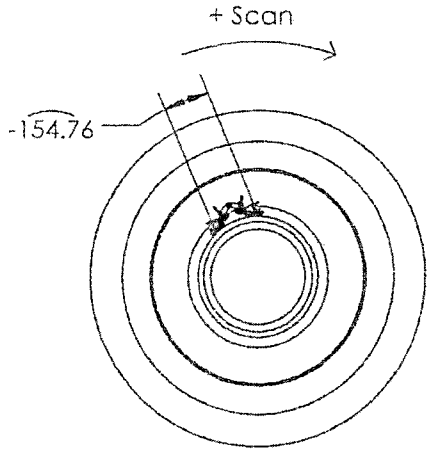
DETAIL A
SCALE 1 : 8







DETAIL B
SCALE 1 : 8



Probe	Axis	Offset
L-Wave CCW	Axial	0.00
	Circ	-154.26
S-Wave CCW	Axial	0.00
	Circ	-154.76

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Automated Phased Array Data Analysis Report (Examination Data Sheet)

Customer: Duke Energy	Procedure No.: 54-ISI-869	Summary Number:1-CS-027-RI
Site: Brunswick	Revision: 000	Report Number:BNP1-DM-2018-10
Outage:B1R22	SOCN: N/A	Data Sheet Number: 1B11N5B-RPV-FWRNB16A-EDS-01

Component Information

System:Core Spray	Measured OD:15.48"	Weld Crown Width: 1.30" (including butter)
Configuration:Safe End to Nozzle	Measured Thickness:0.90"	Weld Crown Condition:Flush
Weld ID(s):1B11N5B-RPV-FWRNB16A	Material:SB166 Alloy 600 / Inconel /SA508 CL2	Component Temperature:90°F

Data Analysis Results

Data File Name	Date/Time	Scan Type	Beam Direction	Results/Comments
1_BNP1_1B11N5B-RPV-FWRNB16A_Axial_LKUP_LKDN_LW_SW_AS_203_0-1260	03-11-2018 / 0932	Axial	LKUP/LKDN	ISG, RG, CB
1_BNP1_1B11N5B-RPV-FWRNB16A_Axial_LKUP_LKDN_LW_CW_AS_2x9_0-1260_1	03-11-2018 / 2359	Axial	LKUP/LKDN	ISG, RG, CB
2_BNP1_1B11N5B-RPV-FWRNB16A_CIRC_CW_CCW_LW_AS_103_0-1260-1	03-11-2018 / 1237	Circumferential	LKCW / LKCCW	ISG
2_BNP1_1B11N5B-RPV-FWRNB16A_CIRC_CW_CCW_LW_AS_103_0-1260-2	03-11-2018 / 1338	Circumferential	LKCW / LKCCW	ISG
3_BNP1_1B11N5B-RPV-FWRNB16A_CIRC_CW_CCW_SW_AS_103_0-1260	03-11-2018 / 1552	Circumferential	LKCW / LKCCW	

Data Analysis Results Legend (Classification)

Non-Relevant Geometrical Indications	Non-Relevant Metallurgical Indications	Flaw Indications
ISG: Inside Surface Geometry	AI: Acoustic Interface	Circ ID Flaw: ID Connected Circumferential Flaw
RG: Root Geometry	BR: Beam Redirect	AX ID Flaw: ID Connected Axial Flaw
CB: Counterbore		EMB: Embedded Weld Fabrication Flaw
		Other: See Notes

Notes: Automated scans limited due to N5 nozzle configuration (proximity to weld). Examination supplemented with manual scans to increase coverage.

Other:

Limitations: Yes

Data Analyst: Jason Droza	Level: III Date: 03/11/2018	Data Analyst: Nathan Bauman	Level: III Date: 03/11/2018
Utility Review: Ned Finney	Date: 3-18-18	ANII Review: DAVID M. REYNOLDS	Date: 3-18-2018

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UT Examination Data Sheet

Piping Welds

Report No.:	BNP1-SM-2018-10
Examination Data Sheet No.:	1B11N5B-RPV-FWRNB16A-EDS-01
Calibration Sheet No's.:	BNP1-N5-CS-04 BNP1-N5-CS-05 BNP1-N5-CS-06 BNP1-N5-CS-07

				Procedure	*Component Information*			
Customer:	Duke Energy				System:	Corespray	Weld ID:	1B11N5B-RPV-FWRNB16A
Site:	BNP	Unit:	1	54-ISI-829 Rev 013	Configuration:	SE to Nozzle	Nom. Diameter:	15.50"
Outage:	B1R22				Material:	SS/INC/CS	Nom. Thickness:	0.90"
Procedure Title:	PDI Generic Procedure for the Ultrasonic Examination of Dissimilar Metal Welds PDI-UT-10				Scan Surface:	OD	Weld Width:	1.30"

Examination Information

Start Date:	03/13/2018	Start Time:	2321	Component Temperature:	90°F	Couplant Type:	Sonotech
End Date:	03/13/2018	End Time:	2356	Thermometer Serial No.:	VH-15481	Couplant Batch No.:	17C011

Angle / Mode	Direction	Cal Sheet No.	Scan Gain (dB)	Scan Limitation	Recordable Indications	Indication Data Sheet No.	Examiner Initials
45° / Shear	Axial/Circ	CS-04	38.0	Yes	No	N/A	TT
45° / RL	Axial	CS-05	47.0	No	No	N/A	TT
60° / RL	Axial	CS-06	49.0	No	No	N/A	TT
45° / RL	Circ	CS-07	52.0	Yes	No	N/A	TT

Comments: Manual examination used to supplement automated examination to maximize coverage.

Personnel	*Name*	*Signature*	*Level*	*Date*
Examiner:	Travis Thomas		III	03/14/2018
Examiner:	N/A	N/A	N/A	N/A
Reviewer:	Jason Breza		III	03/14/2018
Customer:	Ned Finney		III	3-18-18
ANII:	DAVID M. REYNOLDS		N/A	3-18-2018

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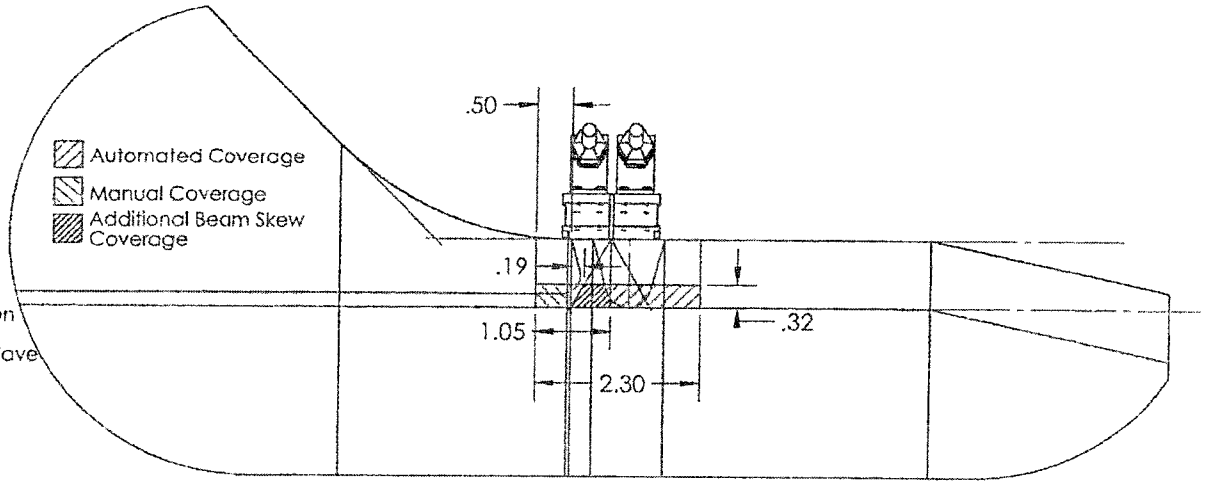
UT Limitation Report
Circumferential Scans



Limitation - N5 Nozzle Configuration

Scans Limited - Circ L-Wave & S-Wave

Total Examination Area
2.30" x 0.32" = 0.74 in²

Automated Coverage
1.25" x 0.32" = 0.40 in²

Total Automated Circ Coverage
0.40 / 0.74 x 100 = 54.1%

Total Beam Skew Coverage
(0.55" x 0.32")-(0.19" x 0.32 " / 2) = 0.15 in²

Additional Manual Coverage
0.50" x 0.32" = 0.16 in²

Total Manual Coverage
0.16 / 0.74 x 100 = 21.6%

Combined Circ Scan Coverage
54.1 + 21.6 = 75.7%

Total Percentage Covered **
0.40 + 0.16 + 0.15 = 0.71
0.71 / 0.74 x 100 = 95.9%
95.9 + 100 / 200 x 100 = 98.0%

Total ASME Code Coverage
100 + 75.7 / 200 x 100 = 87.9%

Notes: During the examination of the N5B DM weld the circumferential examinations were limited due to the N5B nozzle configuration. The automated technique utilized longitudinal and shear wave probes oriented in the circumferential scan directions. -30° to 30° beam skews were used to interrogate the exam volume to its furthest extent. The beam skews provided additional coverage of the susceptible material at the wetted surface. In addition to the automated technique a manual 45° shear wave was used to interrogate additional base material on the nozzle side of the DM weld.

**Claiming coverage using beam skews isn't procedurally allowed. This calculation was provide to show how much area was interrogated during the examination.

NED FINNEY / DUKE ENERGY / UT L-III 3-8-18 AR 02192258 WRITTEN TO DOCUMENT LIMITATION

ANII DAVID M. REYNOLDS 3-18-2018

Prepared by: Nathan Bauman LVIII
Date: 03/14/2018

framatome

Automated Phased Array Indication Report

Customer:Duke Energy	Procedure:54-ISI-869	Report Number:BNP1-DM-2018-10
Site:Brunswick	Revision:000	Indication Report Number: 1B11N5B-RPV-FWRNB16A-IR-01
Outage:B1R22	SDGN:NA	Summary Number:1-CS-027-RI

Component Information

Weld ID:1B11N5B-RPV-FWRNB16A	Measured OD:15.48"	Weld Crown Width: 1.30" (including butter)
System:Core Spray	Measured Thickness:0.90"	Weld Crown Condition:Flush
Configuration:Safe End to Nozzle	Material:SB166 Alloy 600 / Inconel /SA508 CL2	Component Temperature:80°F

Indication Parameters

Indication Number (Orientation)	Beam Angle	Characterization	Indication OD Start (L1) (Inches)	Indication OD End (L2) (Inches)	Indication OD Length (L) (Inches)	Indication Axial Position	Upper Tip	Lower Tip	Indication Height (H) (Inches)	Indication Thru wall Extent %	Notes
NRI											

Notes/Comments:

Data Analyst:Jason Brega	Level: III Date: 03/11/2018	Data Analyst:Nathan Bauman	Level: III Date:03/11/2018
Utility Review:Ned Finney	Date: 3-18-18	ANII Review: DAVID M. REYNOLDS	Date: 3-18-2018

Enclosure 3

Relief Request ISI-12

Brunswick Steam Electric Plant, Unit 2 Fourth Inservice Inspection (ISI) Interval Limited Coverage Non-Destruction Examination (NDE) Data and Coverage Plots

Ultrasonic Examination

Site/Unit:	BNP / 2	Procedure:	54-ISI-805-009	Outage No.:	B223R1
Summary No.:	2-B11-1078	Procedure Rev.:	009	Report No.:	VEN-17-010
Workscope:	ISI	Work Order No.:	20082951	Page:	1 of 1

Code:	ASME XI, 2001 Ed., 03 Ad.	Cat./Item:	B-D/B3.90	Location:	DW
Drawing No.:	C-02404 Sht. 001-1	Description:	NOZZLE N1A TO REACTOR VESSEL WELD		
System ID:	1005				
Component ID:	2B11-RPV-N1A	Size/Length:	N/A	Thickness/Diameter:	N/A
Limitations:	Yes - Component configuration				

Comments:

Reference BNP Unit 2 Areva final report document # 180-9269913-000 for personnel certifications and equipment certifications.

Detection of flaw indications at the inner 15% t (measured from the clad to base metal interface) of nozzle-to-vessel welds when scanning parallel to the weld axis was performed utilizing 54-ISI-850-008 with SDCN 30-9269636-000.

Results: Sat ☑ Unsat ☐ Eval ☐

Percent Of Coverage Obtained > 90%: No - 76.5% Reviewed Previous Data: Yes

Examiner	Level	Signature	Date	Reviewer	Signature	Date
N/A			3/26/2017	Zimmerman, David Lvl III		3/26/2017
Examiner	Level N/A	Signature	Date	Site Review	Signature	Date
N/A				Finney, Ned Lvl III		3/27/2017
Other	Level N/A	Signature	Date	ANII Review	Signature	Date
N/A				Reynolds, David		3/28/2017

AREVA

Ultrasonic Examination Summary Sheet

Summary No.:	2-B11-1078
Work Order:	2008295104
Component ID:	2B11-RPV-N1A
System:	RPV
Material:	CS (Clad)
Description:	RPV Nozzle to Shell Weld
EPRI Model No.:	IR-2017-680

Customer:	Duke Energy	Code Category:	B-D
Site:	BNS Unit: 2	Code Item:	B3.90
Outage:	B223R1	Code Class:	1
ISO / Drawing(s):	C-02404 Sht. 1-1		

Procedure Number	Procedure Revision	SDCN	Procedure Title
54-ISI-850	008	30-9269636-000	Manual Ultrasonic Examination of BWR Reactor Vessel Nozzle Inner Radius Regions and Nozzle to Shell Welds (inner 15%)
54-ISI-805	009	N/A	PDI Generic Procedure for Ultrasonic Examination of Reactor Pressure Vessel Welds PDI-UT-6

Calibration Sheets	Exam Data Sheets	Indication Data Sheets	Indication Plot Sheets	Coverage Worksheet	Coverage Diagram	Exam Results
CS-01	EDS-01	N/A	N/A	Yes	Yes	Acceptable
CS-02	EDS-02					
CS-03						

Summary:

Manual ultrasonic examinations were performed on the referenced weld during B223R1.

In accordance with UT Procedure 54-ISI-805-009, 60° Longitudinal wave examinations were performed from the vessel surface in both the radial and circumferential scan directions.

In accordance with UT Procedure 54-ISI-850-008 and the referenced EPRI model the following examinations were performed.

Recirculation Outlet Nozzle (N1) Nozzle Modeling Parameters		
Probe	Probe Skew	Scan Surface
50° Shear	± (59° to 82°)	Vessel

76.5% coverage of the required examination volume was obtained. The percentage of coverage for this examination was calculated to the maximum extent possible allowed by the procedure qualification and actual component field conditions for this configuration.

This examination was performed using the alternative examination volume defined in code case N-613-1 which reduces the area to be examined per IWB-2500-7 to the weld plus ½" on each side.

This examination satisfies the requirements of ASME Sec. XI 2001 Edition with 2003 Addenda for Category B-D, item number B3.90, figure number IWB 2500-7 (b) exam volume, and was performed using ASME Sec XI, Appendix VIII qualified personnel, procedures, and equipment.

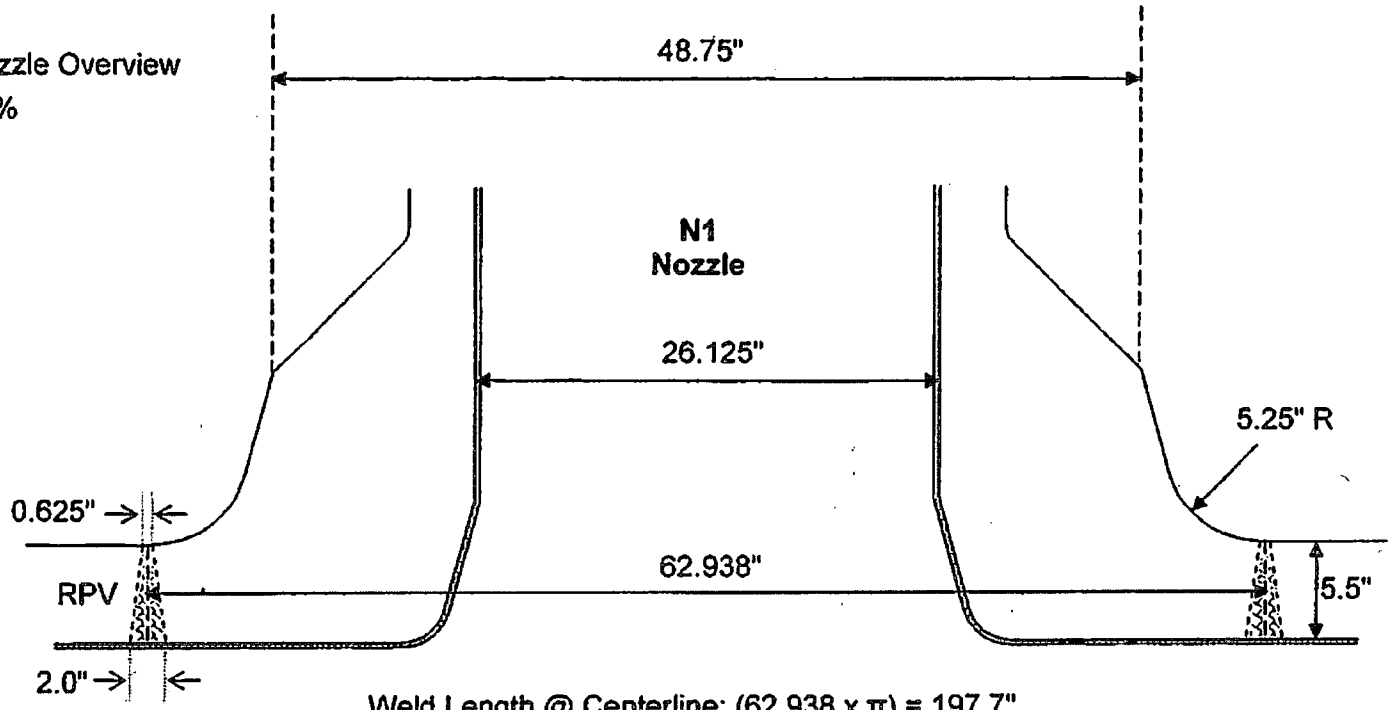
Personnel	Name	Signature	Level	Date
Prepared By:	John Gatica		II	03/26/2017
AREVA Review:	David Zimmerman		III	03/27/2017
Customer:	Ned Finney		III	3/27/2017
ANII:	DAVID M. REYNOLDS		N/A	3/28/2017

AREVA

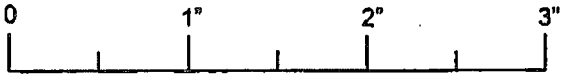
Supplemental Data Sheet

Page:	7 of 12
Component ID:	2B11-RPV-N1A
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 1
Subject: Nozzle Overview
Scale: 10%



Weld Length @ Centerline: (62.938 x π) = 197.7"



This scale is 100% in case of copier distortion

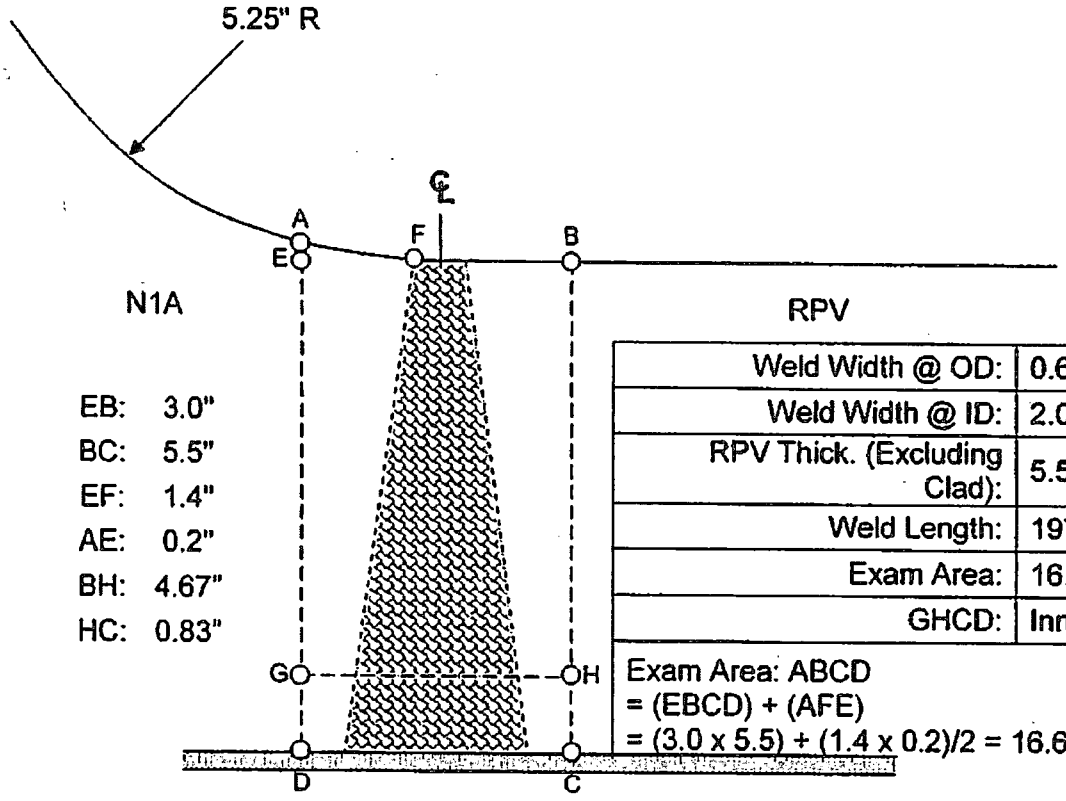
AREVA

Supplemental Data Sheet

Page:	8 of 12
Component ID:	2B11-RPV-N1A
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 2
Subject: Dimensions & Weld fit up
Scale: 50%

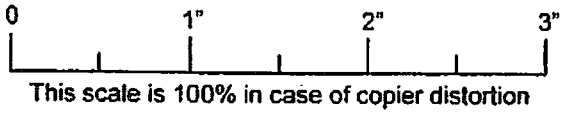
Scan	Description
R100:	60° Radial Exam
C85:	60° Circ Exam / Outer 85%
C15:	50° Circ Exam / Inner 15%



Weld Width @ OD:	0.625"
Weld Width @ ID:	2.0"
RPV Thick. (Excluding Clad):	5.5"
Weld Length:	197.7" @ CL
Exam Area:	16.64 in²
GHCD:	Inner 15%

Exam Area: ABCD
= (EBCD) + (AFE)
= (3.0 x 5.5) + (1.4 x 0.2)/2 = 16.64 in²

Note: Exam area extends to ½" beyond weld per code case N-613-1



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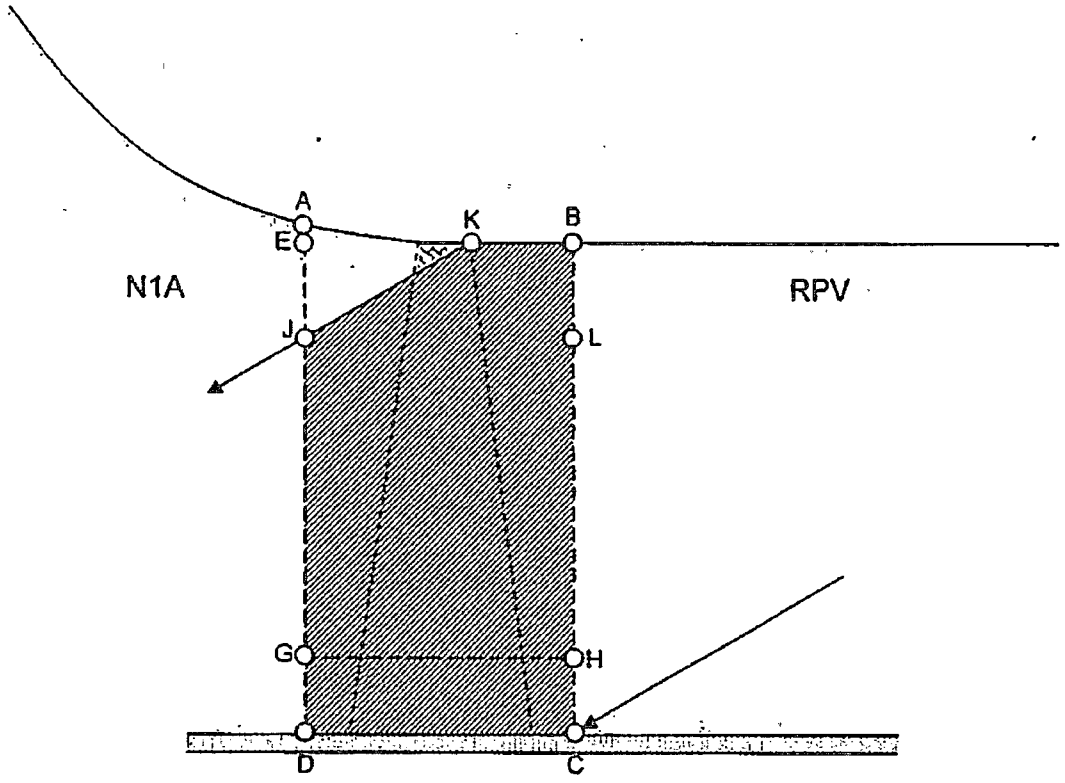
AREVA

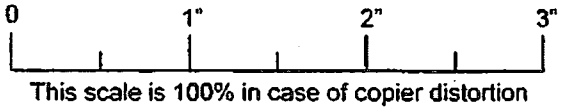
Supplemental Data Sheet

Page:	9 of 12
Component ID:	2B11-RPV-N1A
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 3
Scan: R100
Scale: 50%



Exam Area (ABCD): 16.64 in²
Examined: (KBLJ) + (JLCD)
Examined: 1.1(1.2 + 3.0)/2 + (3.0 x 4.4) = 15.51 in²



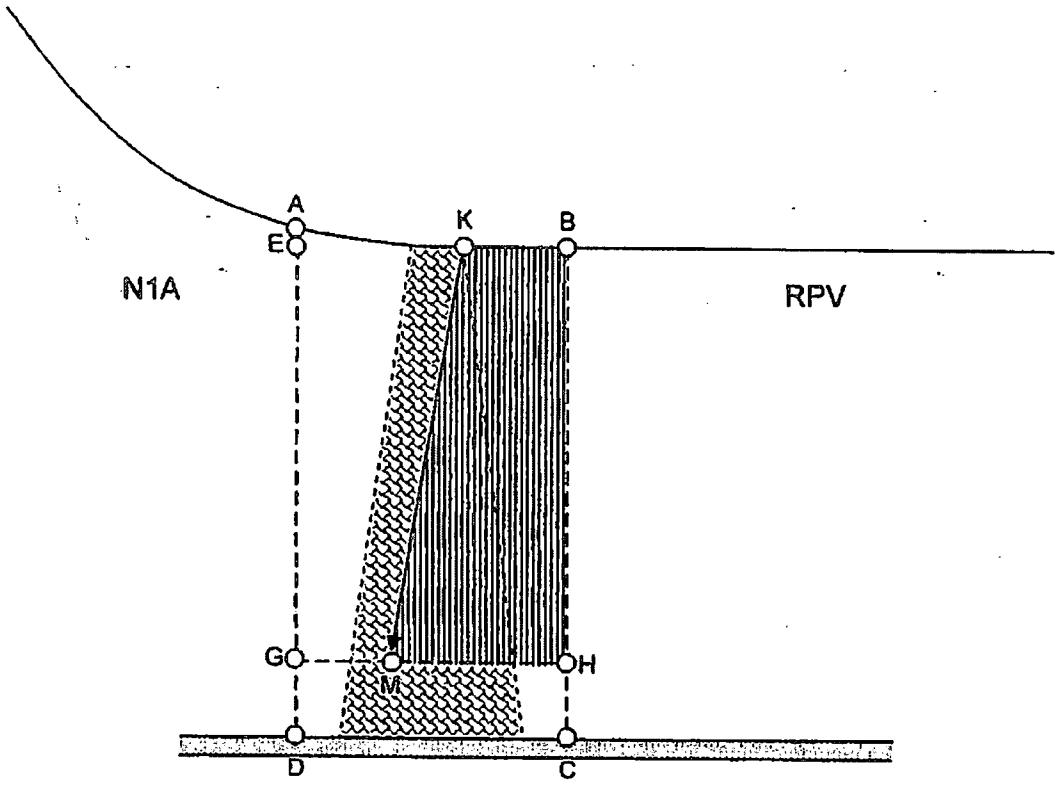
This scale is 100% in case of copier distortion

AREVA

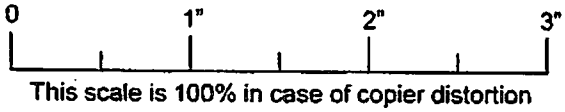
Supplemental Data Sheet

Page:	10 of 12
Component ID:	2B11-RPV-N1A
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 4
Scan: C85
Scale: 50%



Exam Area (ABCD): 16.64 in²
Examined: (KBHM)
Examined: 4.67(1.2 + 2.0)/2 = 7.47 in²



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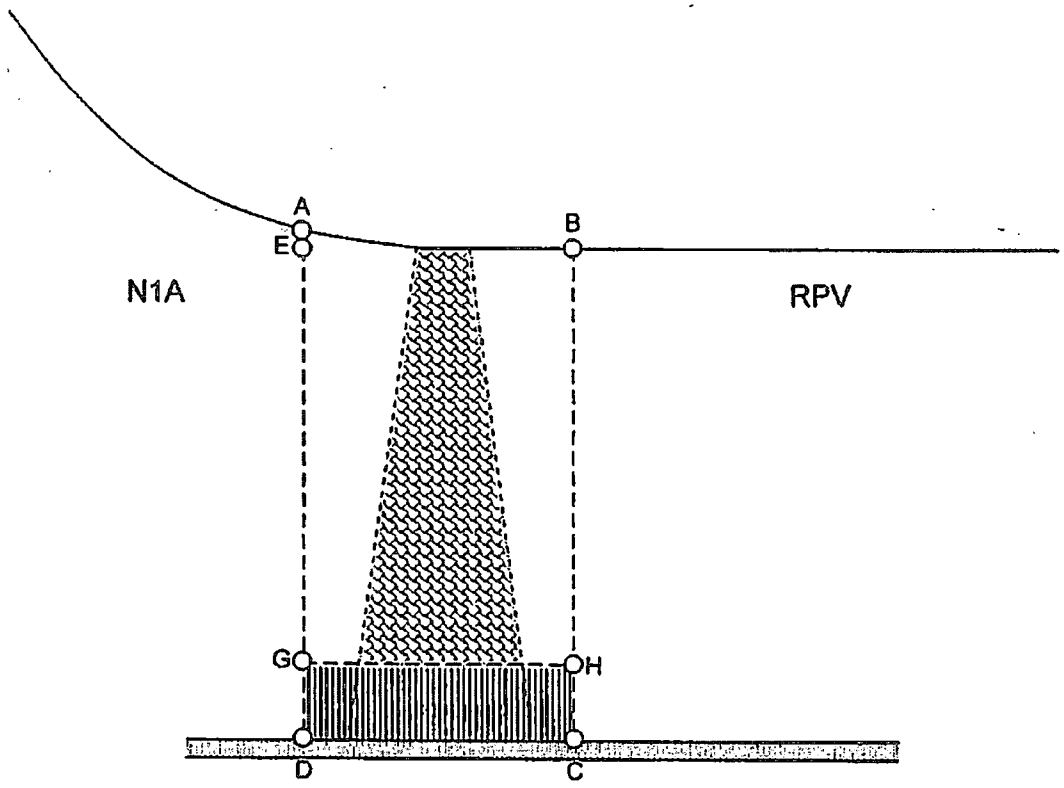
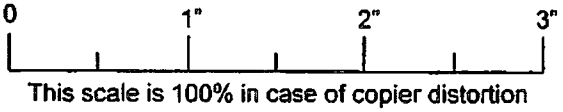
AREVA	Supplemental Data Sheet		
		Page:	11 of 12
		Component ID:	2B11-RPV-N1A
		Utility:	Duke Energy
		Site / Unit:	Brunswick / 2

Sketch: 5
Scan: C15
Scale: 50%



Exam Area (ABCD): 16.64 in²
Examined: (GHCD)
Examined: (3.0 x 0.83) = 2.49 in²



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AREVA

Supplemental Data Sheet

Component ID: 2B11-RPV-N1A
Utility: Duke Energy
Site / Unit: Brunswick / 2

ASME Code Coverage Calculation

Component Information
Exam Area: 16.64 in²
Exam Length: 197.7"

Scan	Description
R100:	60° Radial Exam
C85:	60° Circ Exam / Outer 85%
C15:	50° Circ Exam / Inner 15%

See Sketch	Scan	Area Examined		Exam Area		Length Examined		Exam Length		Percent Coverage
3	R100	(15.51	/	16.64	) x (	197.7	/	197.7	) x 100 =	93.21%
4	C85	(7.47	/	16.64	) x (	197.7	/	197.7	) x 100 =	44.89%
5	C15	(2.49	/	16.64	) x (	197.7	/	197.7	) x 100 =	14.96%
		(	/	~	) x (		/	~	) x 100 =	~
		(	/	~	) x (		/	~	) x 100 =	~
									Total Percent:	153.06%
									Code Examination Coverage (Total Percent / 2 Sound Beams):	76.5%

Reference the following for Nozzle Dimensions
Contract No.: 68-2471 / 72, Dwg. No.: 27 Rev 16
Note: 100% radial & circumferential coverage obtained in the lower 15% of exam volume.

Personnel	Name	Signature	Level	Date
Prepared By:	Simon Crothers	Simon Crothers	II	03/27/17
Reviewed By:	David K. Zimmerman	David K. Zimmerman	III	03/27/2017
Site Review:	NED FINNEY	[signature]	III	3/27/2017

Ultrasonic Examination

Site/Unit:	BNP / 2	Procedure:	54-ISI-805-009	Outage No.:	B223R1
Summary No.:	2-B11-1080	Procedure Rev.:	009	Report No.:	VEN-17-011
Workscope:	ISI	Work Order No.:	20082951	Page:	1 of 1

Code: ASME XI, 2001 Ed., 03 Ad. Cat./Item: B-D/B3.90 Location: DW

Drawing No.: C-02404 Sht. 001-1 Description: NOZZLE N1B TO REACTOR VESSEL WELD

System ID: 1005

Component ID: 2B11-RPV-N1B Size/Length: N/A Thickness/Diameter: N/A

Limitations: Yes - Component configuration

Comments:

Reference BNP Unit 2 Areva final report document # 180-9269913-000 for personnel certifications and equipment certifications.

Detection of flaw indications at the inner 15% t (measured from the clad to base metal interface) of nozzle-to-vessel welds when scanning parallel to the weld axis was performed utilizing 54-ISI-850-008 with SDCN 30-9269636-000.

Results: Sat ☑ Unsat ☐ Eval ☐

Percent Of Coverage Obtained > 90%: No - 76.5% Reviewed Previous Data: Yes

Examiner	Level	Signature	Date	Reviewer	Signature	Date
N/A			3/26/2017	Zimmerman, David Lvl III		3/28/2017
Examiner	Level N/A	Signature	Date	Site Review	Signature	Date
N/A				Finney, Ned Lvl III		3/28/2017
Other	Level N/A	Signature	Date	ANII Review	Signature	Date
N/A				Reynolds, David		3/28/2017

AREVA

Ultrasonic Examination Summary Sheet

Summary No.:	2-B11-1080
Work Order:	2008295114
Component ID:	2B11-RPV-N1B
System:	RPV
Material:	CS (Clad)
Description:	RPV Nozzle to Shell Weld
EPRI Model No.:	IR-2017-680

Customer:	Duke Energy			Code Category:	B-D		
Site:	BNS	Unit:	1	Code Item:	B3.90		
Outage:	B223R1			Code Class:	1		
ISO / Drawing(s):	C-02404 -1-1						

Procedure Number	Procedure Revision	SDCN	Procedure Title
54-ISI-850	008	30-9269636-000	Manual Ultrasonic Examination of BWR Reactor Vessel Nozzle Inner Radius Regions and Nozzle to Shell Welds (inner 15%)
54-ISI-805	009	N/A	PDI Generic Procedure for Ultrasonic Examination of Reactor Pressure Vessel Welds PDI-UT-6

Calibration Sheets		Exam Data Sheets	Indication Data Sheets	Indication Plot Sheets	Coverage Worksheet	Coverage Diagram	Exam Results
CS-01		EDS-01	N/A	N/A	Yes	Yes	Acceptable
CS-02		EDS-02					
CS-03							

Summary:

Manual ultrasonic examinations were performed on the referenced weld during B223R1.

In accordance with UT Procedure 54-ISI-805-009, 60° Longitudinal wave examinations were performed from the vessel surface in both the radial and circumferential scan directions.

In accordance with UT Procedure 54-ISI-850-008 and the referenced EPRI model the following examinations were performed.

Recirculation Outlet Nozzle (N1) Nozzle Modeling Parameters		
Probe	Probe Skew	Scan Surface
50° Shear	± (59° to 82°)	Vessel

76.5% coverage of the required examination volume was obtained. The percentage of coverage for this examination was calculated to the maximum extent possible allowed by the procedure qualification and actual component field conditions for this configuration.

This examination was performed using the alternative examination volume defined in code case N-613-1 which reduces the area to be examined per IWB-2500-7 to the weld plus ½" on each side.

This examination satisfies the requirements of ASME Sec. XI 2001 Edition with 2003 Addenda for Category B-D, item number B3.90, figure number IWB 2500-7 (b) exam volume, and was performed using ASME Sec XI, Appendix VIII qualified personnel, procedures, and equipment.

Personnel	Name	Signature	Level	Date
Prepared By:	Wade Holloway	Wade Holloway	III	03/26/2017
AREVA Review:	David Zimmerman	David K. Z	III	03/28/2017
Customer:	Ned Finney	Ned Finney	III	3/28/17
ANII:	David M. Reynolds	David M. Reynolds	N/A	3/28/2017

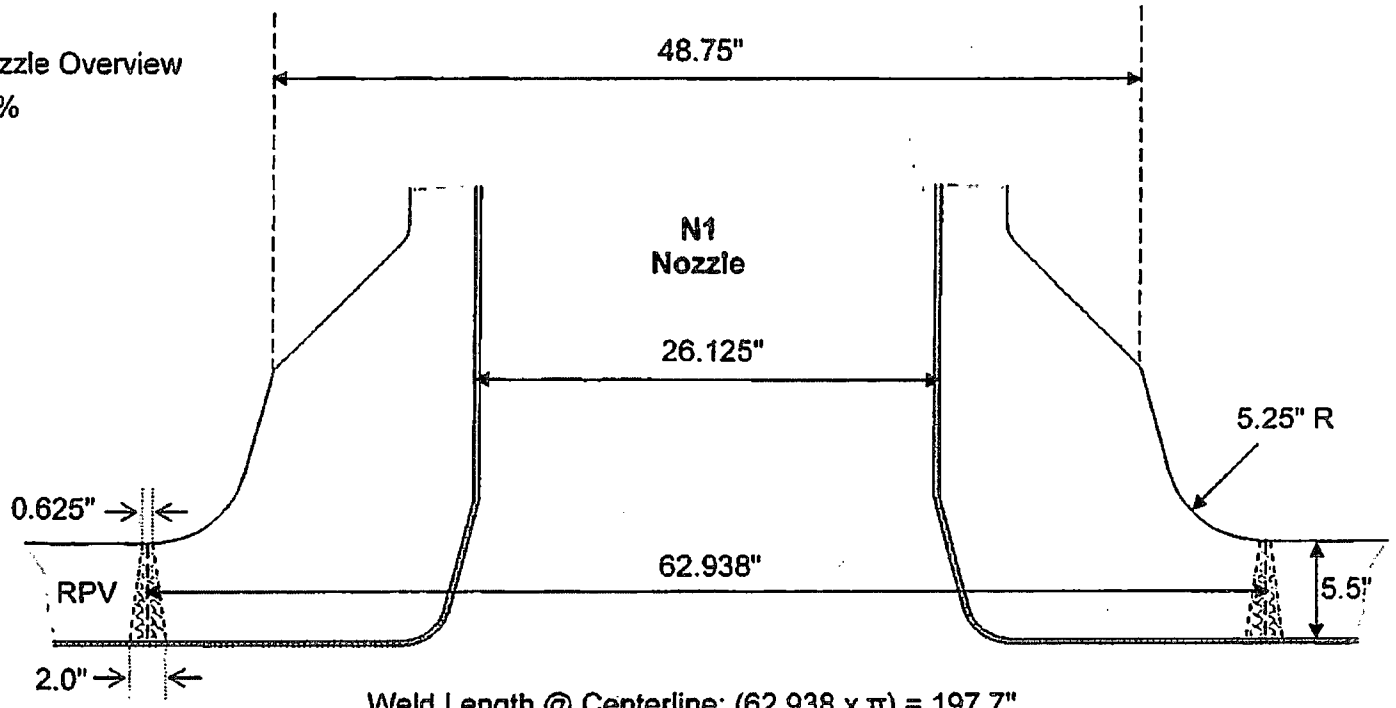
Page 1 of 12

AREVA

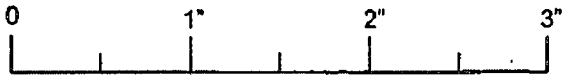
Supplemental Data Sheet

Page:	7 of 12
Component ID:	2B11-RPV-N1B
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 1
Subject: Nozzle Overview
Scale: 10%



Weld Length @ Centerline: (62.938 x π) = 197.7"



This scale is 100% in case of copier distortion

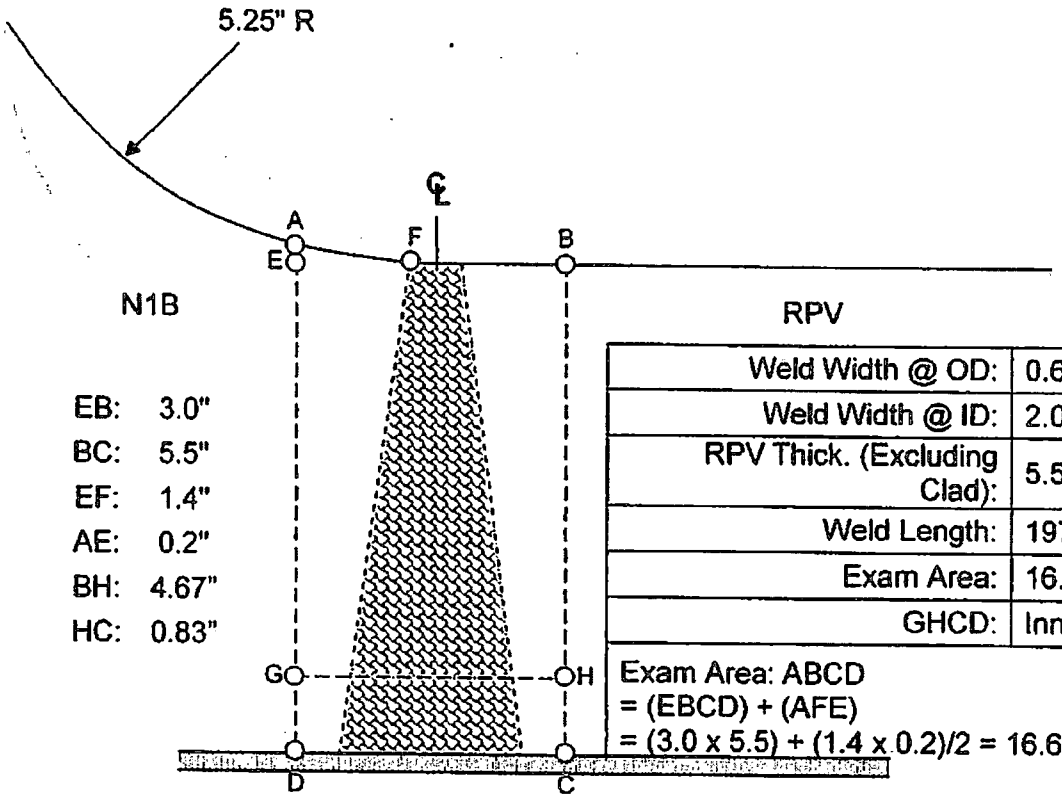
AREVA

Supplemental Data Sheet

Page:	8 of 12
Component ID:	2B11-RPV-N1B
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 2
Subject: Dimensions & Weld fit up
Scale: 50%

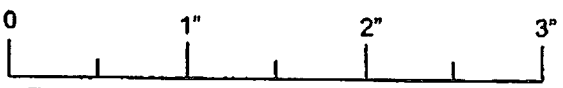
Scan	Description
R100:	60° Radial Exam
C85:	60° Circ Exam / Outer 85%
C15:	50° Circ Exam / Inner 15%



Weld Width @ OD:	0.625"
Weld Width @ ID:	2.0"
RPV Thick. (Excluding Clad):	5.5"
Weld Length:	197.7" @ CL
Exam Area:	16.64 in²
GHCD:	Inner 15%

Exam Area: ABCD
= (EBCD) + (AFE)
= (3.0 x 5.5) + (1.4 x 0.2)/2 = 16.64 in²

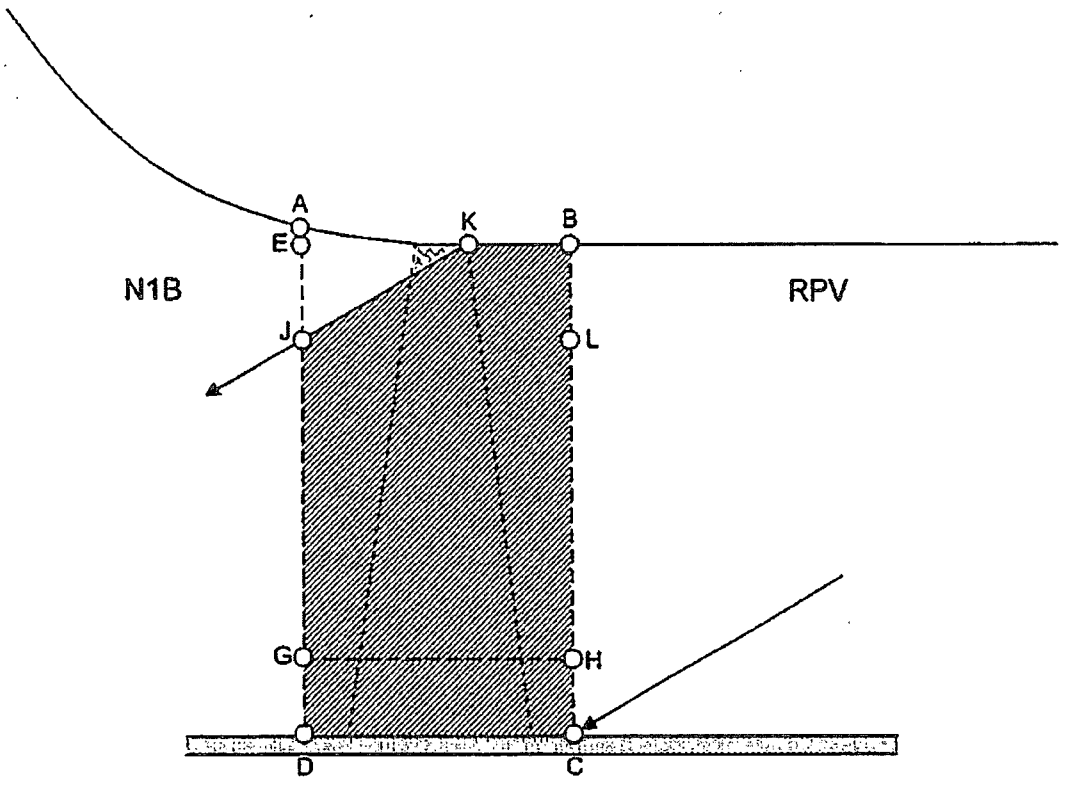
Note: Exam area extends to ½" beyond weld per code case N-613-1



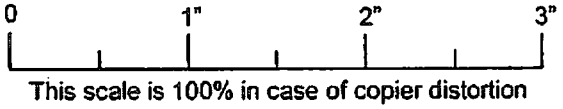
This scale is 100% in case of copier distortion

AREVA	Supplemental Data Sheet		
		Page:	9 of 12
		Component ID:	2B11-RPV-N1B
		Utility:	Duke Energy
		Site / Unit:	Brunswick / 2

Sketch: 3
Scan: R100
Scale: 50%



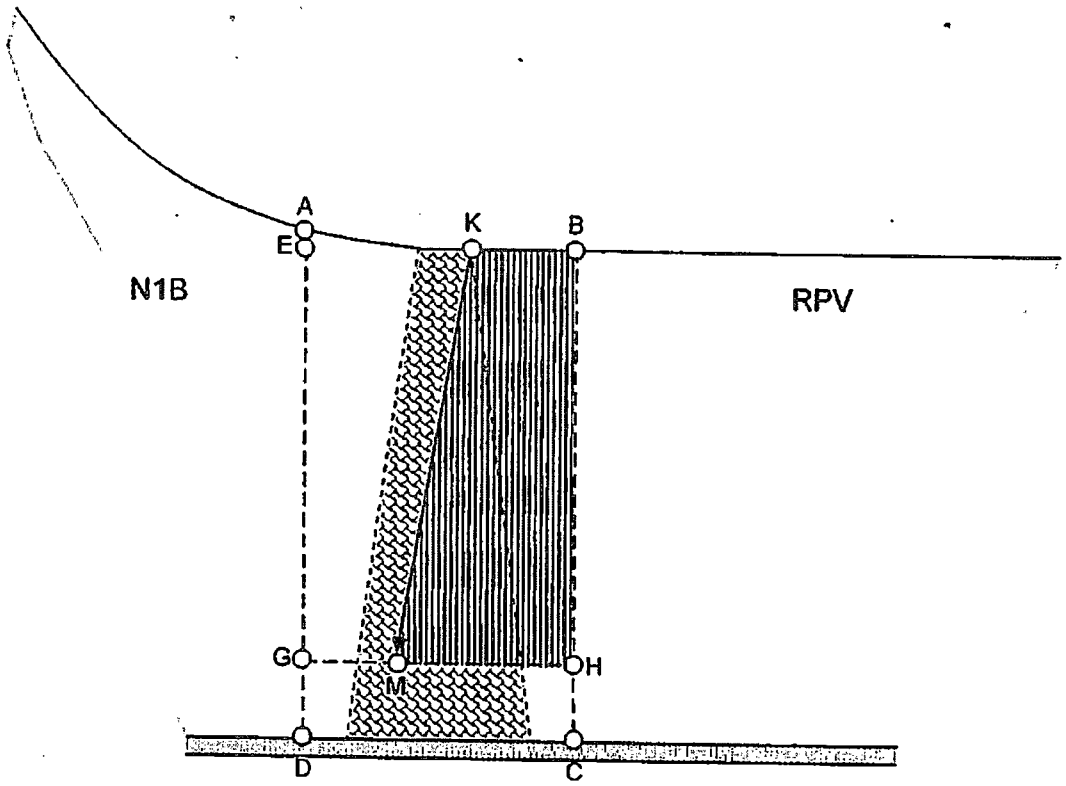
Exam Area (ABCD): 16.64 in²
Examined: (KBLJ) + (JLCD)
Examined: 1.1(1.2 + 3.0)/2 + (3.0 x 4.4) = 15.51 in²



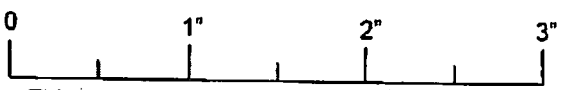
This scale is 100% in case of copier distortion

AREVA	Supplemental Data Sheet	Page: 10 of 12
		Component ID: 2B11-RPV-N1B
		Utility: Duke Energy
		Site / Unit: Brunswick / 2

Sketch: 4
Scan: C85
Scale: 50%



Exam Area (ABCD): 16.64 in²
Examined: (KBHM)
Examined: 4.67(1.2 + 2.0)/2 = 7.47 in²



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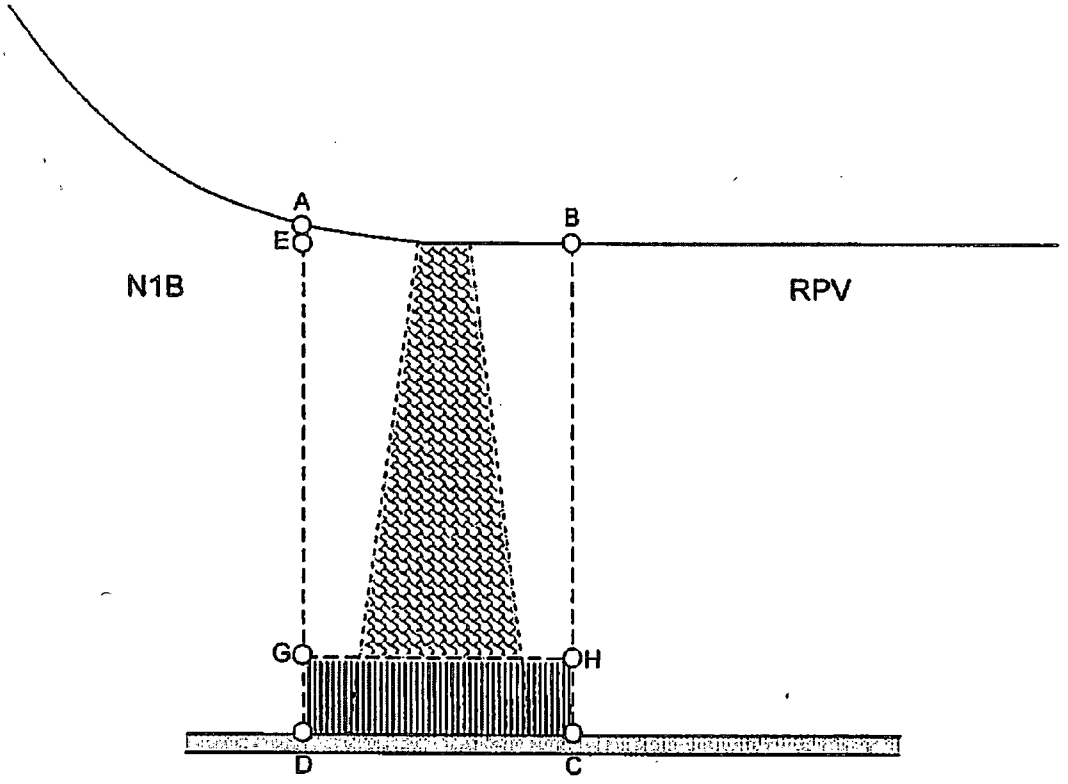
AREVA

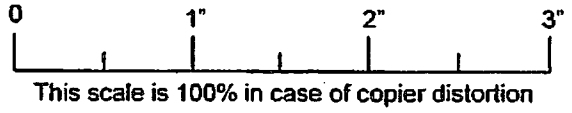
Supplemental Data Sheet

Page:	11 of 12
Component ID:	2B11-RPV-N1B
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 5
Scan: C15
Scale: 50%



Exam Area (ABCD): 16.64 in²
Examined: (GHCD)
Examined: (3.0 x 0.83) = 2.49 in²



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AREVA

Supplemental Data Sheet

Component ID: 2B11-RPV-N1B
Utility: Duke Energy
Site / Unit: Brunswick / 2

ASME Code Coverage Calculation

Component Information
Exam Area: 16.64 in²
Exam Length: 197.7"

Scan	Description
R100:	60° Radial Exam
C85:	60° Circ Exam / Outer 85%
C15:	50° Circ Exam / Inner 15%

See Sketch	Scan	Area Examined		Exam Area		Length Examined		Exam Length		Percent Coverage
3	R100	(15.51	/	16.64	) x (	197.7	/	197.7	) x 100 =	93.21%
4	C85	(7.47	/	16.64	) x (	197.7	/	197.7	) x 100 =	44.89%
5	C15	(2.49	/	16.64	) x (	197.7	/	197.7	) x 100 =	14.96%
		(	/	~	) x (		/	~	) x 100 =	~
		(	/	~	) x (		/	~	) x 100 =	~
									Total Percent:	153.06%
									Code Examination Coverage (Total Percent / 2 Sound Beams):	76.5%

Reference the following for Nozzle Dimensions
Contract No.: 68-2471 / 72, Dwg. No.: 27 Rev 16
Note: 100% radial & circumferential coverage obtained in the lower 15% of exam volume.

Personnel	Name	Signature	Level	Date
Prepared By:	Simon Crothers	Simon Crothers	II	03/27/17
Reviewed By:	David K. Zimmerman	David K. Zimmerman	III	03/27/2017
Site Review:	NED FINNEY	[signature]	III	3/28/17

Ultrasonic Examination

Site/Unit:	BNP / 2	Procedure:	54-ISI-805-009	Outage No.:	B223R1
Summary No.:	2-B11-1084	Procedure Rev.:	009	Report No.:	VEN-17-012
Workscope:	ISI	Work Order No.:	20082951	Page:	1 of 1

Code: ASME XI, 2001 Ed., 03 Ad. Cat./Item: B-D/B3.90 Location: DW

Drawing No.: C-02404 Sht. 001-1 Description: NOZZLE N2B TO REACTOR VESSEL WELD

System ID: 1005

Component ID: 2B11-RPV-N2B Size/Length: N/A Thickness/Diameter: N/A

Limitations: Yes - Component configuration

Comments:

Reference BNP Unit 2 Areva final report document # 180-9269913-000 for personnel certifications and equipment certifications.

Detection of flaw indications at the inner 15% t (measured from the clad to base metal interface) of nozzle-to-vessel welds when scanning parallel to the weld axis was performed utilizing 54-ISI-850-008 with SDCN 30-9269636-000.

Results: Sat ☑ Unsat ☐ Eval ☐

Percent Of Coverage Obtained > 90%: No - 72.8% Reviewed Previous Data: Yes

Examiner	Level	Signature	Date	Reviewer	Signature	Date
N/A			3/22/2017	Zimmerman, David Lvl III		3/27/2017
Examiner	Level N/A	Signature	Date	Site Review	Signature	Date
N/A				Finney, Ned Lvl III		3/27/2017
Other	Level N/A	Signature	Date	ANII Review	Signature	Date
N/A				Reynolds, David		3/27/2017

AREVA

Ultrasonic Examination Summary Sheet

Summary No.:	2-B11-1084				
Work Order:	2008295124				
Component ID:	2B11-RPV-N2B				
Customer:	Duke Energy		Code Category:	B-D	
Site:	BNS	Unit: 2	Code Item:	B3.90	
Outage:	B223R1		Code Class:	1	
System:	RPV				
Material:	CS (Clad)				
Description:	RPV Nozzle to Shell Weld				
ISO / Drawing(s):	C-02404-1-1				
EPRI Model No.:	IR-2017-680				

Procedure Number	Procedure Revision	SDCN	Procedure Title
54-ISI-850	008	30-9269636-000	Manual Ultrasonic Examination of BWR Reactor Vessel Nozzle Inner Radius Regions and Nozzle to Shell Welds (inner 15%)
54-ISI-805	009	N/A	PDI Generic Procedure for Ultrasonic Examination of Reactor Pressure Vessel Welds PDI-UT-6

Calibration Sheets		Exam Data Sheets	Indication Data Sheets	Indication Plot Sheets	Coverage Worksheet/Diagrams		Exam Results
CS-01		EDS-01	N/A	N/A	Yes	Yes	Acceptable
CS-02		EDS-02					
CS-03							

Summary:

Manual ultrasonic examinations were performed on the referenced weld during B223R1.

In accordance with UT Procedure 54-ISI-805-009, 60° Longitudinal wave examinations were performed from the vessel surface in both the radial and circumferential scan directions.

In accordance with UT Procedure 54-ISI-850-008 and the referenced EPRI model the following examinations were performed.

Recirculation Inlet Nozzle (N2B) Nozzle Modeling Parameters		
Probe	Probe Skew	Scan Surface
50° Shear	± (51° to 76°)	Vessel

72.8% coverage of the required examination volume was obtained. The percentage of coverage for this examination was calculated to the maximum extent possible allowed by the procedure qualification and actual component field conditions for this configuration.

This examination was performed using the alternative examination volume defined in code case N-613-1 which reduces the area to be examined per IWB-2500-7 to the weld plus ½" on each side.

This examination satisfies the requirements of ASME Sec. XI 2001 Edition with 2003 Addenda for Category B-D, item number B3.90, figure number IWB 2500-7 (b) exam volume, and was performed using ASME Sec XI, Appendix VIII qualified personnel, procedures, and equipment.

Personnel	Name	Signature	Level	Date
Prepared By:	George Chapman		III	03/22/2017
Prepared By:	John Gatica		II	03/22/2017
AREVA Review:	David Zimmerman		III	03/27/2017
Customer:	Ned Finney		III	3/27/2017
ANII:	DAVID M. REYNOLDS		N/A	3/27/2017

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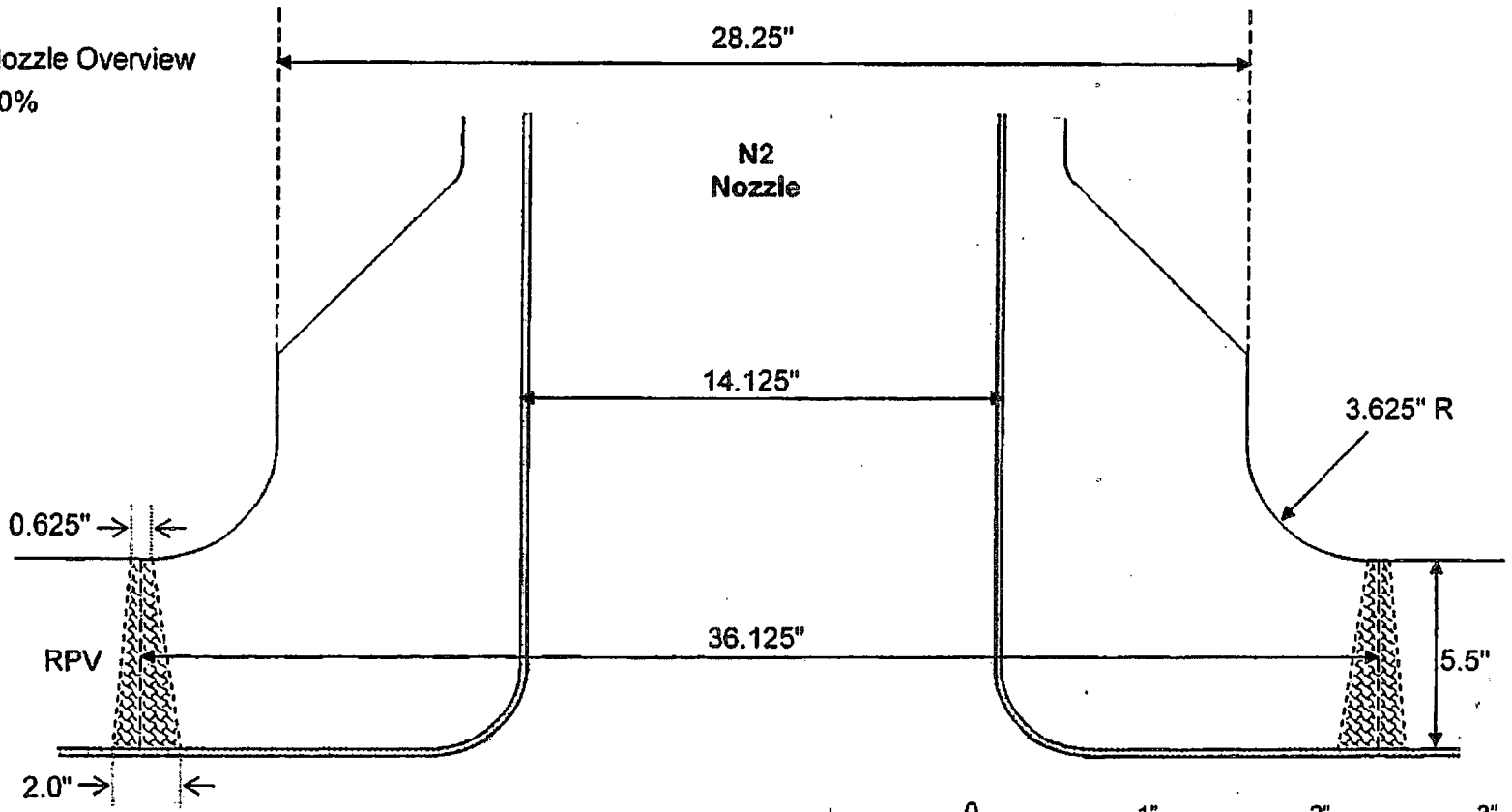
AREVA

Supplemental Data Sheet

Page:	7 of 12
Component ID:	2B11-RPV-N2B
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 1
Subject: Nozzle Overview
Scale: 20%



Weld Length @ Centerline: (36.125 x π) = 113.5"

This scale is 100% in case of copier distortion

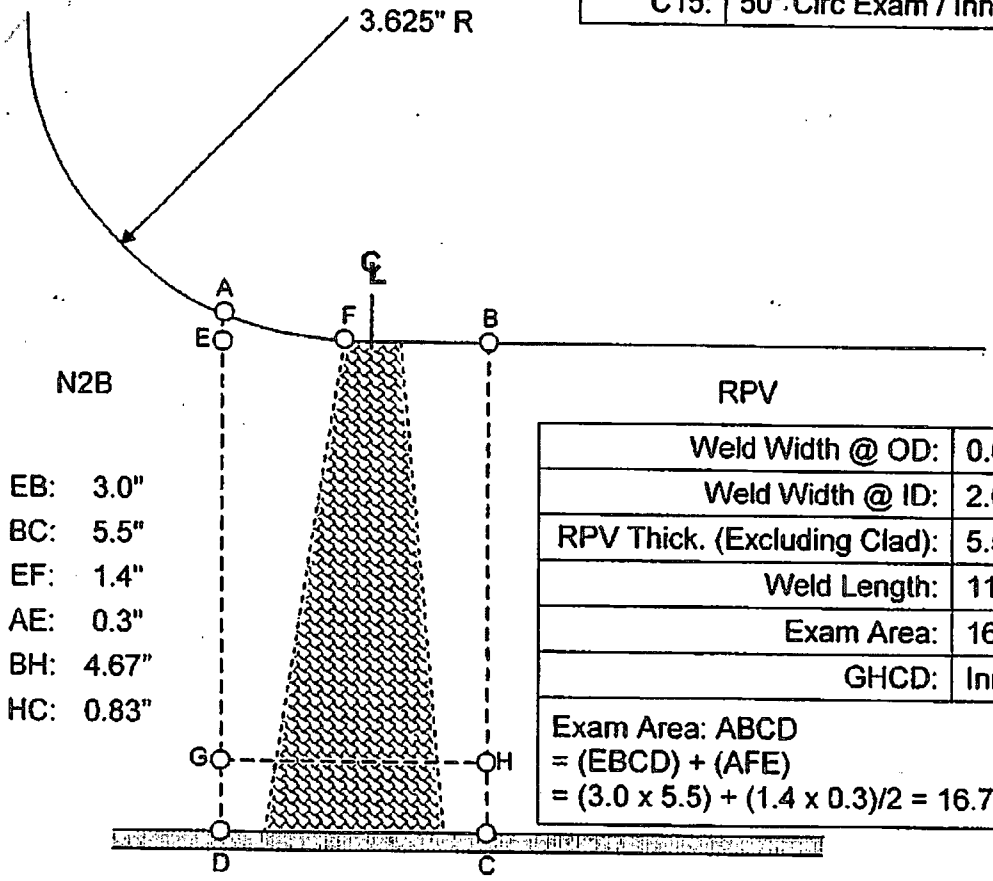
AREVA

Supplemental Data Sheet

Page:	8 of 12
Component ID:	2B11-RPV-N2B
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 2
Subject: Dimensions & Weld fit up
Scale: 50%

Scan	Description
R100:	60° Radial Exam
C85:	60° Circ Exam / Outer 85%
C15:	50° Circ Exam / Inner 15%

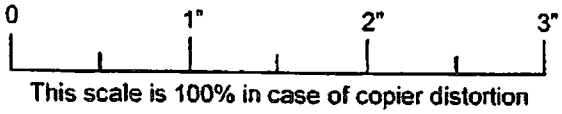


EB: 3.0"
BC: 5.5"
EF: 1.4"
AE: 0.3"
BH: 4.67"
HC: 0.83"

Weld Width @ OD:	0.625"
Weld Width @ ID:	2.0"
RPV Thick. (Excluding Clad):	5.5"
Weld Length:	113.5" @ CL
Exam Area:	16.71 in²
GHCD:	Inner 15%

Exam Area: ABCD
= (EBCD) + (AFE)
= (3.0 x 5.5) + (1.4 x 0.3)/2 = 16.71 in²

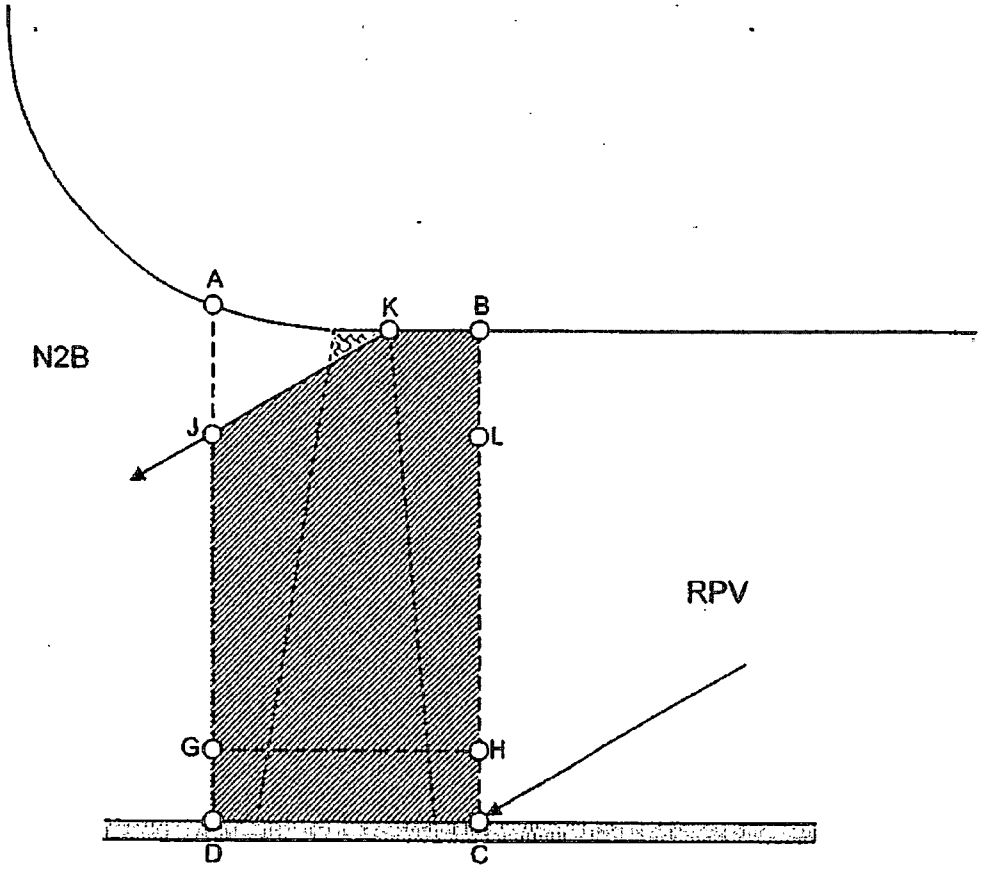
Note: Exam area extends to ½" beyond weld per code case N-613-1



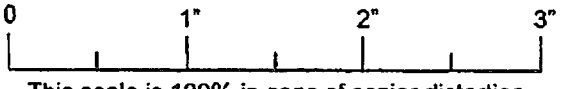
This scale is 100% in case of copier distortion

AREVA	Supplemental Data Sheet	Page: 9 of 12
		Component ID: 2B11-RPV-N2B
		Utility: Duke Energy
		Site / Unit: Brunswick / 2

Sketch: 3
Scan: R100
Scale: 50%



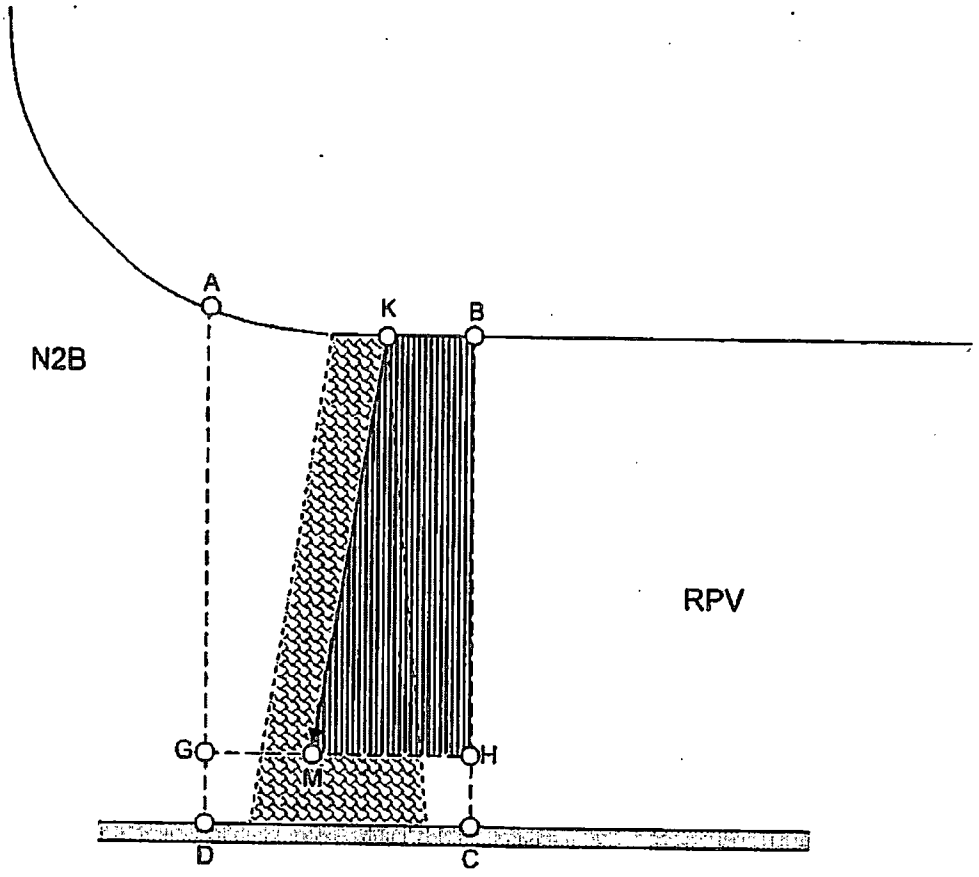
Exam Area (ABCD): 16.71 in²
Examined: (KBLJ) + (JLCD)
Examined: 1.2(1.0 + 3.0)/2 + (3.0 x 4.3) = 15.30 in²



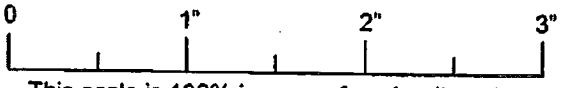
This scale is 100% in case of copier distortion

AREVA	Supplemental Data Sheet	Page:	10 of 12
		Component ID:	2B11-RPV-N2B
		Utility:	Duke Energy
		Site / Unit:	Brunswick / 2

Sketch: 4
Scan: C85
Scale: 50%



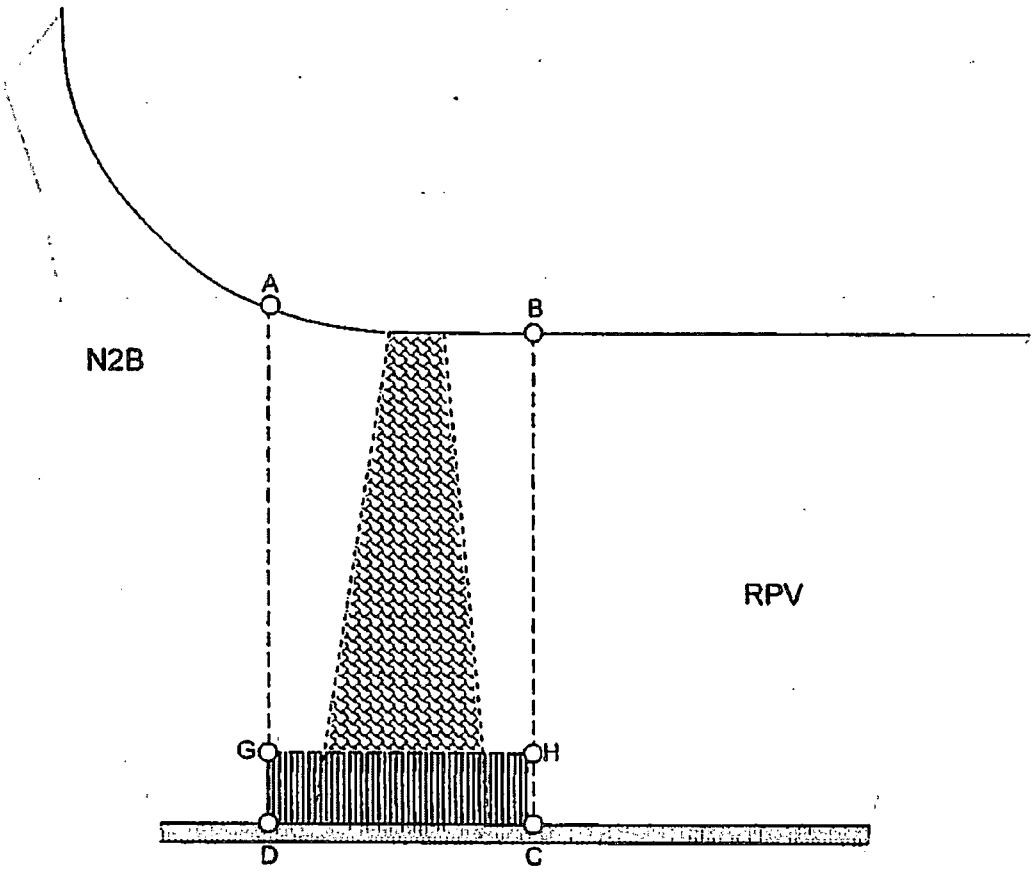
Exam Area (ABCD): 16.71 in²
Examined: (KBHM)
Examined: 4.67(1.0 + 1.8)/2 = 6.54 in²



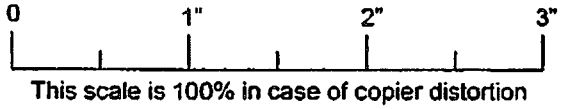
This scale is 100% in case of copier distortion

AREVA	Supplemental Data Sheet		
		Page:	11 of 12
		Component ID:	2B11-RPV-N2B
		Utility:	Duke Energy
		Site / Unit:	Brunswick / 2

Sketch: 5
Scan: C15
Scale: 50%



Exam Area (ABCD): 16.71 in²
Examined: (GHCD)
Examined: (3.0 x 0.83) = 2.49 in²



This scale is 100% in case of copier distortion

AREVA

Supplemental Data Sheet

Component ID: 2B11-RPV-N2B
Utility: Duke Energy
Site / Unit: Brunswick / 2

ASME Code Coverage Calculation

Component Information
Exam Area: 16.71 in²
Exam Length: 113.5"

Scan	Description
R100:	60° Radial Exam
C85:	60° Circ Exam / Outer 85%
C15:	50° Circ Exam / Inner 15%

See Sketch	Scan	Area Examined		Exam Area		Length Examined		Exam Length		Percent Coverage
3	R100	(15.30	/	16.71	) x (	113.5	/	113.5	) x 100 =	91.56%
4	C85	(6.54	/	16.71	) x (	113.5	/	113.5	) x 100 =	39.14%
5	C15	(2.49	/	16.71	) x (	113.5	/	113.5	) x 100 =	14.90%
		(	/	~	) x (		/	~	) x 100 =	~
		(	/	~	) x (		/	~	) x 100 =	~
									Total Percent:	145.60%
									Code Examination Coverage (Total Percent / 2 Sound Beams):	72.8%

Reference the following for Nozzle Dimensions
Contract No.: 68-2471 / 72, Dwg. No.: 28 Rev 19
Note: 100% radial & circumferential coverage obtained in the lower 15% of exam volume.

Personnel	Name	Signature	Level	Date
Prepared By:	Simon Crothers	Simon Crothers	II	03/27/17
Reviewed By:	David K. Zimmerman	David K. Zimmerman	III	03/27/2017
Site Review:	NED FENNEY		III	3/27/2017

Ultrasonic Examination

Site/Unit:	BNP / 2	Procedure:	54-ISI-805-009	Outage No.:	B223R1
Summary No.:	2-B11-1086	Procedure Rev.:	009	Report No.:	VEN-17-014
Workscope:	ISI	Work Order No.:	20082951	Page:	1 of 1

Code: ASME XI, 2001 Ed., 03 Ad. Cat./Item: B-D/B3.90 Location: DW

Drawing No.: C-02404 Sht. 001-1 Description: NOZZLE N2C TO REACTOR VESSEL WELD

System ID: 1005

Component ID: 2B11-RPV-N2C Size/Length: N/A Thickness/Diameter: N/A

Limitations: Yes - Component configuration

Comments:

Reference BNP Unit 2 Areva final report document # 180-9269913-000 for personnel certifications and equipment certifications.

Detection of flaw indications at the inner 15% t (measured from the clad to base metal interface) of nozzle-to-vessel welds when scanning parallel to the weld axis was performed utilizing 54-ISI-850-008 with SDCN 30-9269636-000.

Results: Sat ☑ Unsat ☐ Eval ☐

Percent Of Coverage Obtained > 90%: No - 72.8% Reviewed Previous Data: Yes

Examiner	Level	Signature	Date	Reviewer	Signature	Date
N/A			3/22/2017	Zimmerman, David Lvl III		3/27/2017
Examiner	Level N/A	Signature	Date	Site Review	Signature	Date
N/A				Finney, Ned Lvl III		3/27/2017
Other	Level N/A	Signature	Date	ANII Review	Signature	Date
N/A				Reynolds, David		3/27/2017

AREVA

Ultrasonic Examination Summary Sheet

Summary No.:	2-B11-1086
Work Order:	2008295134
Component ID:	2B11-RPV-N2C
System:	RPV
Material:	CS (Clad)
Description:	RPV Nozzle to Shell Weld
EPRI Model No.:	IR-2017-680

Customer:	Duke Energy	Code Category:	B-D
Site:	BNS Unit: 2	Code Item:	B3.90
Outage:	B223R1	Code Class:	1
ISO / Drawing(s):	C-02404-1-1		

Procedure Number	Procedure Revision	SDCN	Procedure Title
54-ISI-850	008	30-9269636-000	Manual Ultrasonic Examination of BWR Reactor Vessel Nozzle Inner Radius Regions and Nozzle to Shell Welds (inner 15%)
54-ISI-805	009	N/A	PDI Generic Procedure for Ultrasonic Examination of Reactor Pressure Vessel Welds PDI-UT-6

Calibration Sheets	Exam Data Sheets	Indication Data Sheets	Indication Plot Sheets	Coverage Worksheet	Coverage Diagram	Exam Results
CS-01	EDS-01	N/A	N/A	Yes	Yes	Acceptable
CS-02	EDS-02					
CS-03						

Summary:

Manual ultrasonic examinations were performed on the referenced weld during B223R1.

In accordance with UT Procedure 54-ISI-805-009, 60° Longitudinal wave examinations were performed from the vessel surface in both the radial and circumferential scan directions.

In accordance with UT Procedure 54-ISI-850-008 and the referenced EPRI model the following examinations were performed.

Recirculation Inlet Nozzle (N2C) Nozzle Modeling Parameters		
Probe	Probe Skew	Scan Surface
50° Shear	± (51° to 76°)	Vessel

72.8% coverage of the required examination volume was obtained. The percentage of coverage for this examination was calculated to the maximum extent possible allowed by the procedure qualification and actual component field conditions for this configuration.

This examination was performed using the alternative examination volume defined in code case N-613-1 which reduces the area to be examined per IWB-2500-7 to the weld plus ½" on each side.

This examination satisfies the requirements of ASME Sec. XI 2001 Edition with 2003 Addenda for Category B-D, item number B3.90, figure number IWB 2500-7 (b) exam volume, and was performed using ASME Sec XI, Appendix VIII qualified personnel, procedures, and equipment.

Personnel	Name	Signature	Level	Date
Prepared By:	George Chapman		III	03/22/2017
Prepared By:	John Gatica		II	03/22/2017
AREVA Review:	David Zimmerman		III	03/27/2017
Customer:	Ned Finney		III	3/27/2017
ANII:	DAVID M. REYNOLDS		N/A	3/27/2017

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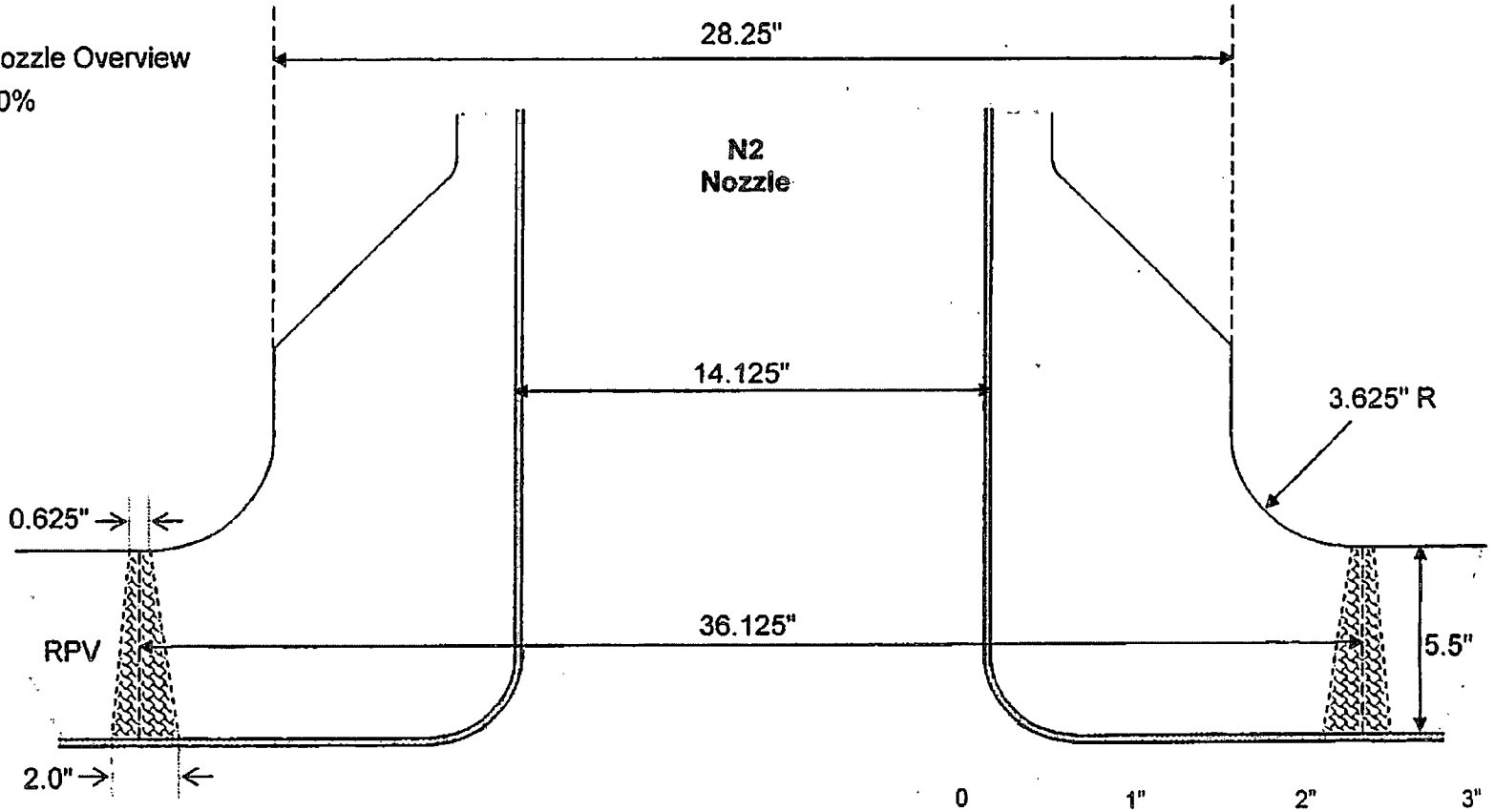
AREVA

Supplemental Data Sheet

Page:	7 of 12
Component ID:	2B11-RPV-N2C
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 1
Subject: Nozzle Overview
Scale: 20%



Weld Length @ Centerline: (36.125 x π) = 113.5"

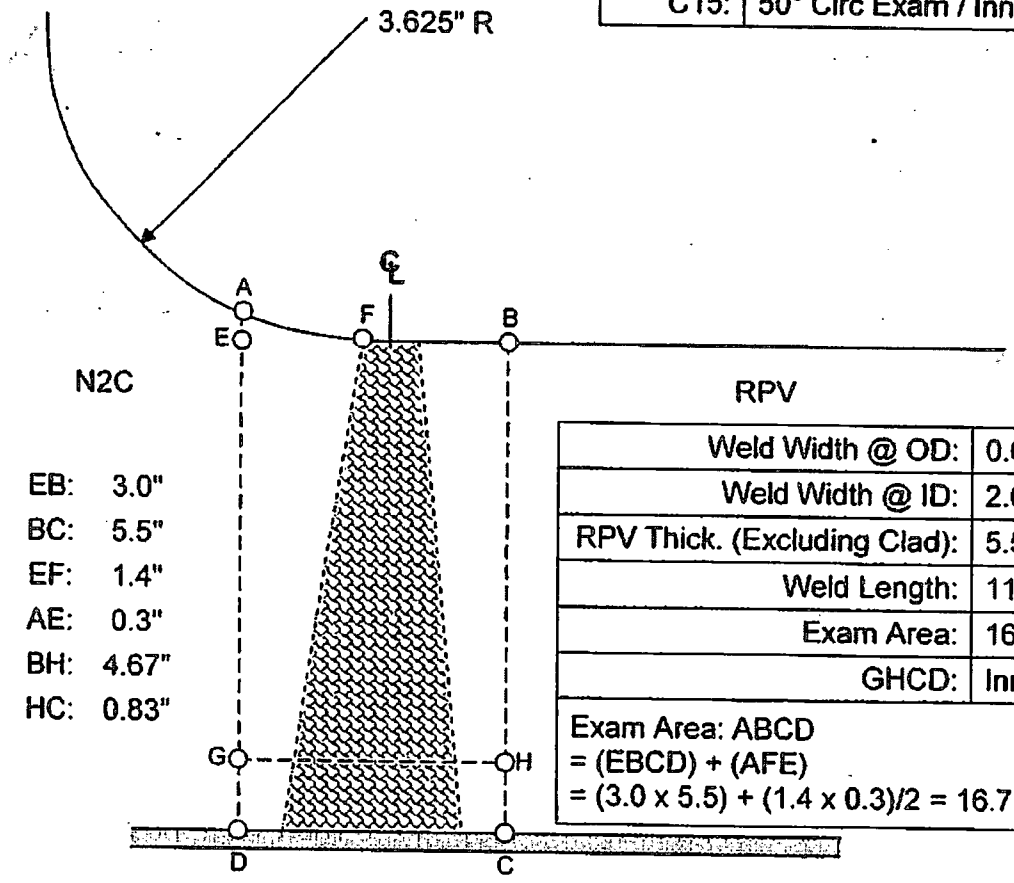
AREVA

Supplemental Data Sheet

Page:	8 of 12
Component ID:	2B11-RPV-N2C
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 2
Subject: Dimensions & Weld fit up
Scale: 50%

Scan	Description
R100:	60° Radial Exam
C85:	60° Circ Exam / Outer 85%
C15:	50° Circ Exam / Inner 15%



N2C

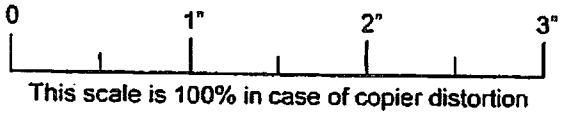
EB: 3.0"
BC: 5.5"
EF: 1.4"
AE: 0.3"
BH: 4.67"
HC: 0.83"

RPV

Weld Width @ OD:	0.625"
Weld Width @ ID:	2.0"
RPV Thick. (Excluding Clad):	5.5"
Weld Length:	113.5" @ CL
Exam Area:	16.71 in²
GHCD:	Inner 15%

Exam Area: ABCD
= (EBCD) + (AFE)
= (3.0 x 5.5) + (1.4 x 0.3)/2 = 16.71 in²

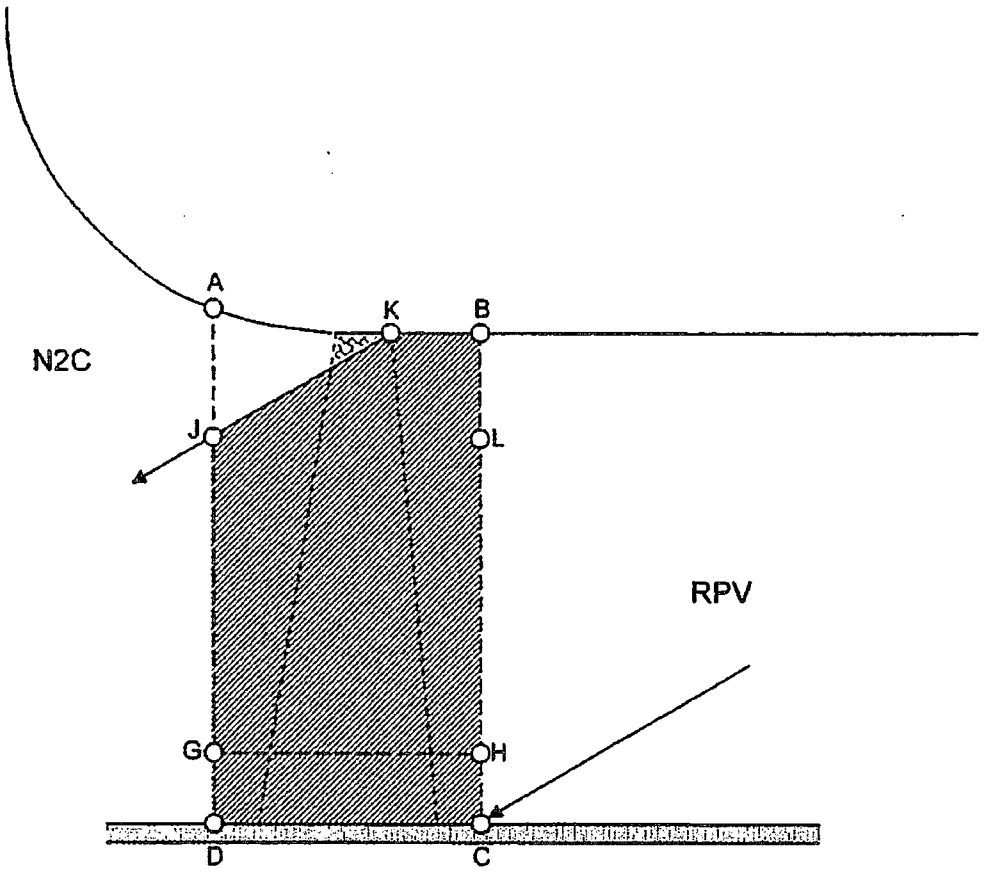
Note: Exam area extends to ½" beyond weld per code case N-613-1



This scale is 100% in case of copier distortion

AREVA	Supplemental Data Sheet	Page: 9 of 12
		Component ID: 2B11-RPV-N2C
		Utility: Duke Energy
		Site / Unit: Brunswick / 2

Sketch: 3
Scan: R100
Scale: 50%



Exam Area (ABCD): 16.71 in²
Examined: (KBLJ) + (JLCD)
Examined: 1.2(1.0 + 3.0)/2 + (3.0 x 4.3) = 15.30 in²

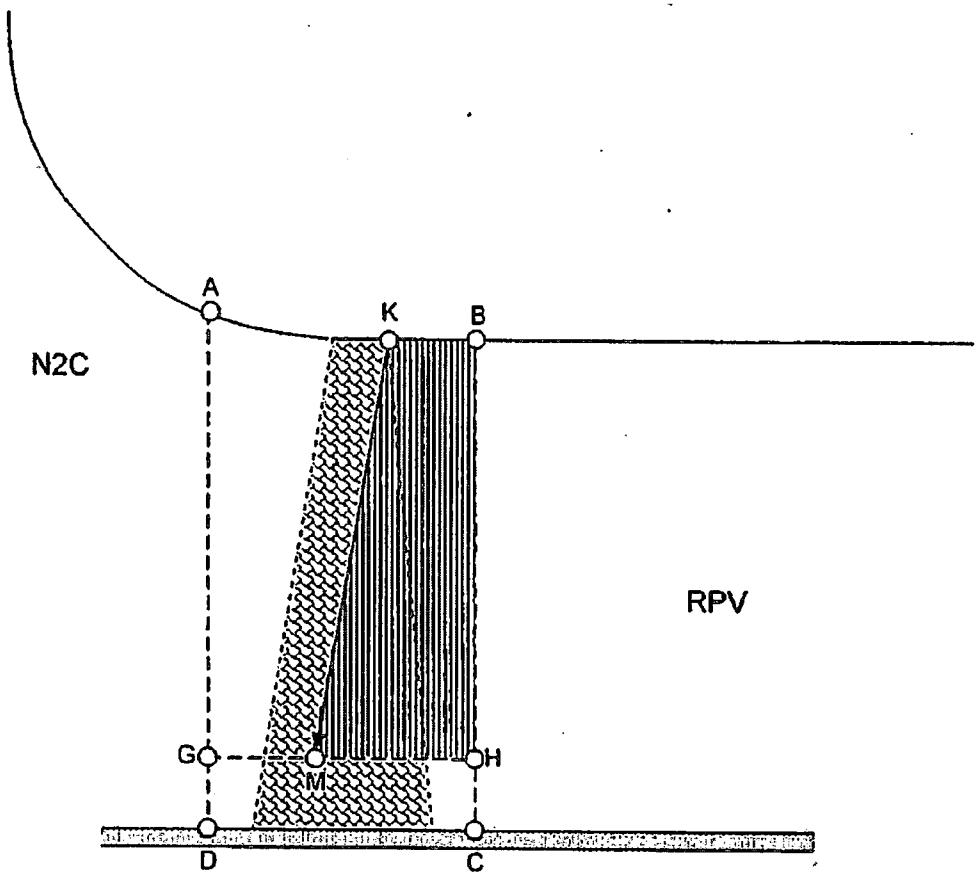
This scale is 100% in case of copier distortion

AREVA

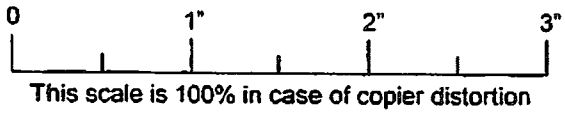
Supplemental Data Sheet

Page:	10 of 12
Component ID:	2B11-RPV-N2C
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 4
Scan: C85
Scale: 50%



Exam Area (ABCD): 16.71 in²
Examined: (KBHM)
Examined: 4.67(1.0 + 1.8)/2 = 6.54 in²



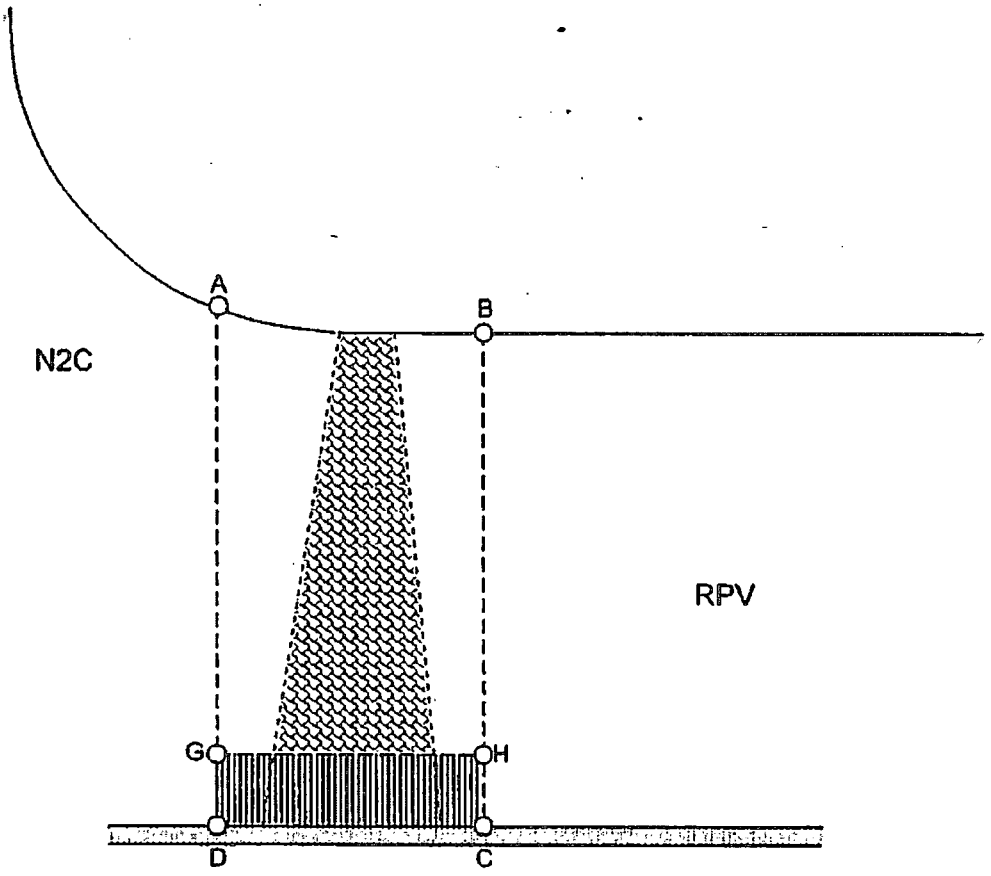
This scale is 100% in case of copier distortion

AREVA

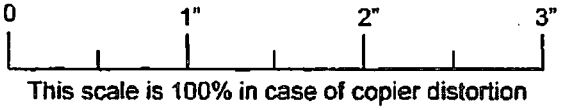
Supplemental Data Sheet

Page:	11 of 12
Component ID:	2B11-RPV-N2C
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 5
Scan: C15
Scale: 50%



Exam Area (ABCD): 16.71 in²
Examined: (GHCD)
Examined: (3.0 x 0.83) = 2.49 in²



This scale is 100% in case of copier distortion

AREVA

Supplemental Data Sheet

Page: 12 of 12
Component ID: 2B11-RPV-N2C
Utility: Duke Energy
Site / Unit: Brunswick / 2

ASME Code Coverage Calculation

Component Information
Exam Area: 16.71 in²
Exam Length: 113.5"

Scan	Description
R100:	60° Radial Exam
C85:	60° Circ Exam / Outer 85%
C15:	50° Circ Exam / Inner 15%

See Sketch	Scan	Area Examined	/	Exam Area		Length Examined	/	Exam Length		Percent Coverage
3	R100	(15.30	/	16.71	) x (	113.5	/	113.5	) x 100 =	91.56%
4	C85	(6.54	/	16.71	) x (	113.5	/	113.5	) x 100 =	39.14%
5	C15	(2.49	/	16.71	) x (	113.5	/	113.5	) x 100 =	14.90%
		(	/	~	) x (		/	~	) x 100 =	~
		(	/	~	) x (		/	~	) x 100 =	~
									Total Percent:	145.60%
									Code Examination Coverage (Total Percent / 2 Sound Beams):	72.8%

Reference the following for Nozzle Dimensions
Contract No.: 68-2471 / 72, Dwg. No.: 28 Rev 19
Note: 100% radial & circumferential coverage obtained in the lower 15% of exam volume.

Personnel	Name	Signature	Level	Date
Prepared By:	Simon Crothers	Simon Crothers	II	03/27/17
Reviewed By:	David K. Zimmerman	David K Z	III	03/27/2017
Site Review:	NED FINNEY	Ned Finney	III	3-27-17

Ultrasonic Examination

Site/Unit:	BNP / 2	Procedure:	54-ISI-805-009	Outage No.:	B223R1
Summary No.:	2-B11-1088	Procedure Rev.:	009	Report No.:	VEN-17-015
Workscope:	ISI	Work Order No.:	20082951	Page:	1 of 1

Code: ASME XI, 2001 Ed., 03 Ad. Cat./Item: B-D/B3.90 Location: DW

Drawing No.: C-02404 Sht. 001-1 Description: NOZZLE N2D TO REACTOR VESSEL WELD

System ID: 1005

Component ID: 2B11-RPV-N2D Size/Length: N/A Thickness/Diameter: N/A

Limitations: Yes - Component configuration

Comments:

Reference BNP Unit 2 Areva final report document # 180-9269913-000 for personnel certifications and equipment certifications.

Detection of flaw indications at the inner 15% t (measured from the clad to base metal interface) of nozzle-to-vessel welds when scanning parallel to the weld axis was performed utilizing 54-ISI-850-008 with SDCN 30-9269636-000.

Results: Sat ☑ Unsat ☐ Eval ☐

Percent Of Coverage Obtained > 90%: No - 72.8% Reviewed Previous Data: Yes

Examiner	Level		Signature	Date	Reviewer	Signature	Date
N/A				3/23/2017	Zimmerman, David Lvl III		3/27/2017
Examiner	Level	N/A	Signature	Date	Site Review	Signature	Date
N/A					Finney, Ned Lvl III		3/27/2017
Other	Level	N/A	Signature	Date	ANII Review	Signature	Date
N/A					Reynolds, David		3/27/2017

AREVA

Ultrasonic Examination Summary Sheet

Summary No.:	2-B11-1088				
Work Order:	2008295144				
Component ID:	2B11-RPV-N2D				
System:	RPV				
Material:	CS (Clad)				
Description:	RPV Nozzle to Shell Weld				
EPRI Model No.:	IR-2017-680				
Customer:	Duke Energy			Code Category:	B-D
Site:	BNS	Unit:	2	Code Item:	B3.90
Outage:	B223R1			Code Class:	1
ISO / Drawing(s):	C-02404-1-1				

Procedure Number	Procedure Revision	SDCN	Procedure Title
54-ISI-850	008	30-9269636-000	Manual Ultrasonic Examination of BWR Reactor Vessel Nozzle Inner Radius Regions and Nozzle to Shell Welds (inner 15%)
54-ISI-805	009	N/A	PDI Generic Procedure for Ultrasonic Examination of Reactor Pressure Vessel Welds PDI-UT-6

Calibration Sheets	Exam Data Sheets	Indication Data Sheets	Indication Plot Sheets	Coverage Worksheet	Coverage Diagram	Exam Results
CS-01	EDS-01	N/A	N/A	Yes	Yes	Acceptable
CS-02	EDS-02					
CS-03						

Summary:

Manual ultrasonic examinations were performed on the referenced weld during B223R1.

In accordance with UT Procedure 54-ISI-805-009, 60° Longitudinal wave examinations were performed from the vessel surface in both the radial and circumferential scan directions.

In accordance with UT Procedure 54-ISI-850-008 and the referenced EPRI model the following examinations were performed.

Recirculation Inlet Nozzle (N2D) Nozzle Modeling Parameters		
Probe	Probe Skew	Scan Surface
50° Shear	± (51° to 76°)	Vessel

72.8% coverage of the required examination volume was obtained. The percentage of coverage for this examination was calculated to the maximum extent possible allowed by the procedure qualification and actual component field conditions for this configuration.

This examination was performed using the alternative examination volume defined in code case N-613-1 which reduces the area to be examined per IWB-2500-7 to the weld plus ½" on each side.

This examination satisfies the requirements of ASME Sec. XI 2001 Edition with 2003 Addenda for Category B-D, item number B3.90, figure number IWB 2500-7 (b) exam volume, and was performed using ASME Sec XI, Appendix VIII qualified personnel, procedures, and equipment.

Personnel	Name	Signature	Level	Date
Prepared By:	George Chapman		III	03/23/17
Prepared By:	John Gatica		II	03/23/17
AREVA Review:	David Zimmerman		III	03/27/2017
Customer:	Ned Finney		III	3/27/2017
ANII:	David M. Reynolds		N/A	3/27/2017

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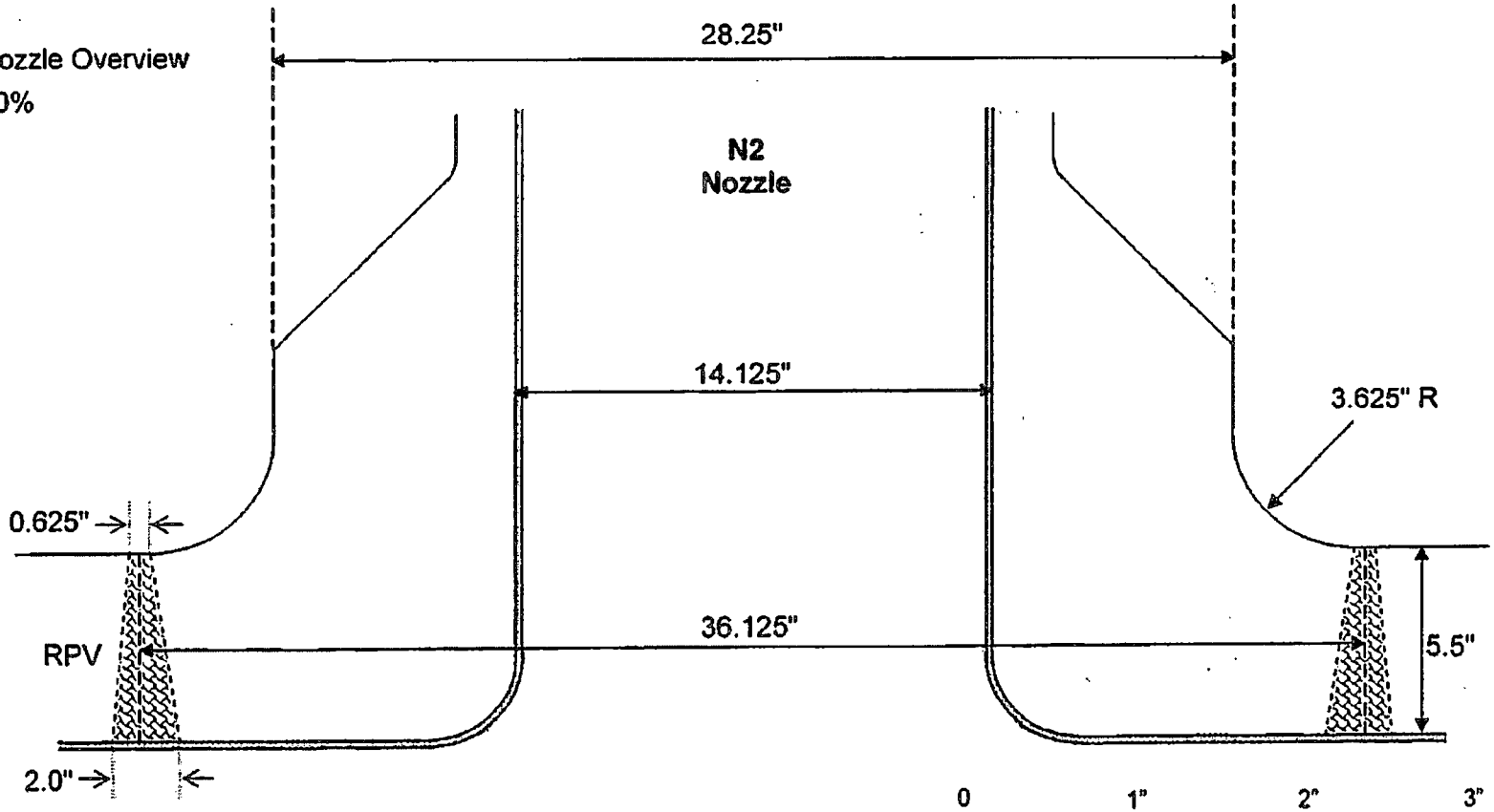
AREVA

Supplemental Data Sheet

Page:	7 of 12
Component ID:	2B11-RPV-N2D
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 1
Subject: Nozzle Overview
Scale: 20%



Weld Length @ Centerline: (36.125 x π) = 113.5"

This scale is 100% in case of copier distortion

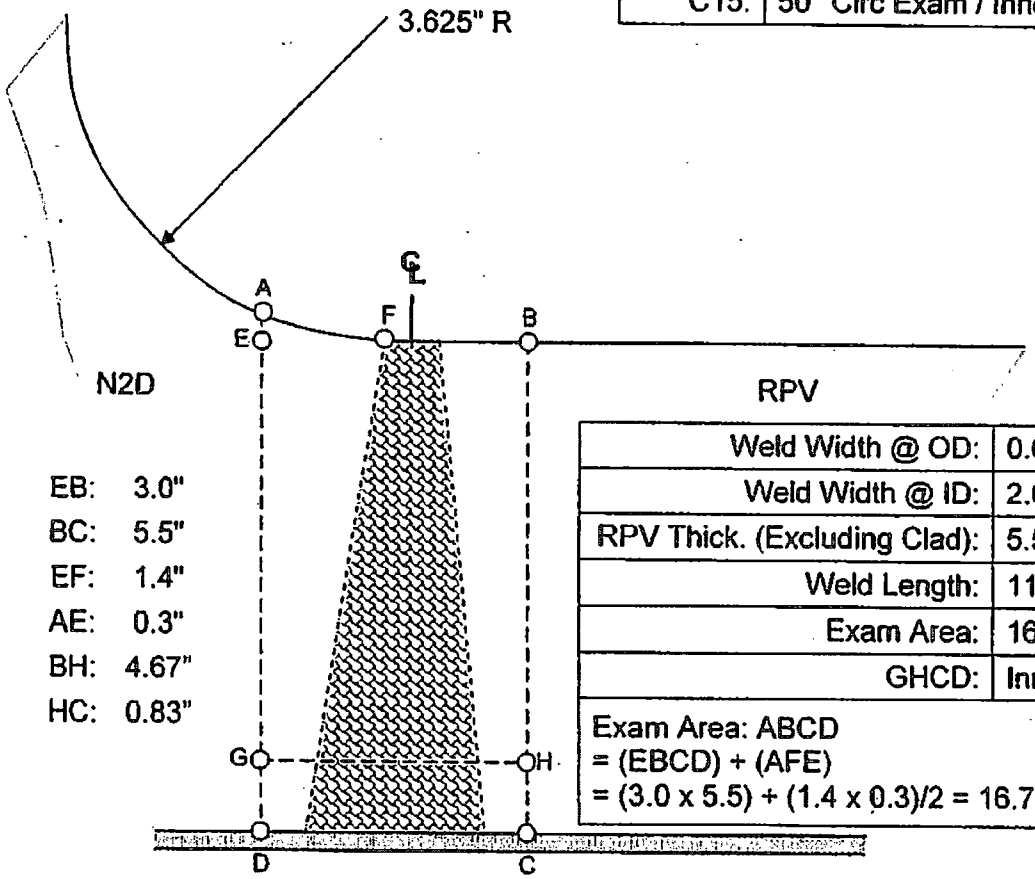
AREVA

Supplemental Data Sheet

Page:	8 of 12
Component ID:	2B11-RPV-N2D
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 2
Subject: Dimensions & Weld fit up
Scale: 50%

Scan	Description
R100:	60° Radial Exam
C85:	60° Circ Exam / Outer 85%
C15:	50° Circ Exam / Inner 15%

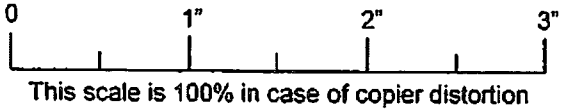


EB: 3.0"
BC: 5.5"
EF: 1.4"
AE: 0.3"
BH: 4.67"
HC: 0.83"

Weld Width @ OD:	0.625"
Weld Width @ ID:	2.0"
RPV Thick. (Excluding Clad):	5.5"
Weld Length:	113.5" @ CL
Exam Area:	16.71 in²
GHCD:	Inner 15%

Exam Area: ABCD
= (EBCD) + (AFE)
= (3.0 x 5.5) + (1.4 x 0.3)/2 = 16.71 in²

Note: Exam area extends to ½" beyond weld per code case N-613-1



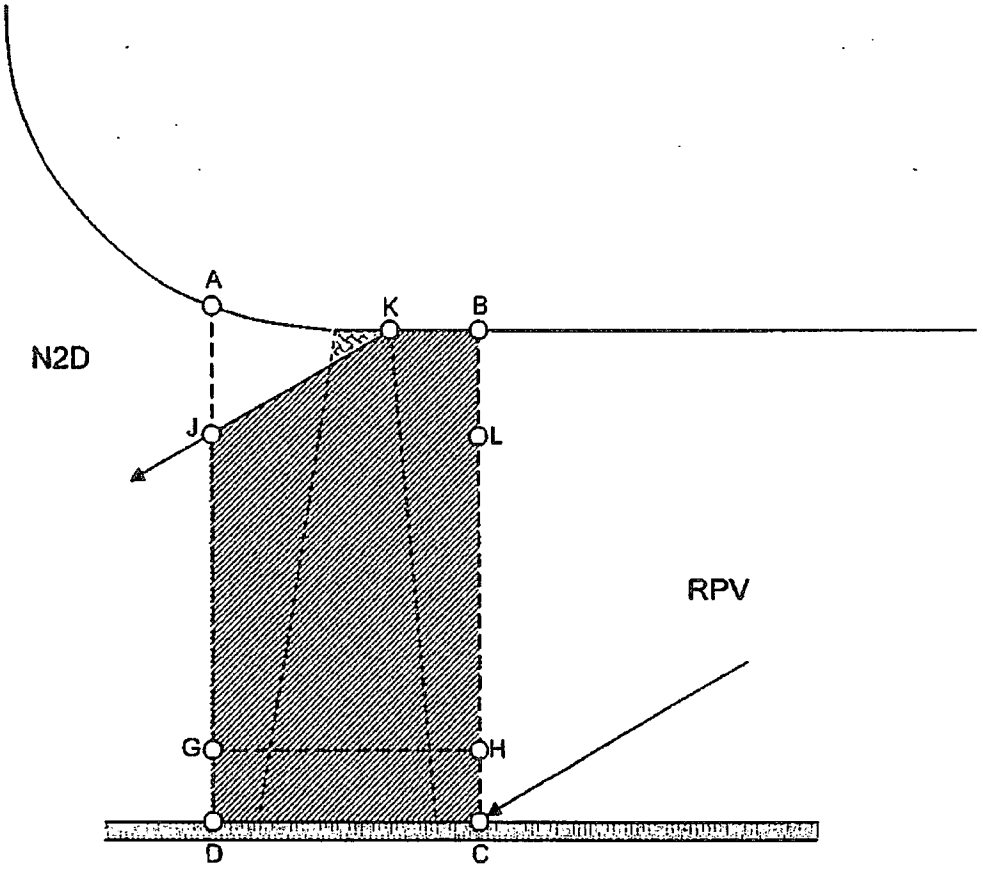
This scale is 100% in case of copier distortion

AREVA

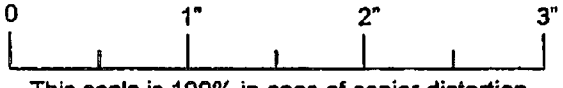
Supplemental Data Sheet

Page:	9 of 12
Component ID:	2B11-RPV-N2D
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 3
Scan: R100
Scale: 50%



Exam Area (ABCD): 16.71 in²
Examined: (KBLJ) + (JLCD)
Examined: 1.2(1.0 + 3.0)/2 + (3.0 x 4.3) = 15.30 in²



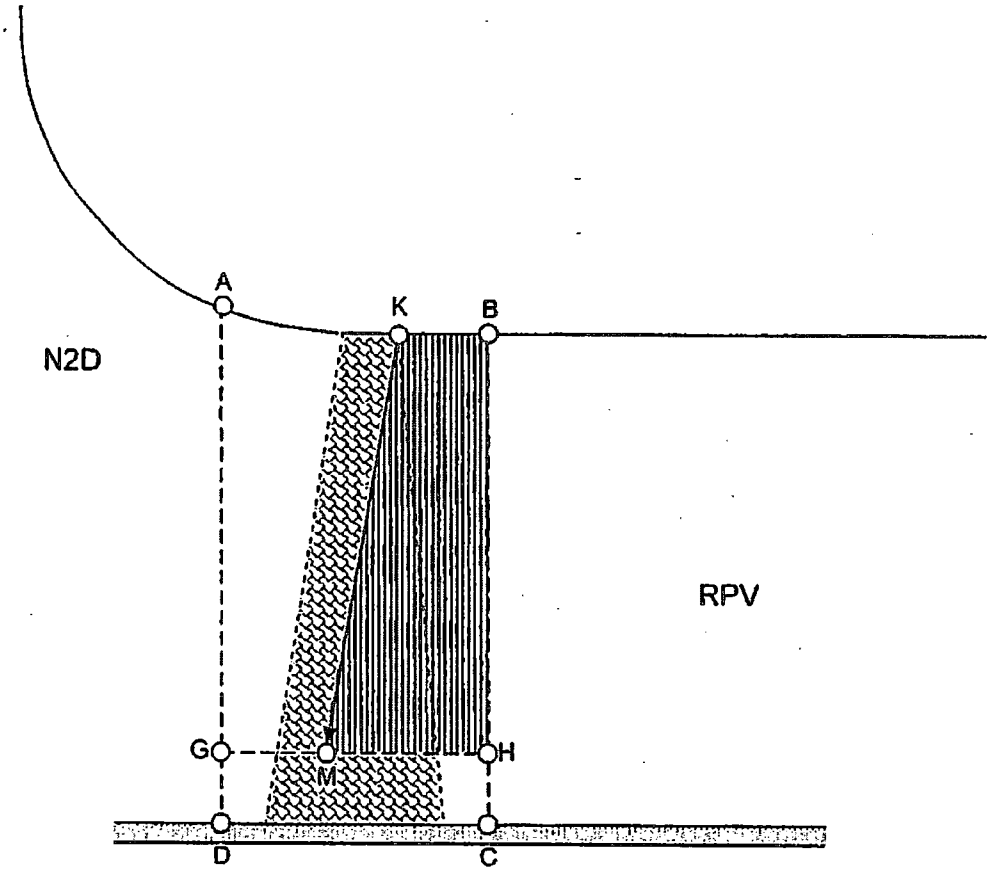
This scale is 100% in case of copier distortion

AREVA

Supplemental Data Sheet

Page:	10 of 12
Component ID:	2B11-RPV-N2D
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 4
Scan: C85
Scale: 50%



Exam Area (ABCD): 16.71 in²
Examined: (KBHM)
Examined: 4.67(1.0 + 1.8)/2 = 6.54 in²

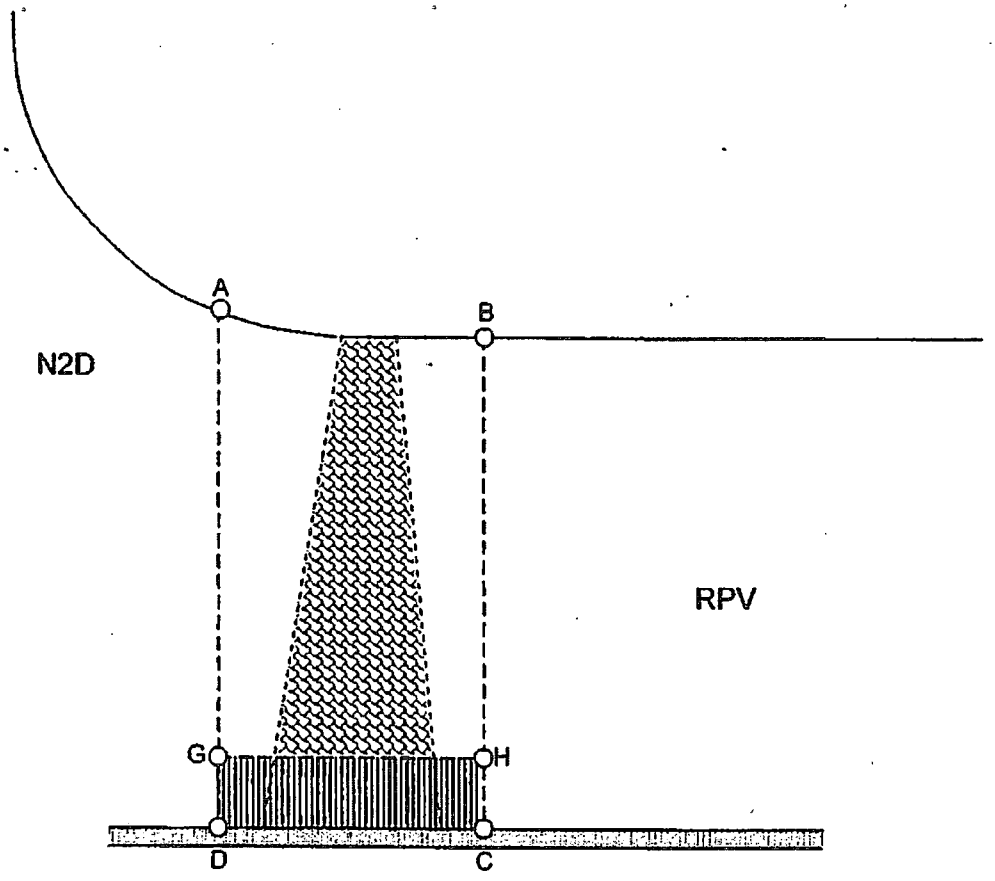
This scale is 100% in case of copier distortion

AREVA

Supplemental Data Sheet

Page:	11 of 12
Component ID:	2B11-RPV-N2D
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 5
Scan: C15
Scale: 50%



Exam Area (ABCD): 16.71 in²
Examined: (GHCD)
Examined: (3.0 x 0.83) = 2.49 in²

This scale is 100% in case of copier distortion

AREVA

Supplemental Data Sheet

Page: 12 of 12
Component ID: 2B11-RPV-N2D
Utility: Duke Energy
Site / Unit: Brunswick / 2

ASME Code Coverage Calculation

Component Information
Exam Area: 16.71 in²
Exam Length: 113.5"

Scan	Description
R100:	60° Radial Exam
C85:	60° Circ Exam / Outer 85%
C15:	50° Circ Exam / Inner 15%

See Sketch	Scan	Area Examined		Exam Area		Length Examined		Exam Length		Percent Coverage
3	R100	(15.30	/	16.71	) x (	113.5	/	113.5	) x 100 =	91.56%
4	C85	(6.54	/	16.71	) x (	113.5	/	113.5	) x 100 =	39.14%
5	C15	(2.49	/	16.71	) x (	113.5	/	113.5	) x 100 =	14.90%
		(	/	~	) x (		/	~	) x 100 =	~
		(	/	~	) x (		/	~	) x 100 =	~
									Total Percent:	145.60%
									Code Examination Coverage (Total Percent / 2 Sound Beams):	72.8%

Reference the following for Nozzle Dimensions
Contract No.: 68-2471 / 72, Dwg. No.: 28 Rev 19
Note: 100% radial & circumferential coverage obtained in the lower 15% of exam volume.

Personnel	Name	Signature	Level	Date
Prepared By:	Simon Crothers	Simon Crothers	II	03/27/17
Reviewed By:	David K. Zimmerman	David K. Zimmerman	III	03/27/2017
Site Review:	NED FINNEY	Ned Finney	III	3/27/2017

NGG Nuclear Generation Group

Ultrasonic Examination

Site/Unit:	BNP / 2	Procedure:	54-ISI-805-009	Outage No.:	B223R1
Summary No.:	2-B11-1120	Procedure Rev.:	009	Report No.:	VEN-17-018
Workscope:	ISI	Work Order No.:	20082951	Page:	1 of 1

Code: ASME XI, 2001 Ed., 03 Ad. Cat./Item: B-D/B3.90 Location: DW

Drawing No.: C-02404 Sht. 001-1 Description: NOZZLE N5B TO REACTOR VESSEL WELD

System ID: 1005

Component ID: 2B11-RPV-N5B Size/Length: N/A Thickness/Diameter: N/A

Limitations: Yes - Component configuration

Comments:

Reference BNP Unit 2 Areva final report document # 180-9269913-000 for personnel certifications and equipment certifications.

Detection of flaw indications at the inner 15% t (measured from the clad to base metal interface) of nozzle-to-vessel welds when scanning parallel to the weld axis was performed utilizing 54-ISI-850-008 with SDCN 30-9269636-000.

Results: Sat ☑ Unsat ☐ Eval ☐

Percent Of Coverage Obtained > 90%: No - 72.8% Reviewed Previous Data: Yes

Examiner	Level		Signature	Date	Reviewer	Signature	Date
N/A				3/22/2017	Zimmerman, David Lvl III		3/27/2017
Examiner	Level	N/A	Signature	Date	Site Review	Signature	Date
N/A					Finney, Ned Lvl III		3/27/2017
Other	Level	N/A	Signature	Date	ANII Review	Signature	Date
N/A					Reynolds, David		3/28/2017

AREVA

Ultrasonic Examination Summary Sheet

Summary No.:	2-B11-1120				
Work Order:	2008295154				
Component ID:	2B11-RPV-N5B				
Customer:	Duke Energy		Code Category:	B-D	
Site:	BNS	Unit: 2	Code Item:	B3.90	
Outage:	B223R1		Code Class:	1	
System:	RPV				
Material:	CS (Clad)				
Description:	RPV Nozzle to Shell Weld				
ISO / Drawing(s):	C-02404 Sht. 001-1				
EPRI Model No.:	IR-2017-680				

Procedure Number	Procedure Revision	SDCN	Procedure Title
54-ISI-850	008	30-9269636-000	Manual Ultrasonic Examination of BWR Reactor Vessel Nozzle Inner Radius Regions and Nozzle to Shell Welds (inner 15%)
54-ISI-805	009	N/A	PDI Generic Procedure for Ultrasonic Examination of Reactor Pressure Vessel Welds PDI-UT-6

Calibration Sheets		Exam Data Sheets	Indication Data Sheets	Indication Plot Sheets	Coverage Worksheet	Coverage Diagram	Exam Results
CS-01		EDS-01	N/A	N/A	Yes	Yes	Acceptable
CS-02		EDS-02					
CS-03							

Summary:

Manual ultrasonic examinations were performed on the referenced weld during B223R1.

In accordance with UT Procedure 54-ISI-805-009, 60° Longitudinal wave examinations were performed from the vessel surface in both the radial and circumferential scan directions.

In accordance with UT Procedure 54-ISI-850-008 and the referenced EPRI model the following examinations were performed.

Core Spray Nozzle (N5B) Nozzle Modeling Parameters		
Probe	Probe Skew	Scan Surface
50° Shear	± (51° to 77°)	Vessel

72.8% coverage of the required examination volume was obtained. The percentage of coverage for this examination was calculated to the maximum extent possible allowed by the procedure qualification and actual component field conditions for this configuration.

This examination was performed using the alternative examination volume defined in code case N-613-1 which reduces the area to be examined per IWB-2500-7 to the weld plus ½" on each side.

This examination satisfies the requirements of ASME Sec. XI 2001 Edition with 2003 Addenda for Category B-D, item number B3.90, figure number IWB 2500-7 (b) exam volume, and was performed using ASME Sec XI, Appendix VIII qualified personnel, procedures, and equipment.

Personnel	Name	Signature	Level	Date
Prepared By:	Chris Van Ruler	Chris V.R	II	03/22/2017
AREVA Review:	David Zimmerman	David K. Z	III	03/27/2017
Customer:	Ned Finney		III	3/27/2017
ANII:	David M. Reynolds	David M. Reynolds	N/A	3/28/2017

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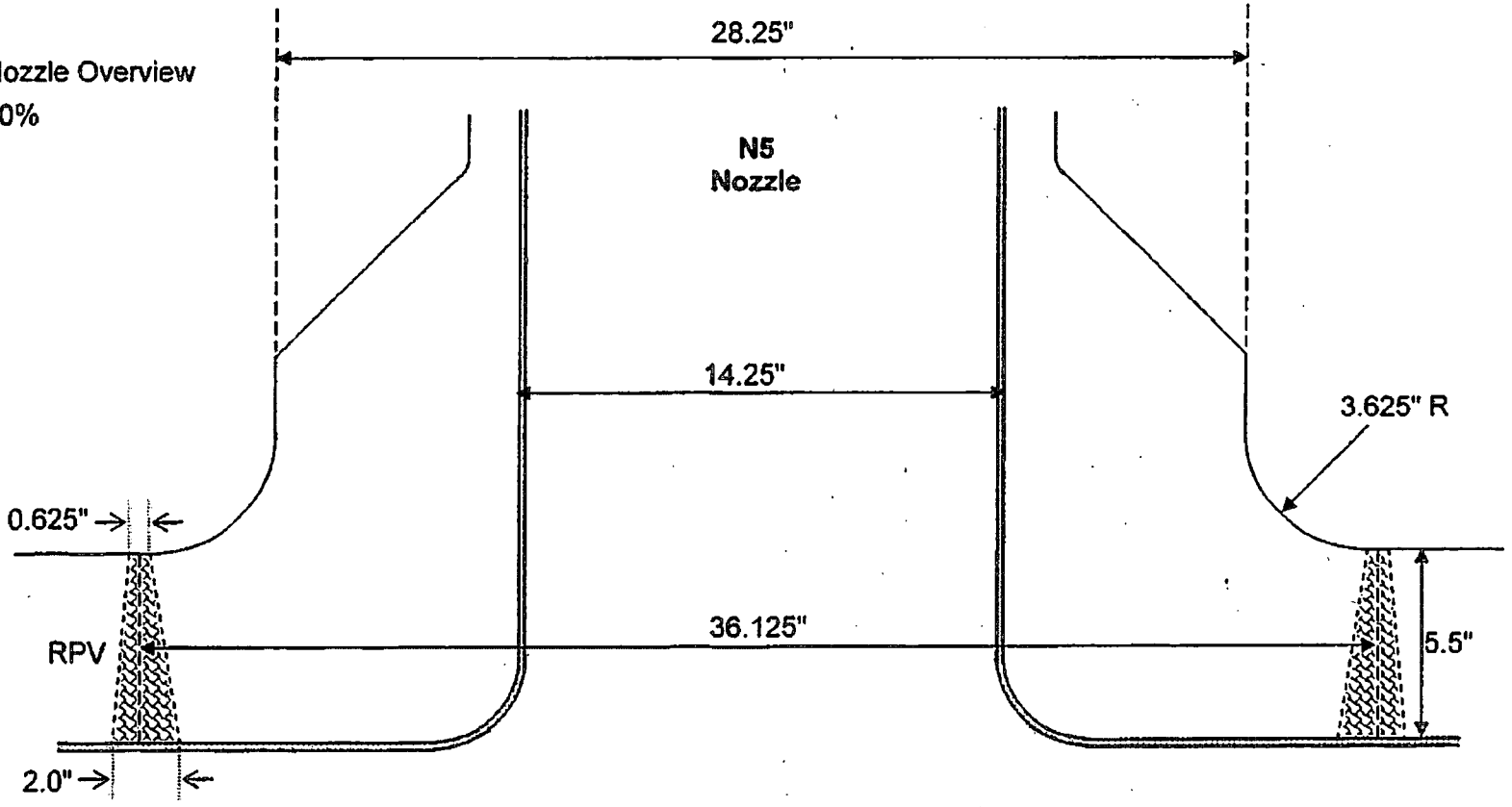
AREVA

Supplemental Data Sheet

Page:	7 of 12
Component ID:	2B11-RPV-N5B
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 1
Subject: Nozzle Overview
Scale: 20%



Weld Length @ Centerline: (36.125 x π) = 113.5"

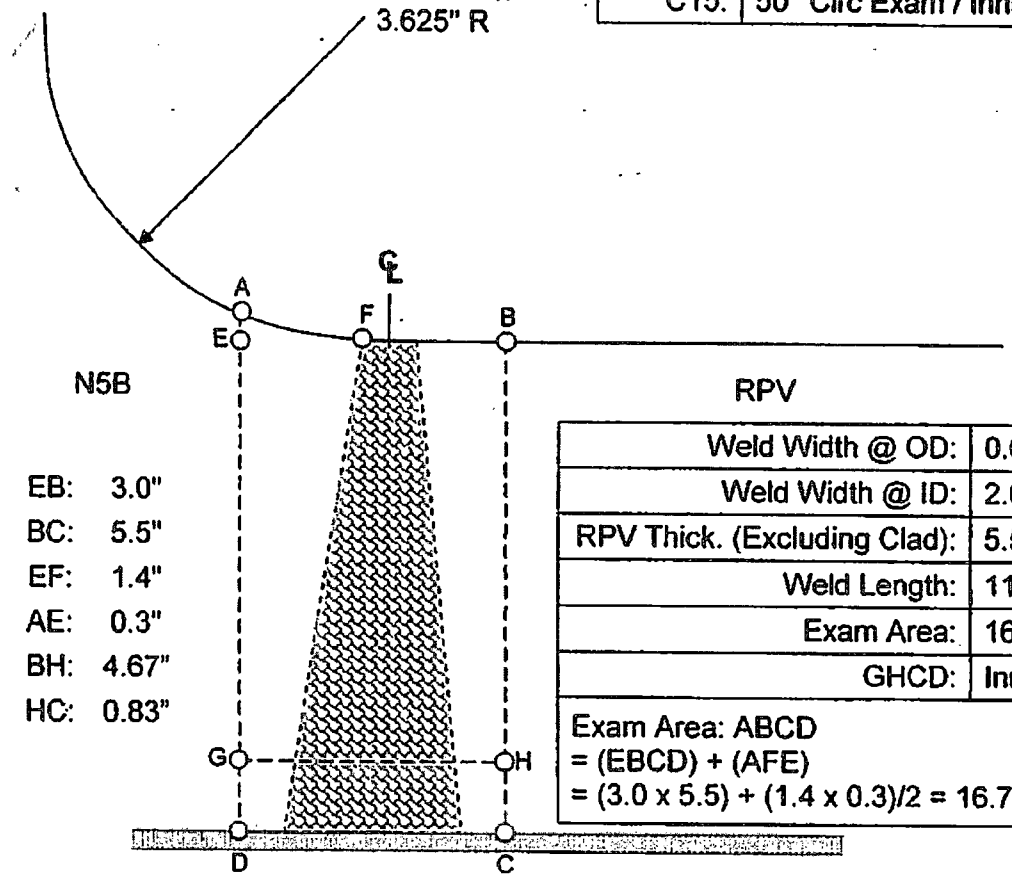
AREVA

Supplemental Data Sheet

Page:	8 of 12
Component ID:	2B11-RPV-N5B
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 2
Subject: Dimensions & Weld fit up
Scale: 50%

Scan	Description
R100:	60° Radial Exam
C85:	60° Circ Exam / Outer 85%
C15:	50° Circ Exam / Inner 15%

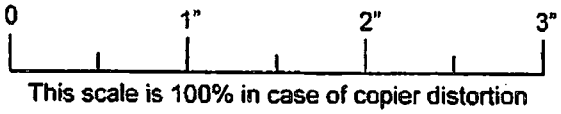


EB: 3.0"
BC: 5.5"
EF: 1.4"
AE: 0.3"
BH: 4.67"
HC: 0.83"

Weld Width @ OD:	0.625"
Weld Width @ ID:	2.0"
RPV Thick. (Excluding Clad):	5.5"
Weld Length:	113.5" @ CL
Exam Area:	16.71 in²
GHCD:	Inner 15%

Exam Area: ABCD
= (EBCD) + (AFE)
= (3.0 x 5.5) + (1.4 x 0.3)/2 = 16.71 in²

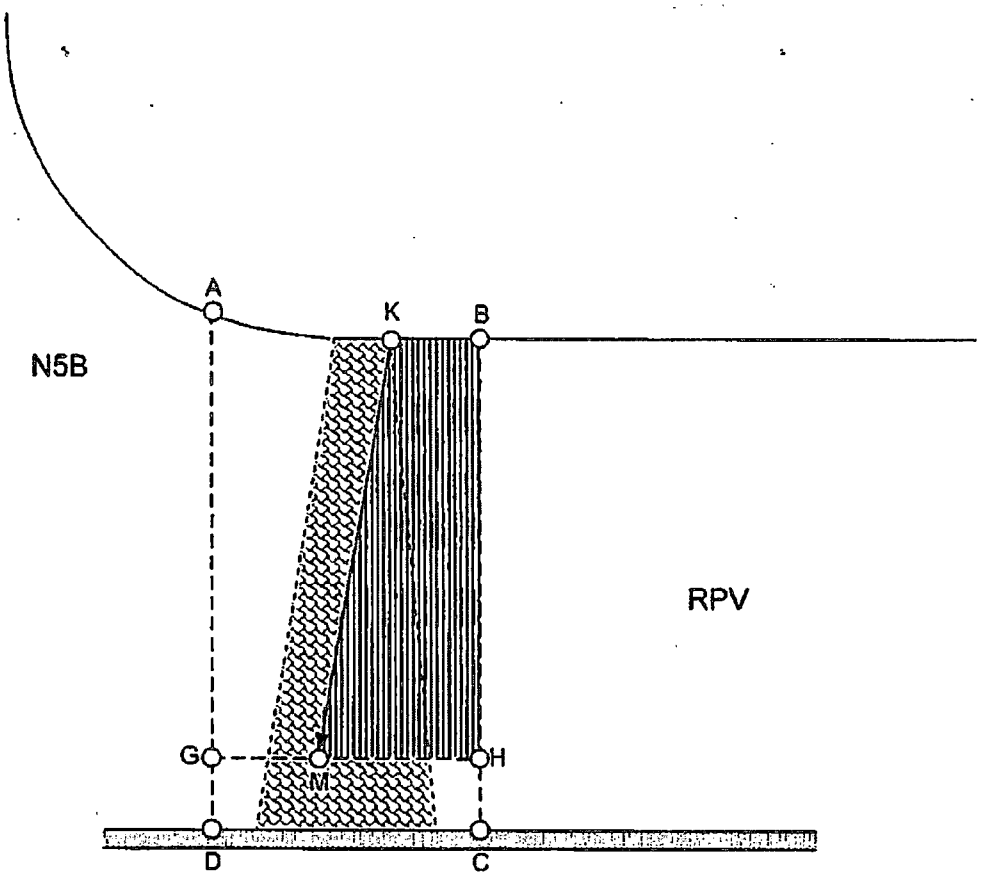
Note: Exam area extends to ½" beyond weld per code case N-613-1



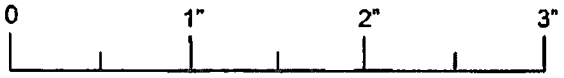
This scale is 100% in case of copier distortion

AREVA	Supplemental Data Sheet	Page:	10 of 12
		Component ID:	2B11-RPV-N5B
		Utility:	Duke Energy
		Site / Unit:	Brunswick / 2

Sketch: 4
Scan: C85
Scale: 50%



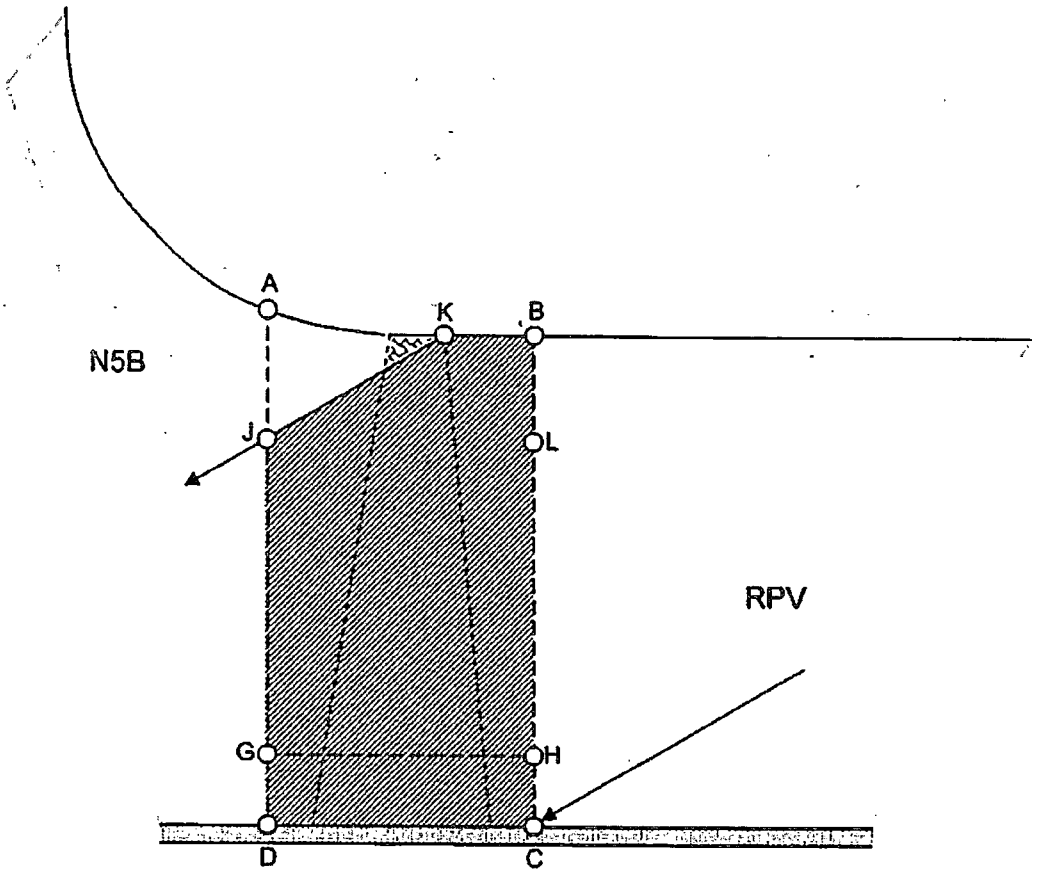
Exam Area (ABCD): 16.71 in²
Examined: (KBHM)
Examined: 4.67(1.0 + 1.8)/2 = 6.54 in²



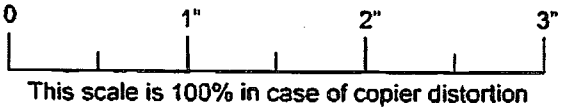
This scale is 100% in case of copier distortion

AREVA	Supplemental Data Sheet	Page: 9 of 12
		Component ID: 2B11-RPV-N5B
		Utility: Duke Energy
		Site / Unit: Brunswick / 2

Sketch: 3
Scan: R100
Scale: 50%



Exam Area (ABCD): 16.71 in²
Examined: (KBLJ) + (JLCD)
Examined: 1.2(1.0 + 3.0)/2 + (3.0 x 4.3) = 15.30 in²



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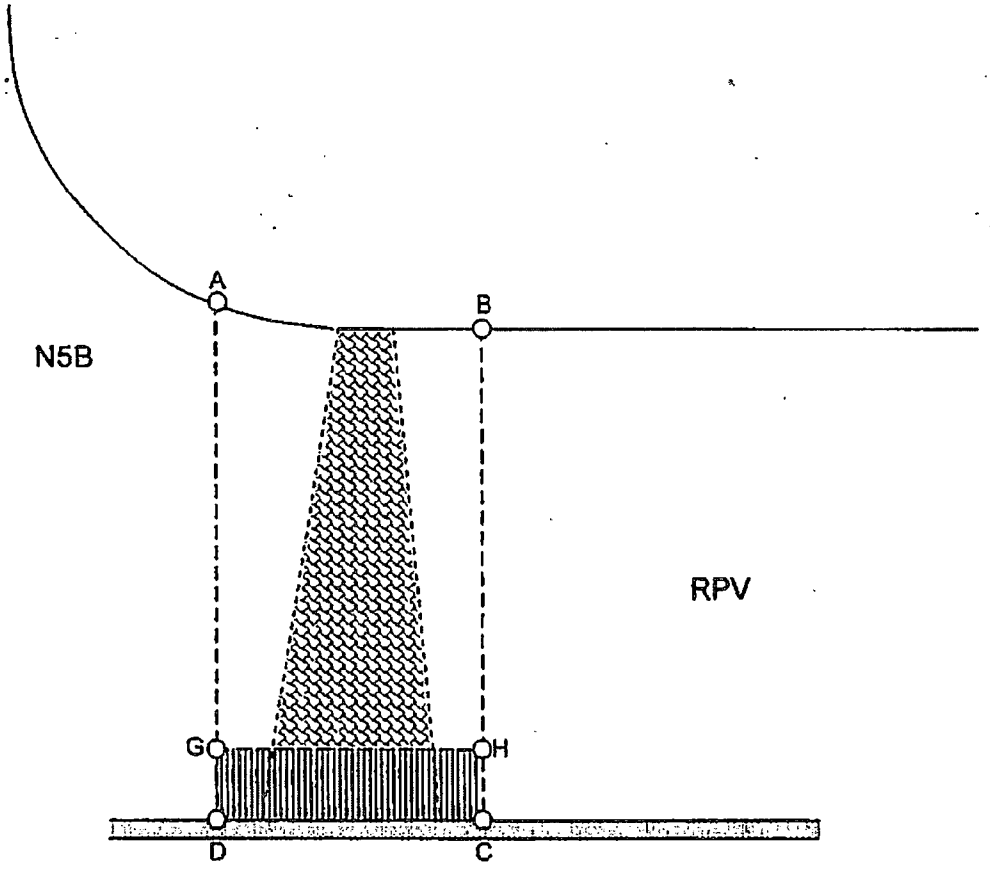
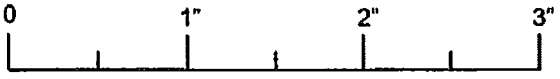
AREVA	Supplemental Data Sheet		
		Page:	11 of 12
		Component ID:	2B11-RPV-N5B
		Utility:	Duke Energy
		Site / Unit:	Brunswick / 2

Sketch: 5
Scan: C15
Scale: 50%



Exam Area (ABCD): 16.71 in²
Examined: (GHCD)
Examined: (3.0 x 0.83) = 2.49 in²



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AREVA

Supplemental Data Sheet

Component ID: 2B11-RPV-N5B
Utility: Duke Energy
Site / Unit: Brunswick / 2

ASME Code Coverage Calculation

Component Information
Exam Area: 16.71 in²
Exam Length: 113.5"

Scan	Description
R100:	60° Radial Exam
C85:	60° Circ Exam / Outer 85%
C15:	50° Circ Exam / Inner 15%

See Sketch	Scan	Area Examined		Exam Area		Length Examined		Exam Length		Percent Coverage
3	R100	(15.30	/	16.71	) x (	113.5	/	113.5	) x 100 =	91.56%
4	C85	(6.54	/	16.71	) x (	113.5	/	113.5	) x 100 =	39.14%
5	C15	(2.49	/	16.71	) x (	113.5	/	113.5	) x 100 =	14.90%
		(	/	~	) x (		/	~	) x 100 =	~
		(	/	~	) x (		/	~	) x 100 =	~
									Total Percent:	145.60%
									Code Examination Coverage (Total Percent / 2 Sound Beams):	72.8%

Reference the following for Nozzle Dimensions
Contract No.: 68-2471 / 72, Dwg. No.: 32 Rev 16
Note: 100% radial & circumferential coverage obtained in the lower 15% of exam volume.

Personnel	*Name*	*Signature*	*Level*	*Date*
Prepared By:	Simon Crothers	Simon Crothers	II	03/27/17
Reviewed By:	David K. Zimmerman	David K. Zimmerman	III	03/27/2017
Site Review:	NED FINNEY	Ned Finney	III	3/27/2017

Ultrasonic Examination

Site/Unit:	BNP / 2	Procedure:	54-ISI-805-009	Outage No.:	B223R1
Summary No.:	2-B11-1137	Procedure Rev.:	009	Report No.:	VEN-17-016
Workscope:	ISI	Work Order No.:	20082951	Page:	1 of 1

Code: ASME XI, 2001 Ed., 03 Ad. Cat./Item: B-D/B3.90 Location: DW

Drawing No.: C-02404 Sht. 001-1 Description: NOZZLE N8B TO REACTOR VESSEL WELD

System ID: 1005

Component ID: 2B11-RPV-N8B Size/Length: 218.0" Thickness/Diameter: 5.56"

Limitations: Yes - Component configuration

Comments:

Reference BNP Unit 2 Areva final report document # 180-9269913-000 for personnel certifications and equipment certifications.

Detection of flaw indications at the inner 15% t (measured from the clad to base metal interface) of nozzle-to-vessel welds when scanning parallel to the weld axis was performed utilizing 54-ISI-850-008 with SDCN 30-9269636-000.

Results: Sat ☑ Unsat ☐ Eval ☐

Percent Of Coverage Obtained > 90%: No - 72.8% Reviewed Previous Data: Yes

Examiner	Level	Signature	Date	Reviewer	Signature	Date
N/A			3/25/2017	Zimmerman, David Lvl III		3/28/2017
Examiner	Level N/A	Signature	Date	Site Review	Signature	Date
N/A				Finney, Ned Lvl III		3/28/2017
Other	Level N/A	Signature	Date	ANII Review	Signature	Date
N/A				Reynolds, David		3/29/2017

AREVA

Ultrasonic Examination Summary Sheet

Summary No.:	2-B11-1137
Work Order:	2008295164
Component ID:	2B11-RPV-N8B
System:	RPV
Material:	CS (Clad)
Description:	RPV Nozzle to Shell Weld
EPRI Model No.:	IR-2017-680

Customer:	Duke Energy			Code Category:	B-D
Site:	BNS	Unit:	1	Code Item:	B3.90
Outage:	B223R1			Code Class:	1
ISO / Drawing(s):	C02404 Sht. 001-1				

Procedure Number	Procedure Revision	SDCN	Procedure Title
54-ISI-850	008	30-9269636-000	Manual Ultrasonic Examination of BWR Reactor Vessel Nozzle Inner Radius Regions and Nozzle to Shell Welds (inner 15%)
54-ISI-805	009	N/A	PDI Generic Procedure for Ultrasonic Examination of Reactor Pressure Vessel Welds PDI-UT-6

Calibration Sheets	Exam Data Sheets	Indication Data Sheets	Indication Plot Sheets	Coverage Worksheet	Coverage Diagram	Exam Results
CS-01	EDS-01	N/A	N/A	Yes	Yes	Acceptable
CS-02	EDS-02					
CS-03						

Summary:

Manual ultrasonic examinations were performed on the referenced weld during B223R1.

In accordance with UT Procedure 54-ISI-805-009, 60° Longitudinal wave examinations were performed from the vessel surface in both the radial and circumferential scan directions.

In accordance with UT Procedure 54-ISI-850-008 and the referenced EPRI model the following examinations were performed.

Jet Pump Instrumentation (N8) Nozzle Modeling Parameters		
Probe	Probe Skew	Scan Surface
50° Shear	± (43° to 65°)	Vessel

72.8% coverage of the required examination volume was obtained. The percentage of coverage for this examination was calculated to the maximum extent possible allowed by the procedure qualification and actual component field conditions for this configuration.

This examination was performed using the alternative examination volume defined in code case N-613-1 which reduces the area to be examined per IWB-2500-7 to the weld plus ½" on each side.

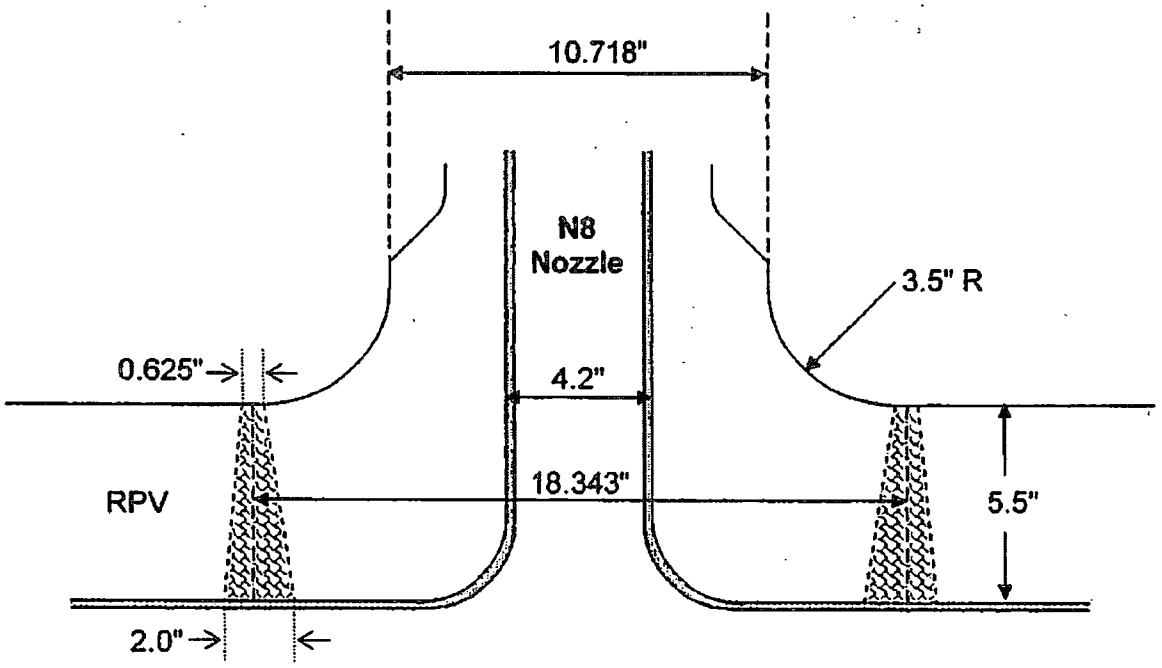
This examination satisfies the requirements of ASME Sec. XI 2001 Edition with 2003 Addenda for Category B-D, item number B3.100, figure number IWB 2500-7 (b) exam volume, and was performed using ASME Sec XI, Appendix VIII qualified personnel, procedures, and equipment.

Personnel	Name	Signature	Level	Date
Prepared By:	Edward P. Mazyck	Edward P Mazyck	III	03/25/2017
AREVA Review:	David Zimmerman	David L. Zimmerman	III	03/28/2017
Customer:	Ned Finney	Ned Finney	III	3/28/17
ANII:	David M. Reynolds	David M. Reynolds	N/A	3/29/2017

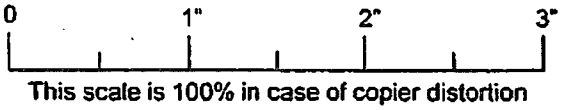
Page 1 of 12

AREVA	Supplemental Data Sheet		
		Page:	7 of 12
		Component ID:	2B11-RPV-N8B
		Utility:	Duke Energy
		Site / Unit:	Brunswick / 2

Sketch: 1
Subject: Nozzle Overview
Scale: 20%



Weld Length @ Centerline: (18.343 x π) = 57.6"



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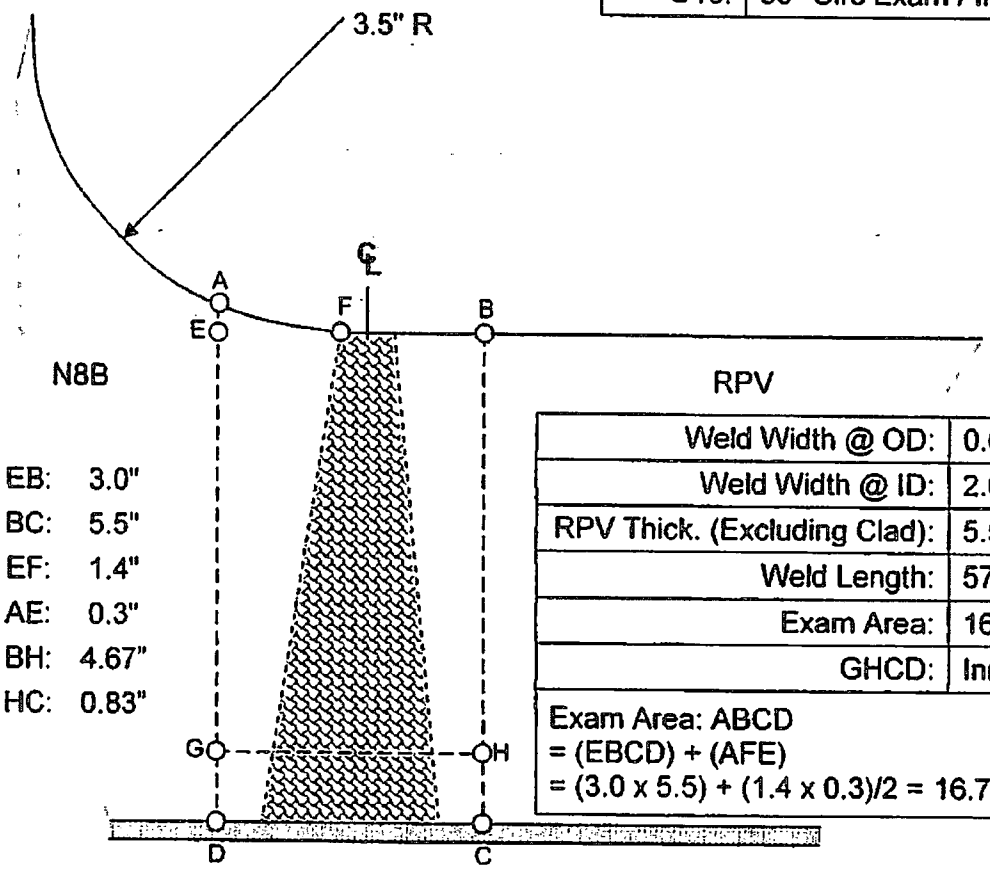
AREVA

Supplemental Data Sheet

Page:	8 of 12
Component ID:	2B11-RPV-N8B
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 2
Subject: Dimensions & Weld fit up
Scale: 50%

Scan	Description
R100:	60° Radial Exam
C85:	60° Circ Exam / Outer 85%
C15:	50° Circ Exam / Inner 15%

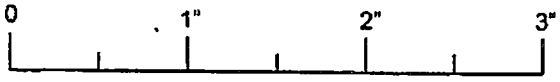


EB: 3.0"
BC: 5.5"
EF: 1.4"
AE: 0.3"
BH: 4.67"
HC: 0.83"

Weld Width @ OD:	0.625"
Weld Width @ ID:	2.0"
RPV Thick. (Excluding Clad):	5.5"
Weld Length:	57.6" @ CL
Exam Area:	16.71 in²
GHCD:	Inner 15%

Exam Area: ABCD
= (EBCD) + (AFE)
= (3.0 x 5.5) + (1.4 x 0.3)/2 = 16.71 in²

Note: Exam area extends to ½" beyond weld per code case N-613-1



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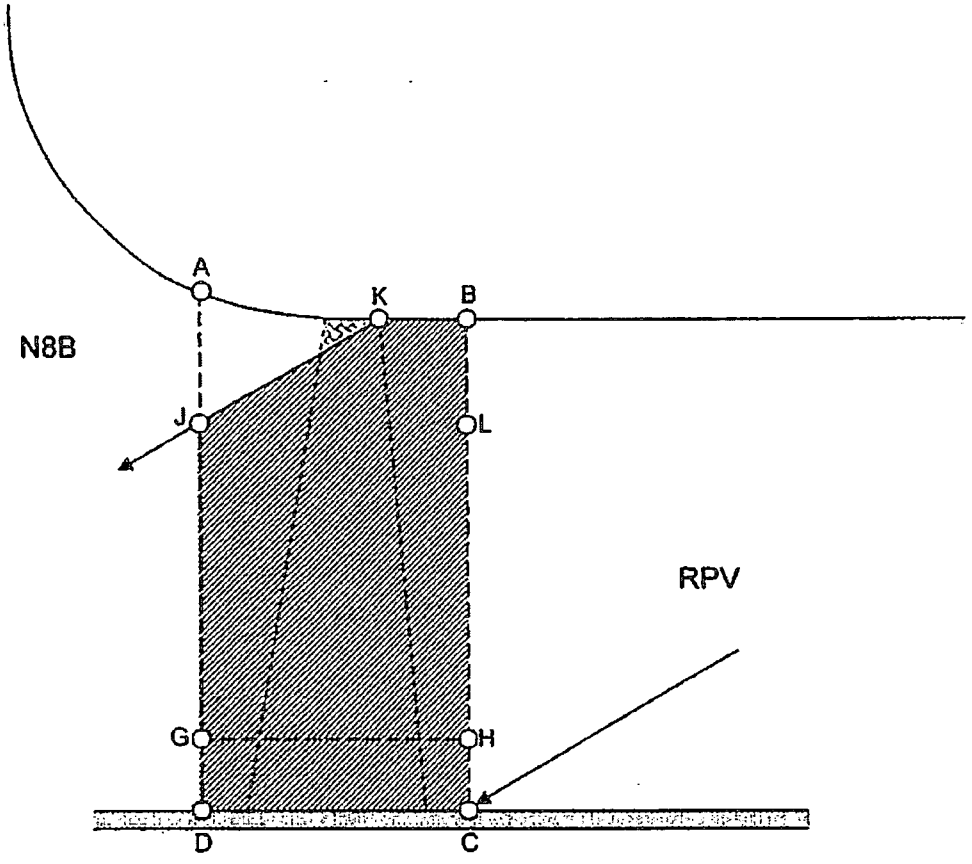
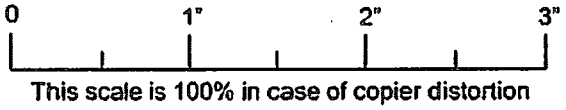
AREVA	Supplemental Data Sheet		
		Page:	9 of 12
		Component ID:	2B11-RPV-N8B
		Utility:	Duke Energy
		Site / Unit:	Brunswick / 2

Sketch: 3
Scan: R100
Scale: 50%



Exam Area (ABCD): 16.71 in²
Examined: (KBLJ) + (JLCD)
Examined: 1.2(1.0 + 3.0)/2 + (3.0 x 4.3) = 15.30 in²



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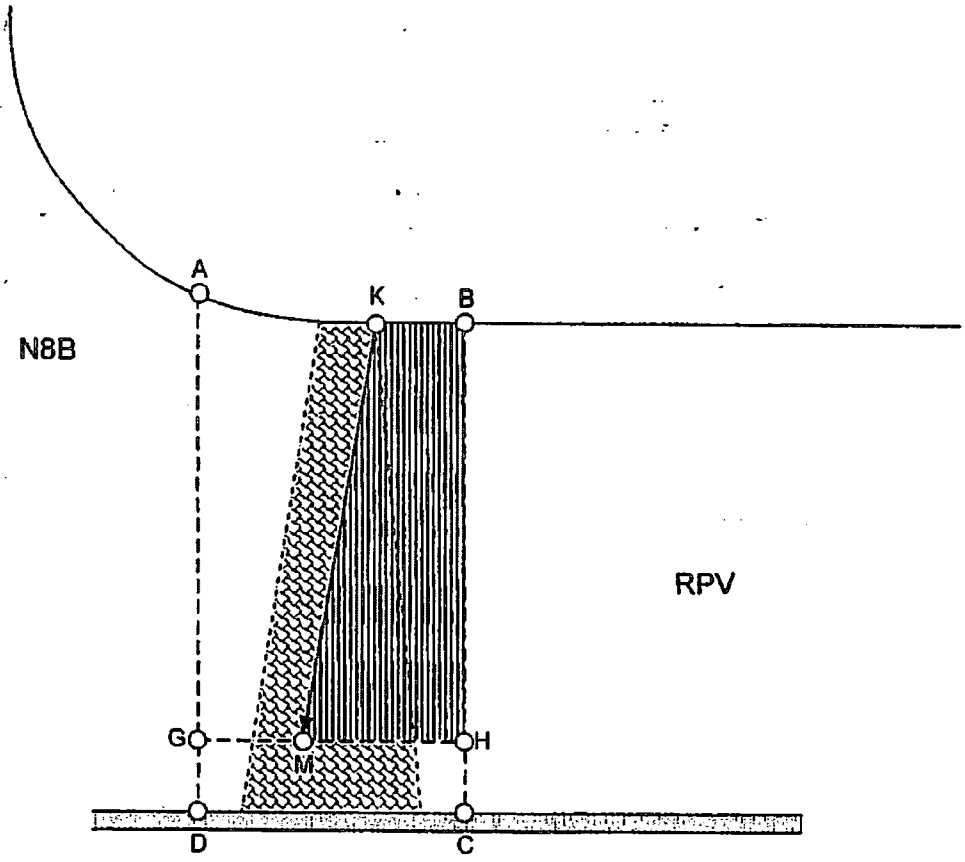
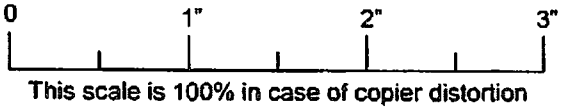
AREVA	Supplemental Data Sheet	Page:	10 of 12
		Component ID:	2B11-RPV-N8B
		Utility:	Duke Energy
		Site / Unit:	Brunswick / 2

Sketch: 4
Scan: C85
Scale: 50%



Exam Area (ABCD): 16.71 in²
Examined: (KBHM)
Examined: 4.67(1.0 + 1.8)/2 = 6.54 in²



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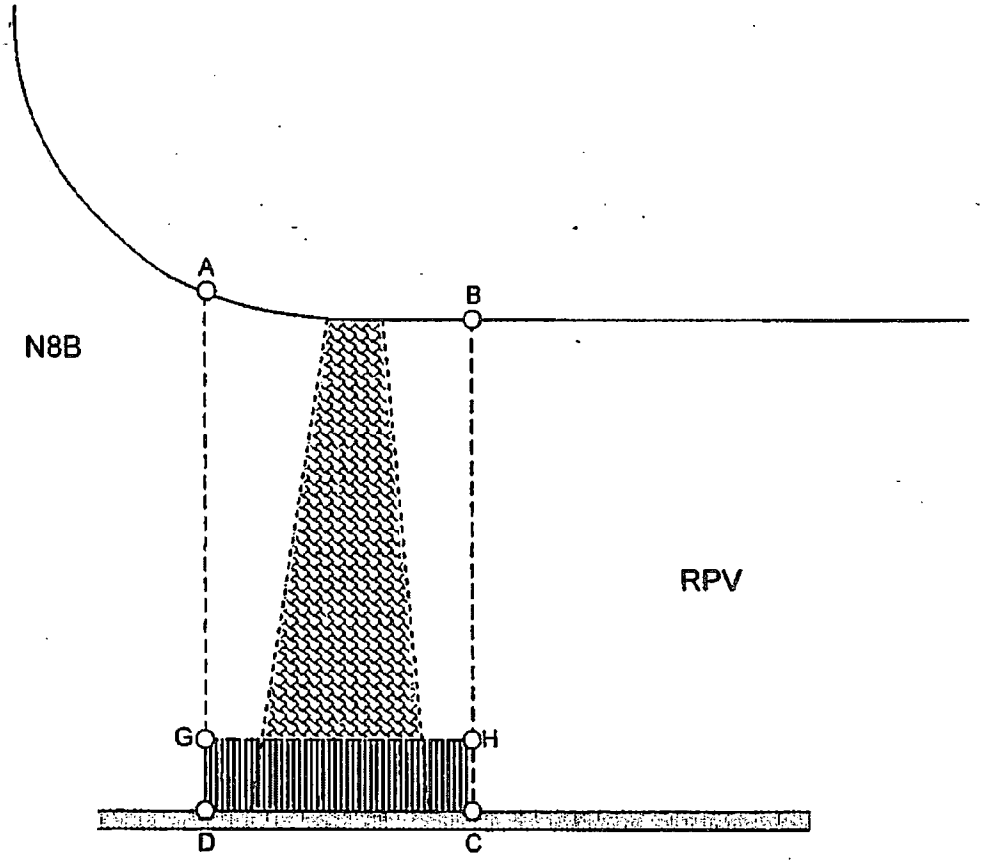
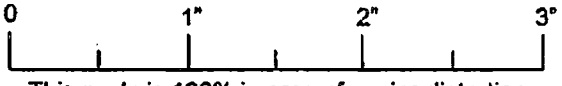
AREVA	Supplemental Data Sheet	Page:	11 of 12
		Component ID:	2B11-RPV-N8B
		Utility:	Duke Energy
		Site / Unit:	Brunswick / 2

Sketch: 5
Scan: C15
Scale: 50%



Exam Area (ABCD): 16.71 in²
Examined: (GHCD)
Examined: (3.0 x 0.83) = 2.49 in²



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AREVA

Supplemental Data Sheet

Component ID: 2B11-RPV-N8B
Utility: Duke Energy
Site / Unit: Brunswick / 2

ASME Code Coverage Calculation

Component Information
Exam Area: 16.71 in²
Exam Length: 57.6"

Scan	Description
R100:	60° Radial Exam
C85:	60° Circ Exam / Outer 85%
C15:	50° Circ Exam / Inner 15%

See Sketch	Scan	Area Examined	/	Exam Area	) x (	Length Examined	/	Exam Length	) x 100 =	Percent Coverage
3	R100	(15.30	/	16.71	) x (	57.6	/	57.6	) x 100 =	91.56%
4	C85	(6.54	/	16.71	) x (	57.6	/	57.6	) x 100 =	39.14%
5	C15	(2.49	/	16.71	) x (	57.6	/	57.6	) x 100 =	14.90%
		(	/	~	) x (		/	~	) x 100 =	~
		(	/	~	) x (		/	~	) x 100 =	~
									Total Percent:	145.60%
									Code Examination Coverage (Total Percent / 2 Sound Beams):	72.8%

Reference the following for Nozzle Dimensions
Contract No.: 68-2471 / 72, Dwg. No.: 36 Rev 1
Note: 100% radial & circumferential coverage obtained in the lower 15% of exam volume.

Personnel	*Name*	*Signature*	*Level*	*Date*
Prepared By:	Simon Crothers	Simon Crothers	II	03/27/17
Reviewed By:	David K. Zimmerman	David K. Zimmerman	III	03/27/2017
Site Review:	NED FINNEY	Ned Finney	III	3/28/17

Ultrasonic Examination

Site/Unit:	BNP / 2	Procedure:	54-ISI-805-009	Outage No.:	B223R1
Summary No.:	2-B11-1140	Procedure Rev.:	009	Report No.:	VEN-17-017
Workscope:	ISI	Work Order No.:	20013237	Page:	1 of 1

Code: ASME XI, 2001 Ed., 03 Ad. Cat./Item: B-D/B3.90 Location: DRYWELL

Drawing No.: C-02404 Sht. 001-1 Description: NOZZLE N9 TO REACTOR VESSEL WELD

System ID: 1005

Component ID: 2B11-RPV-N9 Size/Length: 3.0" Thickness/Diameter: 5.56"

Limitations: Yes - Component configuration

Comments:

Reference BNP Unit 2 Areva final report document # 180-9269913-000 for personnel certifications and equipment certifications.

Detection of flaw indications at the inner 15% t (measured from the clad to base metal interface) of nozzle-to-vessel welds when scanning parallel to the weld axis was performed utilizing 54-ISI-850-008 with SDCN 30-9269636-000.

Results: Sat ☑ Unsat ☐ Eval ☐

Percent Of Coverage Obtained > 90%: No - 72.8% Reviewed Previous Data: Yes

Examiner	Level	Signature	Date	Reviewer	Signature	Date
N/A			3/21/2017	Zimmerman, David Lvl III		3/28/2017
Examiner	Level N/A	Signature	Date	Site Review	Signature	Date
N/A				Finney, Ned Lvl III		3/28/2017
Other	Level N/A	Signature	Date	ANII Review	Signature	Date
N/A				Reynolds, David		3/28/2017

AREVA

Ultrasonic Examination Summary Sheet

Summary No.:	2-B11-1140				
Work Order:	2001323734				
Component ID:	2B11-RPV-N9				
Customer:	Duke Energy		Code Category:	B-D	
Site:	BNS	Unit: 2	Code Item:	B3.90	
Outage:	B223R1		Code Class:	1	
System:	RPV				
Material:	CS (Clad)				
Description:	RPV Nozzle to Shell Weld				
ISO / Drawing(s):	C-02404-1-1				
EPRI Model No.:	IR-2017-680				

Procedure Number	Procedure Revision	SDCN	Procedure Title
54-ISI-850	008	30-9269636-000	Manual Ultrasonic Examination of BWR Reactor Vessel Nozzle Inner Radius Regions and Nozzle to Shell Welds (inner 15%)
54-ISI-805	009	N/A	PDI Generic Procedure for Ultrasonic Examination of Reactor Pressure Vessel Welds PDI-UT-6

Calibration Sheets	Exam Data Sheets	Indication Data Sheets	Indication Plot Sheets	Coverage Worksheet	Coverage Diagram	Exam Results
CS-01	EDS-01	N/A	N/A	Yes	Yes	Acceptable
CS-02	EDS-02					
CS-03						

Summary:

Manual ultrasonic examinations were performed on the referenced weld during B223R1.

In accordance with UT Procedure 54-ISI-805-009, 60° Longitudinal wave examinations were performed from the vessel surface in both the radial and circumferential scan directions.

In accordance with UT Procedure 54-ISI-850-008 and the referenced EPRI model the following examinations were performed.

CRD-HYD System Return (N9) Nozzle Modeling Parameters		
Probe	Probe Skew	Scan Surface
50° Shear	± (44° to 65°)	Vessel

72.8% coverage of the required examination volume was obtained. The percentage of coverage for this examination was calculated to the maximum extent possible allowed by the procedure qualification and actual component field conditions for this configuration.

This examination was performed using the alternative examination volume defined in code case N-613-1 which reduces the area to be examined per IWB-2500-7 to the weld plus ½" on each side.

This examination satisfies the requirements of ASME Sec. XI 2001 Edition with 2003 Addenda for Category B-D, item number B3.90, figure number IWB 2500-7 (b) exam volume, and was performed using ASME Sec XI, Appendix VIII qualified personnel, procedures, and equipment.

Personnel	Name	Signature	Level	Date
Prepared By:	Edward P. Mazyck	Edward P. Mazyck	III	03/21/2017
Prepared By:	Wade Holloway	Wade Holloway	III	03/21/2017
AREVA Review:	David Zimmerman	David C. Z	III	03/28/2017
Customer:	Ned Finney	Ned Finney	III	3/28/2017
ANII:	David M. Reynolds	David M. Reynolds	N/A	3/28/2017

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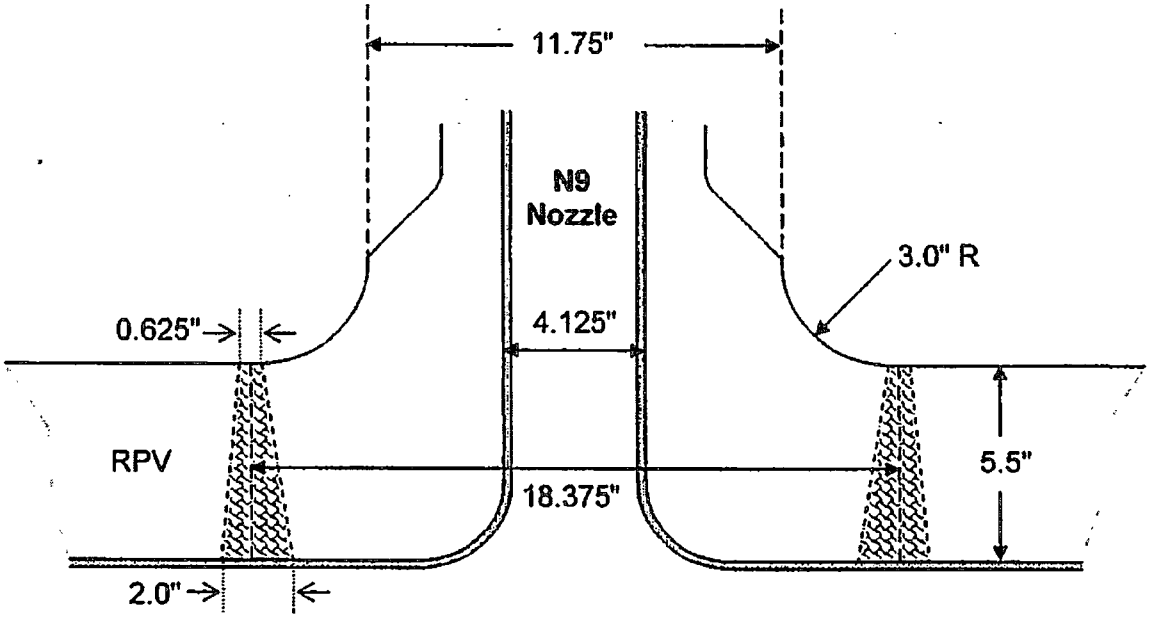
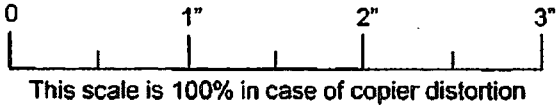
AREVA	Supplemental Data Sheet	Page:	7 of 12
		Component ID:	2B11-RPV-N9
		Utility:	Duke Energy
		Site / Unit:	Brunswick / 2

Sketch: 1
Subject: Nozzle Overview
Scale: 20%



Weld Length @ Centerline: (18.375 x π) = 57.7"



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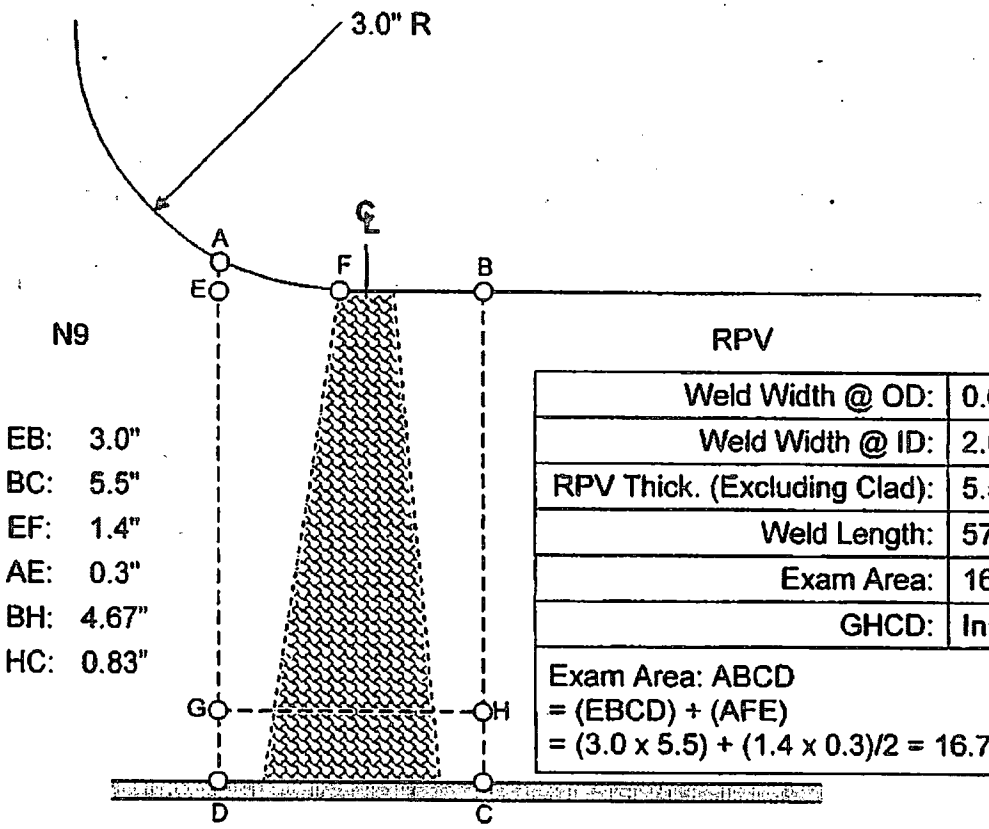
AREVA

Supplemental Data Sheet

Page:	8 of 12
Component ID:	2B11-RPV-N9
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 2
Subject: Dimensions & Weld fit up
Scale: 50%

Scan	Description
R100:	60° Radial Exam
C85:	60° Circ Exam / Outer 85%
C15:	50° Circ Exam / Inner 15%



N9

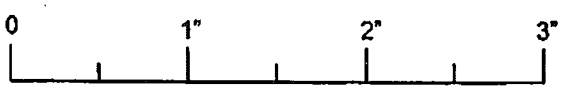
EB: 3.0"
BC: 5.5"
EF: 1.4"
AE: 0.3"
BH: 4.67"
HC: 0.83"

RPV

Weld Width @ OD:	0.625"
Weld Width @ ID:	2.0"
RPV Thick. (Excluding Clad):	5.5"
Weld Length:	57.7" @ CL
Exam Area:	16.71 in²
GHCD:	Inner 15%

Exam Area: ABCD
= (EBCD) + (AFE)
= (3.0 x 5.5) + (1.4 x 0.3)/2 = 16.71 in²

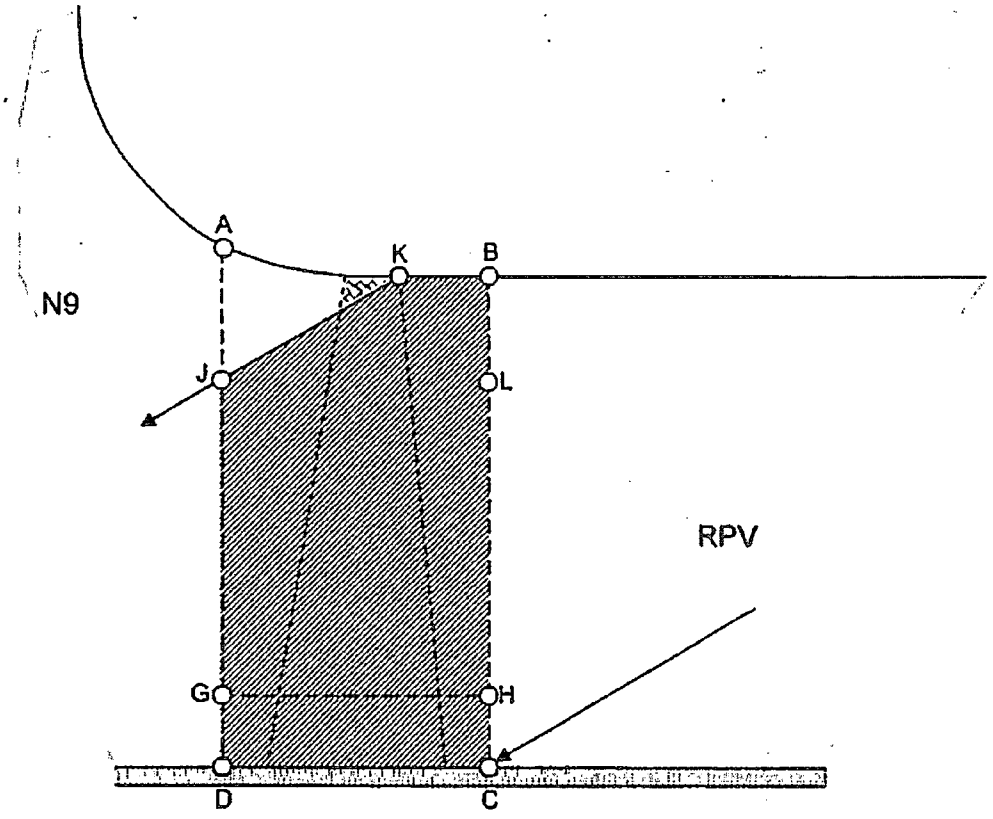
Note: Exam area extends to ½" beyond weld per code case N-613-1



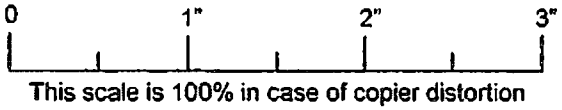
This scale is 100% in case of copier distortion

AREVA	Supplemental Data Sheet		
		Page:	9 of 12
		Component ID:	2B11-RPV-N9
		Utility:	Duke Energy
		Site / Unit:	Brunswick / 2

Sketch: 3
Scan: R100
Scale: 50%



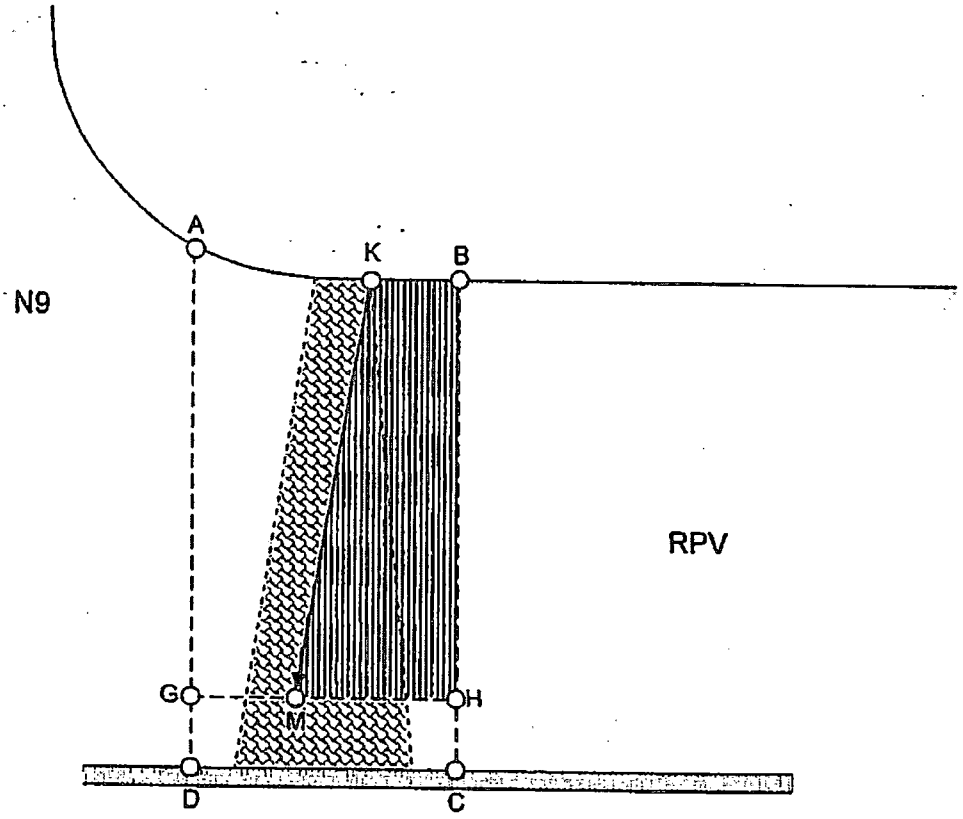
Exam Area (ABCD): 16.71 in²
Examined: (KBLJ) + (JLCD)
Examined: 1.2(1.0 + 3.0)/2 + (3.0 x 4.3) = 15.30 in²



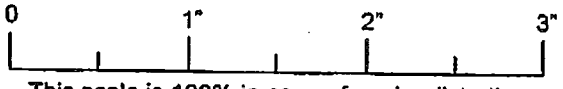
This scale is 100% in case of copier distortion

AREVA	Supplemental Data Sheet	Page: 10 of 12
		Component ID: 2B11-RPV-N9
		Utility: Duke Energy
		Site / Unit: Brunswick / 2

Sketch: 4
Scan: C85
Scale: 50%



Exam Area (ABCD): 16.71 in²
Examined: (KBHM)
Examined: 4.67(1.0 + 1.8)/2 = 6.54 in²



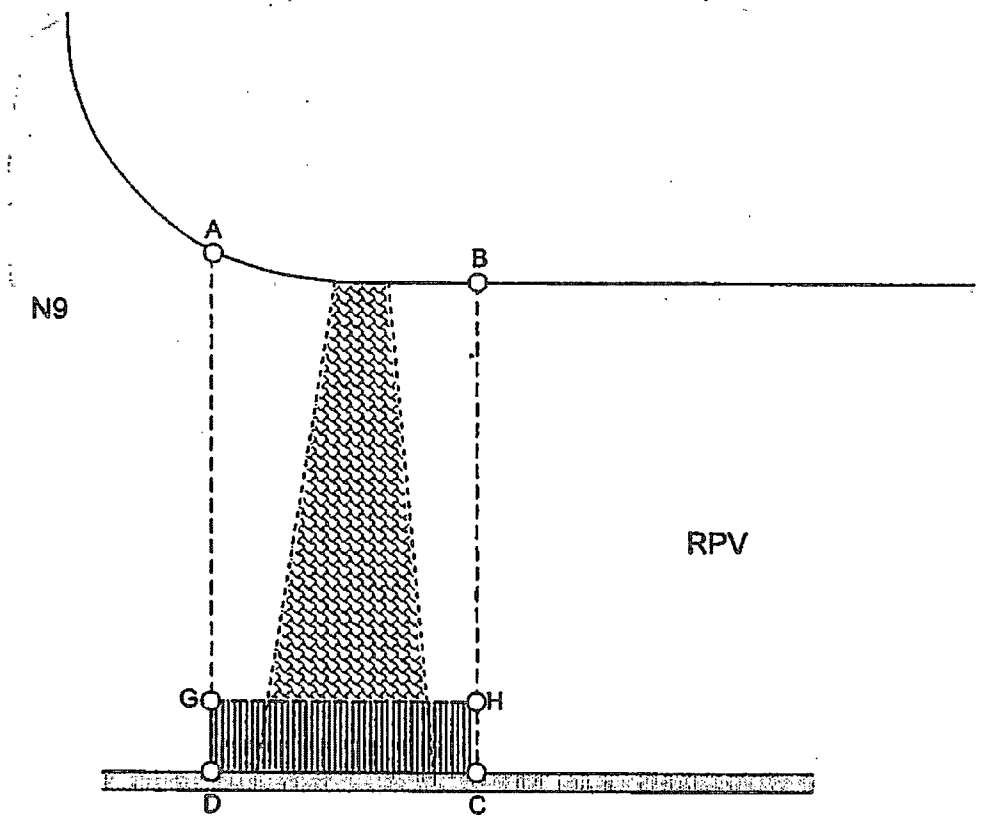
This scale is 100% in case of copier distortion

AREVA

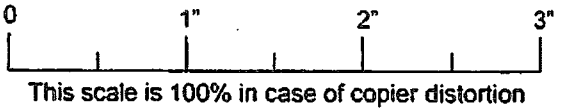
Supplemental Data Sheet

Page:	11 of 12
Component ID:	2B11-RPV-N9
Utility:	Duke Energy
Site / Unit:	Brunswick / 2

Sketch: 5
Scan: C15
Scale: 50%



Exam Area (ABCD): 16.71 in²
Examined: (GHCD)
Examined: (3.0 x 0.83) = 2.49 in²



This scale is 100% in case of copier distortion

AREVA

Supplemental Data Sheet

Page: 12 of 12
Component ID: 2B11-RPV-N9
Utility: Duke Energy
Site / Unit: Brunswick / 2

ASME Code Coverage Calculation

Component Information
Exam Area: 16.71 in²
Exam Length: 57.7"

Scan	Description
R100:	60° Radial Exam
C85:	60° Circ Exam / Outer 85%
C15:	50° Circ Exam / Inner 15%

See Sketch	Scan	Area Examined		Exam Area		Length Examined		Exam Length		Percent Coverage
3	R100	(15.30	/	16.71	) x (	57.7	/	57.7	) x 100 =	91.56%
4	C85	(6.54	/	16.71	) x (	57.7	/	57.7	) x 100 =	39.14%
5	C15	(2.49	/	16.71	) x (	57.7	/	57.7	) x 100 =	14.90%
		(	/	~	) x (		/	~	) x 100 =	~
		(	/	~	) x (		/	~	) x 100 =	~
									Total Percent:	145.60%
									Code Examination Coverage (Total Percent / 2 Sound Beams):	72.8%

Reference the following for Nozzle Dimensions
Contract No.: 68-2471 / 72, Dwg. No.: 37 Rev 10
Note: 100% radial & circumferential coverage obtained in the lower 15% of exam volume.

Personnel	Name	Signature	Level	Date
Prepared By:	Simon Crothers	Simon Crothers	II	03/27/17
Reviewed By:	David K. Zimmerman	David K. Z	III	03/27/2017
Site Review:	NED FINNEY	Ned Finney	III	5/28/17

UT Calibration/Examination

Nuclear Generation Group

Site/Unit: BNP / 2 | Procedure: NDEP-0448 | Outage No.: B223R1
Summary No.: 2-E11-3766 | Procedure Rev.: 4 | Report No.: UT-18-026
Workscope: ISI | Work Order No.: 20200956 | Page: 1 of 7

Code: 2001 EDITION/2003 ADDENDA | Cal./Item: C-B/C2.21 | Location:
Drawing No.: C-02404 Sht. 075-1 | Description: RHR HTX 2A INLET NOZZLE TO HEAD
System ID: 2045
Component ID: 2E11HX-2A-SWN3 | Size/Length: 1.2" / 61.5" | Thickness/Diameter: CS/0.875"/26.0"
Limitations: Yes - Single Sided Exam Due to Nozzle configuration | Start Time: 1450 | Finish Time: 1600

Instrument Settings

Serial No.:	15AD24PE		
Manufacturer:	GE		
Model:	USN 60 SW	Linearity:	L-18-045
Delay:	0.5875	Range:	2.0"
Mil Cal/Vel:	0.2327	Pulser Type:	Square
Damping:	500 Ohms	Reject:	0%
PRF:	Auto High	SU Freq.:	5.0 MHz
Frequency:	5.0 MHz	Rectify:	Fullwave
Voltage:	450	Pulse Width:	130

Ax. Gain (dB): 12.6 | Circ. Gain (dB): N/A
1 Screen Div. = .2 In. of Sound Path

Calibration Block

Cal. Block No.: 071B
Thickness: .875" | Dia.: Flat
Cal. Blk. Temp.: 72 | Temp. Tool: G503099
Comp. Temp.: 83 | Temp. Tool: G503093

Search Unit

Serial No.:	01D0NH		
Manufacturer:	KBA		
Size:	0.250"	Model:	Gamma
Freq.:	5.0 MHz	Center Freq.:	N/A
Exam Angle:	0	Squint Angle:	N/A
Measured Angle:	N/A	Mode:	Long
Exit Point:	N/A	# of Elements:	1
Config.:	Single	Focus:	N/A
Shape:	Round	Contour:	Flat
Wedge Style:	Integral		

Search Unit Cable

Type: RG-174 | Length: 6' | No. Conn.: 0

Scan Coverage

Upstream ☐ Downstream ☑ Scan dB: 33.0
CW ☐ CCW ☐ Scan dB: N/A
Exam Surface: O.D.
Surface Condition: As Ground

Cal. Checks	Time	Date
Initial Cal.	1010	4/19/2018
Inter. Cal.	1450	4/19/2018
Inter. Cal.	N/A	
Inter. Cal.	1504	4/19/2018
Final Cal.	1700	4/19/2018

Couplant

Cal. Batch: 15D016
Type: ULTRAGEL II
Mfg.: MAGNAFLUX
Exam Batch: 16B022
Type: Ultragel II
Mfg.: Magnaflux

Reference Block

Serial No.: 16-4047
Type: Rompas

Axial Oriented Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
1/2T Hole	81	4.4	0.881

Circumferential Oriented Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
20.5	FSDH	78	3.6	0.723

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)
Results: Sat ☑ Unsat ☐ Eval ☐ NCR # 02200157
Percent Of Coverage Obtained > 90%: No - 50% | Reviewed Previous Data: N/A

Comments: Initial Section XI UT exam. Lamination Scan. No examination from Nozzle side due to configuration.

	Level		Signature	Date
Examiner: Goldsmith, C. Tony	II-N	Tony Goldsmith		4/19/2018
Examiner: N/A	N/A			
Other: N/A	N/A			

Reviewer: JASon POLISZCZUK L-III	Jason Poliszczuk		4/20/18
Site Review: Chris Winslow	Chris Winslow		
ANII Review: David M. Reynolds	David M. Reynolds		5-9-2018

UT Calibration/Examination

Site/Unit: BNP / 2 | Procedure: NDEP-0448 | Outage No.: B223R1
Summary No.: 2-E11-3759 | Procedure Rev.: 4 | Report No.: UT-18-029
Workscope: ISI | Work Order No.: 20200656 | Page: 2 of 7

Code: 2001 EDITION/2003 ADDENDA | Cat./Item: C-B/C2.21 | Location:
Drawing No.: C-02604 Sht 075-1 | Description: RHR HTX 2A INLET NOZZLE TO HEAD
System ID: 2045
Component ID: 2E11HX-2A-SWN3 | Size/Length: 1.2" / 81.5" | Thickness/Diameter: CS/0.675"/28.0"
Limitations: Yes - Due to Nozzle Configuration | Start Time: 1450 | Finish Time: 1600

Instrument Settings

Serial No.:	18A024PE		
Manufacturer:	GE		
Model:	USN 60 SW	Linearity:	L-18-045
Delay:	4.8582	Range:	4.0"
Mtl Cal/Vel:	0.1282	Pulser Type:	Square
Damping:	500 Ohms	Reject:	0%
PRF:	Auto High	SU Freq.:	2.25 MHz
Frequency:	2.25 MHz	Rectify:	Fullwave
Voltage:	450	Pulse Width:	220

Ax. Gain (dB): 33.0 | Circ. Gain (dB): 33.0
1 Screen Div. = 0.4 in. of Sound Path

Calibration Block

Cal. Block No.: 0718
Thickness: .675" | Dia.: Flat
Cal. Blk. Temp.: 72 | Temp. Tool: G503096
Comp. Temp.: 83 | Temp. Tool: G503096

Search Unit

Serial No.:	5E0651		
Manufacturer:	KRAUTKRAMER		
Size:	0.5"	Model:	Comp - G
Freq.:	2.25 MHz	Center Freq.:	N/A
Exam Angle:	45	Squint Angle:	N/A
Measured Angle:	46	Mode:	Shear
Exit Point:	.50"	# of Elements:	1
Config.:	Single	Focus:	N/A
Shape:	Round	Contour:	Flat
Wedge Style:	MSWQC		

Search Unit Cable

Type: RG-174 | Length: 6' | No. Conn.: 0

Scan Coverage

Upstream ☐ Downstream ☑ Scan dB: 42.0
CW ☑ CCW ☑ Scan dB: 42.0
Exam Surface: O.D.
Surface Condition: As Ground

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)
Results: Sat ☑ Unsat ☐ Eval ☐

Percent Of Coverage Obtained > 90%: No - 50% | Reviewed Previous Data: N/A

Cal. Checks	Time	Date
Initial Cal.	1018	4/19/2018
Inter. Cal.	1505	4/19/2018
Inter. Cal.	N/A	
Inter. Cal.	1527	4/19/2018
Final Cal.	1650	4/19/2018

Couplant

Cal. Batch: 15D018
Type: ULTRAGEL II
Mfg.: MAGNAFLUX
Exam Batch: 16B022
Type: Ultragel II
Mfg.: Magnaflux

Reference Block

Serial No.: 16-4047
Type: Rompas

Axial Oriented Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
ID Notch	80	3.1	1.23
OD Notch	35	6.0	2.4
ID Notch	17	9.0	3.6

Circumferential Oriented Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
See Axial			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
18.6	1" Radius	80	2.5	1.0

Comments: Initial Section XI UT Exam. No Examination from Nozzle side due to configuration. Circ Scan limitation due to Nozzle & Weld configuration.

Examiner	Level	II-N	Signature	Date	Reviewer	Signature	Date
Goldsmith, C. Tony			Tony Goldsmith	4/19/2018	JASON POLISENSKY L-III	Jason Polisensky	4/20/18
Examiner	Level	N/A	Signature	Date	Site Review	Signature	Date
N/A							
Other	Level	N/A	Signature	Date	ANII Review	Signature	Date
N/A					David M. Reynolds	David M. Reynolds	5-9-2018

UT Calibration/Examination

NGG Nuclear Generation Group

Site/Unit: BNP / 2 | Procedure: NDEP-0448 | Outage No.: B223R1
Summary No.: 2-E11-3756 | Procedure Rev.: 4 | Report No.: UT-18-026
Worksope: ISI | Work Order No.: 20200956 | Page: 3 of 7

Code: 2001 EDITION/2003 ADDENDA | Cat./Item: C-B/C2.21 | Location:
Drawing No.: C-02404 Sht. 075-1 | Description: RHR HTX 2A INLET NOZZLE TO HEAD
System ID: 2045
Component ID: 2E11HX-2A-SWN3 | Size/Length: 1.2" / 81.5" | Thickness/Diameter: CS/0.675"/26.0"
Limitations: Yes - Due to Nozzle Configuration | Start Time: 1450 | Finish Time: 1600

Instrument Settings

Serial No.:	16A024PE		
Manufacturer:	GE		
Model:	USN 60 SW	Linearity:	L-18-045
Delay:	9.8953	Range:	5.0"
Mtl Cal/Vel:	0.1280	Pulser Type:	Square
Damping:	500 Ohms	Reject:	0%
PRF:	Auto High	SU Freq.:	2.25 MHz
Frequency:	2.25 MHz	Rectify:	Fullwave
Voltage:	450	Pulse Width:	220
Ax. Gain (dB):	46.7	Circ. Gain (dB):	N/A

1 Screen Div. = 0.5 in. of Sound Path

Calibration Block

Cal. Block No.: 071B
Thickness: .675" | Dia.: Flat
Cal. Blk. Temp.: 72 | Temp. Tool: G503098
Comp. Temp.: 83 | Temp. Tool: G503098

Search Unit

Serial No.:	SE0381		
Manufacturer:	GE		
Size:	0.5"	Model:	Comp - G
Freq.:	2.25 MHz	Center Freq.:	N/A
Exam Angle:	70	Squint Angle:	N/A
Measured Angle:	70	Mode:	Shear
Exit Point:	0.70"	# of Elements:	1
Config.:	Single	Focus:	N/A
Shape:	Round	Contour:	Flat
Wedge Style:	MSWGC		

Search Unit Cable

Type: RG-174 | Length: 6' | No. Conn.: 0

Scan Coverage

Upstream ☐ Downstream ☑ Scan dB: 54.0
CW ☐ CCW ☐ Scan dB: N/A
Exam Surface: O.D.
Surface Condition: As Ground

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)
Results: Sat ☑ Unsat ☐ Eval ☐

Percent Of Coverage Obtained > 90%: No - 50% | Reviewed Previous Data: N/A

Cal. Checks	Time	Date
Initial Cal.	1055	4/19/2018
Inter. Cal.	1528	4/19/2018
Inter. Cal.	N/A	
Inter. Cal.	1543	4/19/2018
Final Cal.	1655	4/19/2018

Couplant

Cal. Batch: 150916
Type: ULTRAGEL II
Mfg.: MAGNAFLUX
Exam Batch: 168022
Type: Ultragel II
Mfg.: Magnaflux

Reference Block

Serial No.: 16-4047
Type: Rompas

Axial Oriented Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
ID Notch	79	5	2.49

Circumferential Oriented Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
18.4	1" Radius	81	2	1.0

Comments: Initial Section XI UT Exam. Supplemental exam for coverage.

Examiner: Goldsmith, C. Tony	Level: II-N	Signature: Tony Goldsmith	Date: 4/19/2018	Reviewer: JASON POLISENSKY L III	Signature: Jason Polisensky	Date: 4/20/18
Examiner: N/A	Level: N/A	Signature	Date	Site Review: Chris Winslow	Signature	Date
Other: N/A	Level: N/A	Signature	Date	ANII Review	Signature: David M. Reynolds	Date: 5-9-2018

NGG Nuclear Generation Group

Supplemental Report

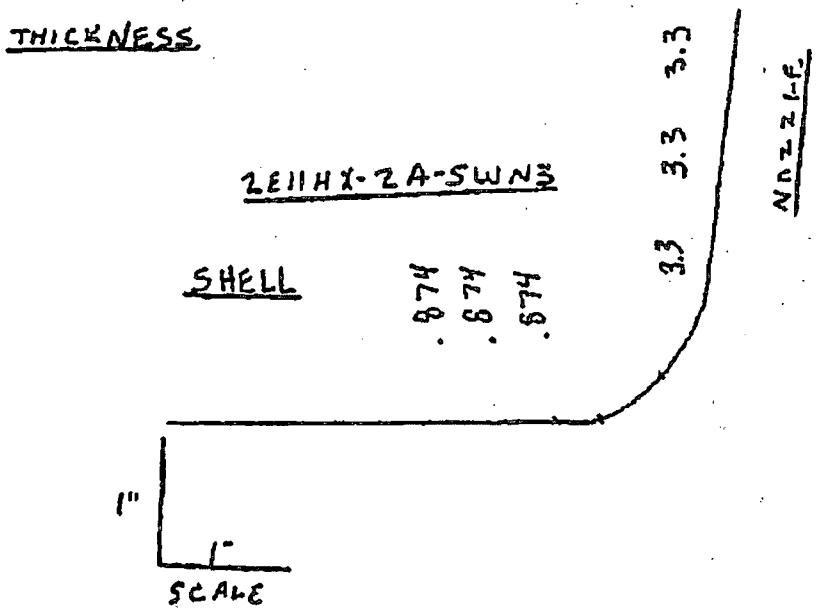
Report No.: UT-18-026
Page: 4 of 7

Summary No.: 2-E11-3756

Examiner: Goldsmith, C. Tony — Level: II-N — Reviewer: J. Polensky III — Date: 4/20/18
Examiner: N/A — Level: N/A — Site Review: — Date:
Other: N/A — Level: N/A — ANII Review: David M. Reynolds — Date: 5-9-2018

Comments: T&C

Sketch or Photo: Z:\Unit 2\B223\Profiles & Contour\2E11HX-2A-SWN3 Pg1.bmp



NGG Nuclear Generation Group

Supplemental Report

Report No.: UT-18-026
Page: 5 of 7

Summary No.: 2-E11-3758

Examiner: Goldsmith, C. Tony — Level: II-N — Reviewer: J. Polisensky L-III — Date: 4/20/18
Examiner: N/A — Level: N/A — Site Review: — Date:
Other: N/A — Level: N/A — ANII Review: David M. Reynolds — Date: 5-9-2018
Reviewed by: D.B.K. UTC w/ PT — 4/26/18

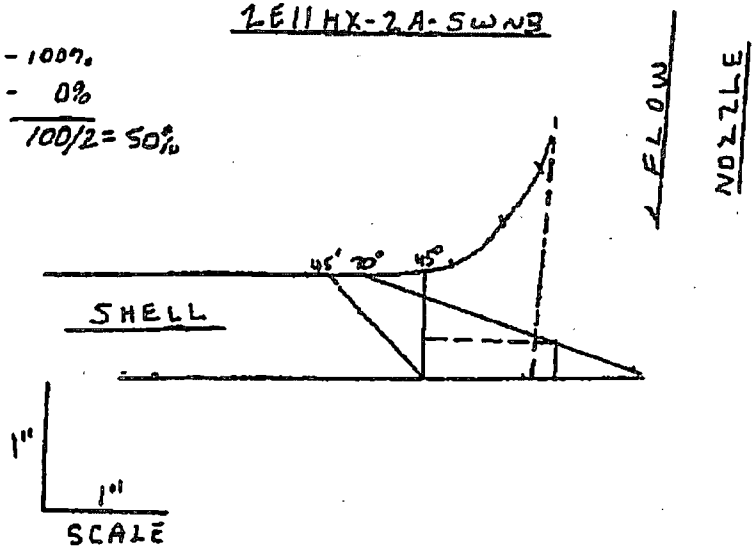
Comments: Coverage Plot
50% Examination Coverage Achieved

Sketch or Photo: Z:\Unit 2\B223\Profiles & Contour\2E11HX-2A-SWN3 Pg2.bmp

COVERAGE PLOT

2E11HX-2A-SWN3

AXIAL - 100%
CIRC - 0%
100/2 = 50%



UT Calibration/Examination

Nuclear Generation Group

Site/Unit: BNP / 2 | Procedure: NDEP-0448 | Outage No.: B222R1
Summary No.: 2-E11-3757 | Procedure Rev.: 003 TR B | Report No.: UT-15-014
Workscope: ISI | Work Order No.: 2252945 | Page: 1 of 13

Code: ASME XI, 2001 Ed., 03 Ad. | Cat./Item: C-B/C2.21 | Location: See ISO
Drawing No.: C-02404 Sht. 075-1 | Description: RHR HTX 2A OUTLET NOZZLE TO SHELL
System ID: 2045
Component ID: 2E11HX-2A-SWN4 | Size/Length: 24"/75.398" | Thickness/Diameter: 1.0"/24"
Limitations: SCANNED FROM SHELL SIDE ONLY | Start Time: 1215 | Finish Time: 1325

Instrument Settings

Serial No.:	106946		
Manufacturer:	GEIT		
Model:	USN 58LSW	Linearity:	L-15-003
Delay:	6.4641	Range:	4.0"
M'tl Cal/Vel:	0.1266	Pulser Type:	Square
Damping:	500 Ohms	Reject:	0%
PRF:	Auto High	SU Freq.:	2.25 MHz
Frequency:	2.25 MHz	Rectify:	Fullwave
Voltage:	450	Pulse Width:	220

Ax. Gain (dB): 25.0 | Circ. Gain (dB): N/A
10 Screen Div. = 4.0 in. of Sound Path

Calibration Block

Cal. Block No.: 072B
Thickness: 1.125" | Dia.: FLAT
Cal. Blk. Temp.: 75° | Temp. Tool: 106898
Comp. Temp.: 72° | Temp. Tool: 106898

Search Unit

Serial No.:	SE2096		
Manufacturer:	GEIT		
Size:	0.5"	Model:	Comp-G
Freq.:	2.25 MHz	Center Freq.:	N/A
Exam Angle:	45°	Squint Angle:	N/A
Measured Angle:	45°	Mode:	Shear
Exit Point:	0.35"	# of Elements:	1
Config.:	Single	Focus:	N/A
Shape:	Round	Contour:	N/A
Wedge Style:	Non-Integral		

Search Unit Cable

Type: RG-174 | Length: 6 | No. Conn.: 0

Scan Coverage

Upstream ☑ | Downstream ☐ | Scan dB: 37.0
CW ☑ | CCW ☑ | Scan dB: 37.0
Exam Surface: OD
Surface Condition: As Found

Cal. Checks	Time	Date
Initial Cal.	0840	3/6/2015
Inter. Cal.	1215	3/6/2015
Inter. Cal.	N/A	
Inter. Cal.	N/A	
Final Cal.	1607	3/6/2015

Couplant

Cal. Batch: 14M076
Type: Ultragel II
Mfg.: Magnaflux
Exam Batch: 14M076
Type: Ultragel II
Mfg.: Magnaflux

Reference Block

Serial No.: 103402
Type: Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
ID NOTCH	80%	4.0	1.590"
OD NOTCH	50%	8.0	3.160"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A	N/A	N/A	N/A

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
25.0	FSDH	85%	2.6	1.040"

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)
Results: Sat ☑ Unsat ☐ Eval ☐
Percent Of Coverage Obtained > 90%: 75% | Reviewed Previous Data: Yes

Comments: No recordable indications. See data report from 2004, no report number. Bottom 8" obstructed by adjacent girth weld.

Examiner	Level	Signature	Date
Michael, Dickey E.	II-PDI	Dickey Michael	3/6/2015
N/A	N/A		
N/A	N/A		

Reviewer	Signature	Date
David King, Lvl III		3/8/2015
Site Review: Scott Larson		3/12/2015
ANII Review: David M. Reynolds		3/12/2015

UT Calibration/Examination

NGG Nuclear Generation Group

Site/Unit:	BNP / 2	Procedure:	NDEP-0448	Outage No.:	B222R1
Summary No.:	2-E11-3757	Procedure Rev.:	003 TR B	Report No.:	UT-15-014
Workscope:	ISI	Work Order No.:	2252945	Page:	2 of 13

Code: ASME XI, 2001 Ed., 03 Ad. Cat./Item: C-B/C2.21 Location: See ISO

Drawing No.: C-02404 Sht. 075-1 Description: RHR HTX 2A OUTLET NOZZLE TO SHELL

System ID: 2045

Component ID: 2E11HX-2A-SWN4 Size/Length: 24"/75.398" Thickness/Diameter: 1.0"/24"

Limitations: SCANNED FROM SHELL SIDE ONLY Start Time: 1215 Finish Time: 1325

Instrument Settings

Serial No.: 106946
Manufacturer: GEIT
Model: USN 58LSW Linearity: L-15-003
Delay: 8.7219 Range: 5.0"
M'tl Cal/Vel: 0.1266 Pulser Type: Square
Damping: 500 Ohms Reject: 0%
PRF: Auto High SU Freq.: 2.25 MHz
Frequency: 2.25 MHz Rectify: Fullwave
Voltage: 450 Pulse Width: 220

Ax. Gain (dB): 44.0 Circ. Gain (dB): N/A
10 Screen Div. = 5.0 in. of Sound Path

Calibration Block

Cal. Block No.: 072B
Thickness: 1.125" Dia.: FLAT
Cal. Blk. Temp.: 75° Temp. Tool: 106898
Comp. Temp.: 72° Temp. Tool: 106898

Search Unit

Serial No.: SE2104
Manufacturer: GEIT
Size: 0.5" Model: Comp-G
Freq.: 2.25 MHz Center Freq.: N/A
Exam Angle: 60° Squint Angle: N/A
Measured Angle: 60° Mode: Shear
Exit Point: 0.50" # of Elements: 1
Config.: Single Focus: N/A
Shape: Round Contour: N/A
Wedge Style: Non-Integral

Search Unit Cable

Type: RG-174 Length: 6' No. Conn.: 0

Scan Coverage

Upstream ☑ Downstream ☐ Scan dB: 44.0
CW ☑ CCW ☑ Scan dB: 44.0
Exam Surface: OD
Surface Condition: As Found

Cal. Checks	Time	Date
Initial Cal.	0850	3/6/2015
Inter. Cal.	1248	3/6/2015
Inter. Cal.	N/A	
Inter. Cal.	N/A	
Final Cal.	1605	3/6/2015

Couplant

Cal. Batch: 14M076
Type: Ultragel II
Mfg.: Magnaflux
Exam Batch: 14M076
Type: Ultragel II
Mfg.: Magnaflux

Reference Block

Serial No.: 103402
Type: Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
ID NOTCH	80%	4.6	2.310"
OD NOTCH	40%	9.2	4.560"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A	N/A	N/A	N/A

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
32.0	FSDH	80%	2.9	1.450"

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)

Results: Sat ☑ Unsat ☐ Eval ☐

Percent Of Coverage Obtained > 90%: 75% Reviewed Previous Data: Yes

Comments: Previously recorded indications, verified no changes except amplitude is higher due to using notches. See 2004 data. Bottom 8" obstructed by adjacent girth weld.

Examiner	Level	Signature	Date
Michael, Dickey E.	II-PDI	Dickey Michael	3/6/2015
N/A	N/A		
N/A	N/A		

Reviewer	Signature	Date
David King, Lvl III		3/8/2015
Site Review: Scott Larson		3/12/2015
ANII Review: David M. Reynolds		3/12/2015

UT Calibration/Examination

NGG Nuclear Generation Group

Site/Unit:	BNP / 2	Procedure:	WDI-STD-006	Outage No.:	B222R1
Summary No.:	2-E11-3757	Procedure Rev.:	7	Report No.:	UT-15-014
Workscope:	ISI	Work Order No.:	2252945	Page:	3 of 13

Code: ASME XI, 2001 Ed., 03 Ad. Cat./Item: C-B/C2.21 Location: See ISO

Drawing No.: C-02404 Sht. 075-1 Description: RHR HTX 2A OUTLET NOZZLE TO SHELL

System ID: 2045

Component ID: 2E11HX-2A-SWN4 Size/Length: 24"/75.398" Thickness/Diameter: 1.0"/24"

Limitations: NONE Start Time: 1341 Finish Time: 1400

Instrument Settings

Serial No.:	105209		
Manufacturer:	GEIT		
Model:	USN 60SW	Linearity:	L-15-002
Delay:	11.5103	Range:	2.5"
M'tl Cal/Vel:	0.1268	Pulser Type:	Square
Damping:	500 Ohms	Reject:	0%
PRF:	Auto High	SU Freq.:	2.25 MHz
Frequency:	2.25 MHz	Rectify:	Fullwave
Voltage:	450	Pulse Width:	220

Ax. Gain (dB): N/A Circ. Gain (dB): 34.0

10 Screen Div. = 2.5 in. of Sound Path

Calibration Block

Cal. Block No.:	072B		
Thickness:	1.125"	Dia.:	FLAT
Cal. Blk. Temp.:	67°	Temp. Tool:	106893
Comp. Temp.:	71°	Temp. Tool:	106893

Search Unit

Serial No.:	H30049		
Manufacturer:	KBA		
Size:	0.5" x 1.0"	Model:	GAMMA
Freq.:	2.25 MHz	Center Freq.:	N/A
Exam Angle:	48°	Squint Angle:	N/A
Measured Angle:	49°	Mode:	Shear
Exit Point:	0.70"	# of Elements:	1
Config.:	Square	Focus:	N/A
Shape:	Rect.	Contour:	Flat
Wedge Style:	Non-Integral		

Search Unit Cable

Type: RG-174 Length: 6' No. Conn.: 0

Scan Coverage

Upstream ☐ Downstream ☐ Scan dB: N/A

CW ☑ CCW ☑ Scan dB: 44.0

Exam Surface: OD

Surface Condition: As Found

Cal. Checks	Time	Date
Initial Cal.	1100	3/6/2015
Inter. Cal.	N/A	
Inter. Cal.	1340	3/6/2015
Inter. Cal.	N/A	
Final Cal.	1640	3/6/2015

Couplant

Cal. Batch:	14M076
Type:	Ultragel II
Mfg.:	Magnaflux
Exam Batch:	09225
Type:	Ultragel II
Mfg.:	Sonotech, Inc.

Reference Block

Serial No.:	104876
Type:	Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A	N/A	N/A	N/A

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
ID NOTCH	80%	6.9	1.688"

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
30.0	FSDH	80%	4.7	1.131"

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)

Results: Sat ☑ Unsat ☐ Eval ☐

Comments: Shell side scan +/- 63° to 87°. See sketch on supplemental report. Bottom 8" obstructed by adjacent girth weld.

Percent Of Coverage Obtained > 90%: 75% Reviewed Previous Data: Yes

Examiner	Level	Signature	Date	Reviewer		Signature	Date
Jennings, Jason J.	II-PDI		3/6/2015	David King, Lvl III			3/8/2015
Examiner	Level	Signature	Date	Site Review		Signature	Date
N/A	N/A			Scott Larson			3/12/2015
Other	Level	Signature	Date	ANII Review		Signature	Date
N/A	N/A			David M. Reynolds			3/12/2015

UT Calibration/Examination

NGG Nuclear Generation Group

Site/Unit: BNP / 2 | Procedure: WDI-STD-006 | Outage No.: B222R1
Summary No.: 2-E11-3757 | Procedure Rev.: 7 | Report No.: UT-15-014
Workscope: ISI | Work Order No.: 2252945 | Page: 4 of 13

Code: ASME XI, 2001 Ed., 03 Ad. | Cat./Item: C-B/C2.21 | Location: See ISO
Drawing No.: C-02404 Sht. 075-1 | Description: RHR HTX 2A OUTLET NOZZLE TO SHELL
System ID: 2045
Component ID: 2E11HX-2A-SWN4 | Size/Length: 24"/75.398" | Thickness/Diameter: 1.0"/24"
Limitations: NOZZLE BOSS LENGTH (SKETCH ATTACHED) | Start Time: 1457 | Finish Time: 1514

Instrument Settings

Serial No.: 105209
Manufacturer: GEIT
Model: USN 60SW | Linearity: L-15-002
Delay: 9.2556 | Range: 12.0"
M'tl Cal/Vel: 0.1294 | Pulser Type: Square
Damping: 500 Ohms | Reject: 0%
PRF: Auto High | SU Freq.: 2.25 MHz
Frequency: 2.25 MHz | Rectify: Fullwave
Voltage: 450 | Pulse Width: 220

Ax. Gain (dB): 56.5 | Circ. Gain (dB): 56.5
10 Screen Div. = 12.0 in. of Sound Path

Calibration Block

Cal. Block No.: 045BR
Thickness: 3.0" | Dia.: FLAT
Cal. Blk. Temp.: 69° | Temp. Tool: 106893
Comp. Temp.: 71° | Temp. Tool: 106893

Search Unit

Serial No.: SE2123
Manufacturer: GEIT
Size: 0.5" | Model: Comp-G
Freq.: 2.25 MHz | Center Freq.: N/A
Exam Angle: 70° | Squint Angle: N/A
Measured Angle: 70.5° | Mode: Shear
Exit Point: 0.65" | # of Elements: 1
Config.: Single | Focus: N/A
Shape: Round | Contour: Flat
Wedge Style: Non-Integral

Search Unit Cable

Type: RG-174 | Length: 6' | No. Conn.: 0

Scan Coverage

Upstream ☐ | Downstream ☐ | Scan dB: N/A
CW ☑ | CCW ☑ | Scan dB: 58.0
Exam Surface: OD
Surface Condition: As Found

Cal. Checks	Time	Date
Initial Cal.	1225	3/6/2015
Inter. Cal.	N/A	
Inter. Cal.	1456	3/6/2015
Inter. Cal.	N/A	
Final Cal.	1610	3/6/2015

Couplant

Cal. Batch: 14M076
Type: Ultragel II
Mfg.: Magnaflux
Exam Batch: 09225
Type: Ultragel II
Mfg.: Sonotech, Inc.

Reference Block

Serial No.: 104876
Type: Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
ID NOTCH	80%	7.6	9.029"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A	N/A	N/A	N/A

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
30.5	NSDH	80%	0.90	1.009"

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)
Results: Sat ☑ Unsat ☐ Eval ☐
Comments: Nozzle side scan +/- 123° to 137°. See sketch on supplemental report.
Percent Of Coverage Obtained > 90%: 75% | Reviewed Previous Data: Yes

Examiner	Level II-PDI	Signature	Date	Reviewer	Signature	Date
Jennings, Jason J.			3/6/2015	David King, Lvl III		3/8/2015
Examiner	Level N/A	Signature	Date	Site Review	Signature	Date
N/A				Scott Larson		3/8/2015
Other	Level N/A	Signature	Date	ANII Review	Signature	Date
N/A				David M. Reynolds		3/21/2015

NGG Nuclear Generation Group

Supplemental Report

Report No.: UT-15-014

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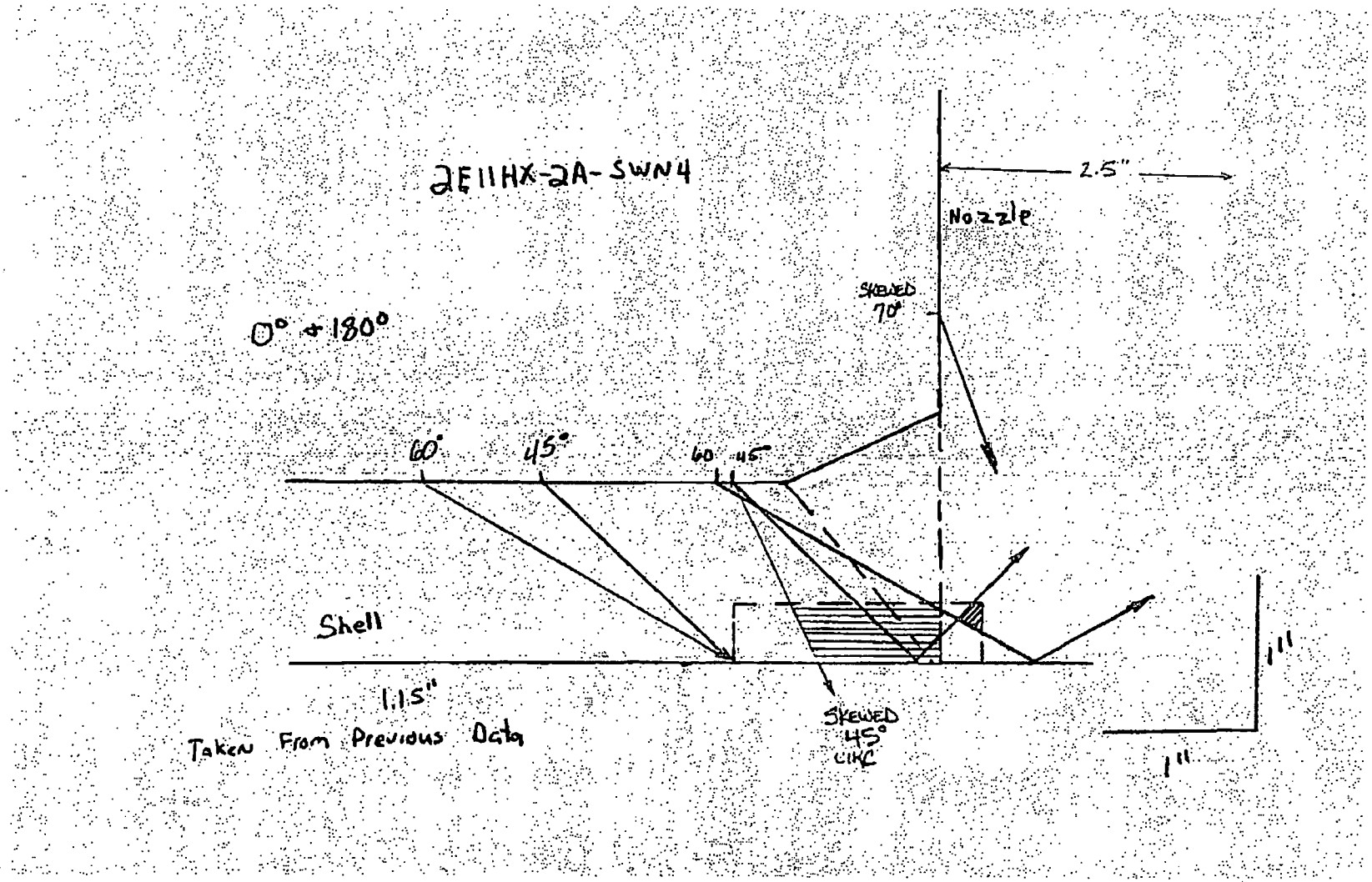
Summary No.: 2-E11-3757

Sketch or Photo: K:\Shared\Iddeal\B222R1 Scanned Data\2E11HX-2A-SWN4(1).jpg



NGG Nuclear Generation Group

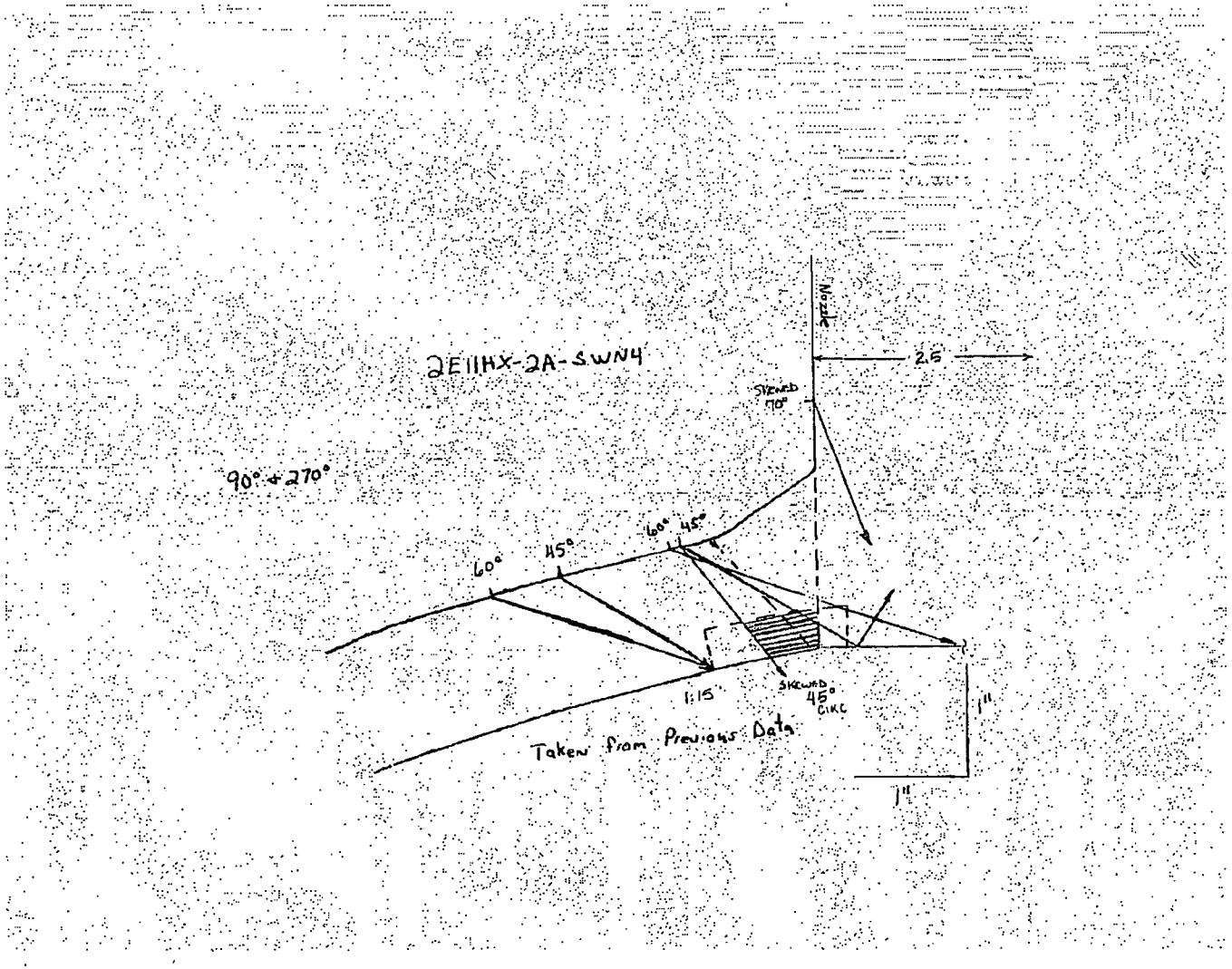
Supplemental Report

Report No.: UT-15-014

Page: 6 of 13

Summary No.: **2-E11-3757**

Sketch or Photo: K:\Shared\Iddeal\B222R1 Scanned Data\2E11HX-2A-SWN4(2).jpg



NGG Nuclear Generation Group

Supplemental Report

Report No.: UT-15-014

Page: 7 of 13

Summary No.: 2-E11-3757

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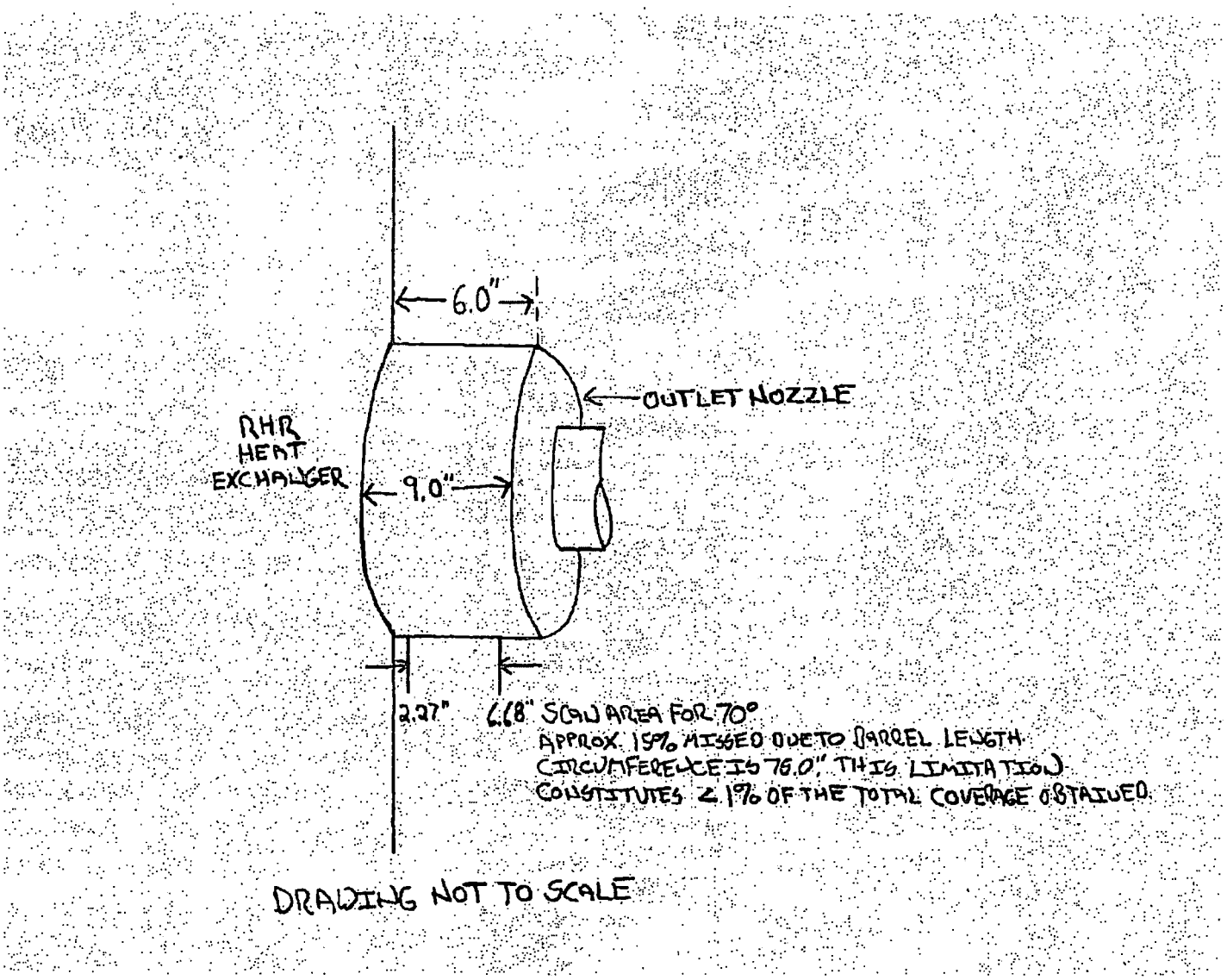


NGG Nuclear Generation Group

Supplemental Report

Report No.: UT-15-014

Page: 8 of 13

Summary No.: 2-E11-3757

Sketch or Photo: K:\Shared\lddeal\B222R1 Scanned Data\2E11HX-2A-SWN4(4).jpg

75.4" CIRC – 8" MISSED @ BDC = 89.5% *

1.6"
× 0.38"
0.608" SQ. IN.

0+180 AX
0.20
× 0.15
0.05
÷ 2
0.035
+
0.17
× 0.05
0.0085
÷ 2
0.004
+ 0.035
0.039
0.04"
÷ 0.608
0.07
(7%) MISSED
93% COVERAGE ACHIEVED

90-270 AX
100% COVERAGE ACHIEVED
100
+ 93
193
÷ 2
96.5%
* 89
× 0.965
86% ACHIEVED AX

90-270 CIRC
0.38 × 0.20
0.076
÷ 2
0.038
0.50 × 0.38
0.190
+ 0.190
0.228
0.23
23% MISSED

0-180 CIRC
0.38 × 0.20
0.076
÷ 2
0.038
0.775 × 0.38
0.2945
+ 0.290
0.328
0.33
33% MISSED

28% MISSED CIRC

* 89
× 0.72
64% ACHIEVED CIRC

86 + 64 = 150 ÷ 2 = 75.0%
TOTAL EXAM VOLUME COVERAGE

NGG Nuclear Generation Group

Supplemental Report

Report No.: **UT-15-014**

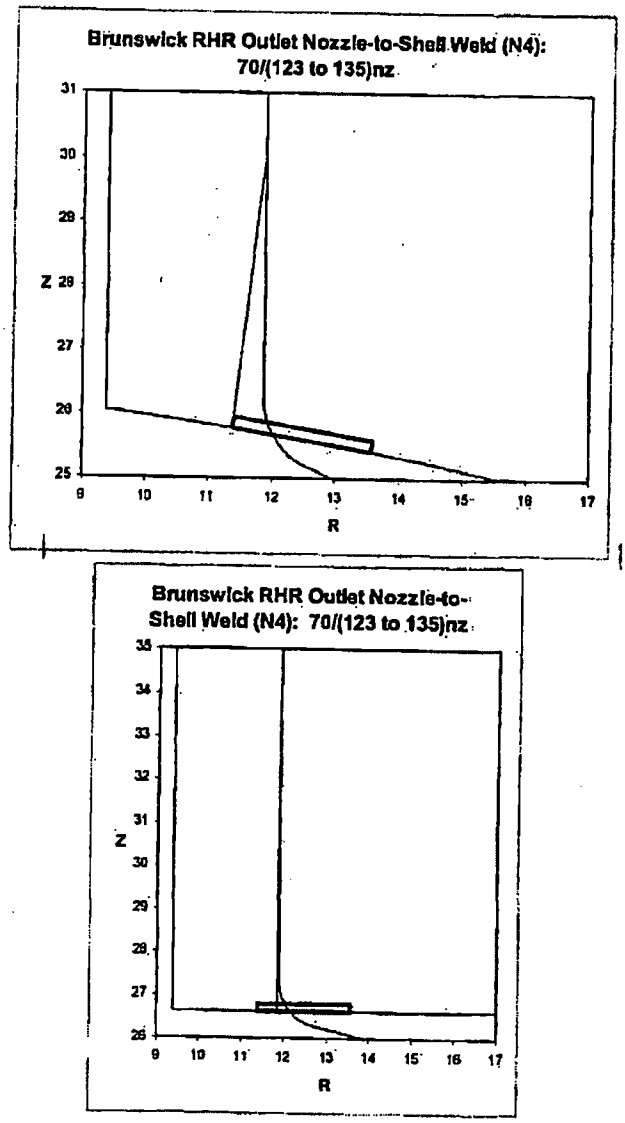
Page: **9** of **13**

Summary No.: **2-E11-3757**

Examiner:	**Michael, Dickey E.**	Level:	**II-PDI**	Reviewer:	**David King, Lvl III**	Date:	**3/8/2015**
Examiner:	**N/A**	Level:	**N/A**	Site Review:	**Scott Larson**	Date:	**3/12/2015**
Other:	**N/A**	Level:	**N/A**	ANII Review:	**David M. Reynolds**	Date:	**3/12/2015**

Comments: **Reference EPRI Model IR-2010-396.**

Sketch or Photo: K:\Shared\Iddeal\B222R1 Scanned Data\2E11HX-2A-SWN4(5).jpg



NGG Nuclear Generation Group

Supplemental Report

Report No.: UT-15-014

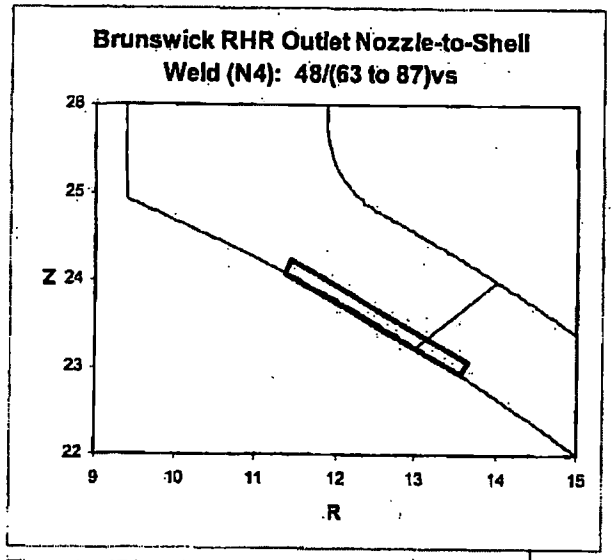
Page: 10 of 13

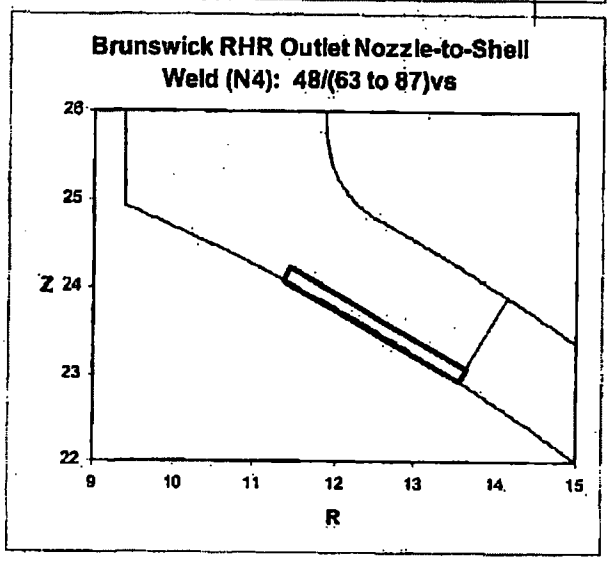
Summary No.: 2-E11-3757

Examiner:	Michael, Dickey E.	Level:	II-PDI	Reviewer: David King, Lvl III	Date: 3/8/2015
Examiner:	N/A	Level:	N/A	Site Review: Scott Larson	Date: 3/12/2015
Other:	N/A	Level:	N/A	ANII Review: David M. Reynolds	Date: 3/12/2015

Comments: **Reference EPRI Model IR-2010-396.**

Sketch or Photo: K:\Shared\Iddeal\B222R1 Scanned Data\2E11HX-2A-SWN4(6).jpg





Nuclear Generation Group

Supplemental Report

Report No.: UT-15-014

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Summary No.: 2-E11-3757

Examiner:	Michael, Dickey E.	Level:	II-PDI	Reviewer:	David King, Lvl III	Date:	3/8/2015
Examiner:	N/A	Level:	N/A	Site Review:	Scott Larson	Date:	3/12/2015
Other:	N/A	Level:	N/A	ANII Review:	David M. Reynolds	Date:	3/12/2015

Comments: **Reference EPRI Model IR-2010-396.**

Sketch or Photo: K:\Shared\Iddeal\B222R1 Scanned Data\2E11HX-2A-SWN4(7).jpg

Table 6-5
Brunswick Nozzle-to-Shell Weld Examination Modeling Parameters

Brunswick Nozzle ID	Metal Path		Beam Angle at Flaw		Maximum Misorientation	Percent Coverage
	Min	Max	Min	Max		
Core Spray (N5)	6.71	8.65	45	50	11	100
Head Spray (N6)	3.27	5.35	45	50	22	100
Vent (N7)	3.27	4.13	45	50	11	100
RHR Outlet (N4)	1.35	11.69	45	50	22	19

UT Calibration/Examination

NGG Nuclear Generation Group

Site/Unit:	BNP / 2	Procedure:	WDI-STD-006	Outage No.:	B222R1
Summary No.:	2-E11-3748	Procedure Rev.:	7	Report No.:	UT-15-013
Workscope:	ISI	Work Order No.:	2252945	Page:	1 of 8

Code:	ASME XI, 2001 Ed., 03 Ad.	Cat./Item:	C-B/C2.22	Location:	See ISO
Drawing No.:	C-02404 Sht. 075-1	Description:	RHR HTX 2A OUTLET NOZZLE INNER RADIUS		
System ID:	2045				
Component ID:	2E11HX-2A-N4NIR	Size/Length:	24"/75"	Thickness/Diameter:	1.0"/24"
Limitations:	NOZZLE/SHELL CONFIGURATION	Start Time:	1403	Finish Time:	1417

Instrument Settings

Serial No.:	105209		
Manufacturer:	GEIT		
Model:	USN 60SW	Linearity:	L-15-002
Delay:	10.9584	Range:	10.0
M'tl Cal/Vel:	0.1297	Pulser Type:	Square
Damping:	500 Ohms	Reject:	0%
PRF:	Auto High	SU Freq.:	2.25 MHz
Frequency:	2.25 MHz	Rectify:	Fullwave
Voltage:	450	Pulse Width:	220

Ax. Gain (dB): 39.0 Circ. Gain (dB): 39.0

10 Screen Div. = 10.0 in. of Sound Path

Calibration Block

Cal. Block No.: 045BR

Thickness: 3.0" Dia.: FLAT

Cal. Blk. Temp.: 69° Temp. Tool: 106893

Comp. Temp.: 71° Temp. Tool: 106893

Search Unit

Serial No.:	SE2123		
Manufacturer:	GEIT		
Size:	0.5"	Model:	Comp-G
Freq.:	2.25 MHz	Center Freq.:	N/A
Exam Angle:	55°	Squint Angle:	N/A
Measured Angle:	55°	Mode:	Shear
Exit Point:	0.60"	# of Elements:	1
Config.:	Single	Focus:	N/A
Shape:	Round	Contour:	Flat
Wedge Style:	Non-Integral		

Search Unit Cable

Type: RG-174 Length: 6' No. Conn.: 0

Scan Coverage

Upstream ☐ Downstream ☐ Scan dB: N/A

CW ☑ CCW ☑ Scan dB: 45.0

Exam Surface: OD

Surface Condition: As Found

Cal. Checks	Time	Date
Initial Cal.	1205	3/6/2015
Inter. Cal.	N/A	
Inter. Cal.	1402	3/6/2015
Inter. Cal.	N/A	
Final Cal.	1600	3/6/2015

Couplant

Cal. Batch:	14M076
Type:	Ultragel II
Mfg.:	Magnaflux
Exam Batch:	09225
Type:	Ultragel II
Mfg.:	Sonotech, Inc.

Reference Block

Serial No.:	104876
Type:	Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
ID NOTCH	80%	5.10	5.086"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A	N/A	N/A	N/A

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
29.0	FSDH	80%	1.3	1.267"

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)

Results: Sat ☑ Unsat ☐ Eval ☐

Percent Of Coverage Obtained > 90%: 55% Reviewed Previous Data: Yes

Comments: **Nozzle side circ scan +/- 123° skew.**

Examiner	Level	II-PDI	Signature	Date	Reviewer	Signature	Date
Jennings, Jason J.				3/6/2015	David King, Lvl III		3/8/2015
Examiner	Level	N/A	Signature	Date	Site Review	Signature	Date
N/A					Scott Larson		3/12/2015
Other	Level	N/A	Signature	Date	ANII Review	Signature	Date
N/A					David M. Reynolds		3/12/2015

UT Calibration/Examination

NGG Nuclear Generation Group

Site/Unit:	BNP / 2	Procedure:	WDI-STD-006	Outage No.:	B222R1
Summary No.:	2-E11-3748	Procedure Rev.:	7	Report No.:	UT-15-013
Workscope:	ISI	Work Order No.:	2252945	Page:	2 of 8

Code: ASME XI, 2001 Ed., 03 Ad. Cat./Item: C-B/C2.22 Location: See ISO

Drawing No.: C-02404 Sht. 075-1 Description: RHR HTX 2A OUTLET NOZZLE INNER RADIUS

System ID: 2045

Component ID: 2E11HX-2A-N4NIR Size/Length: 24"/75" Thickness/Diameter: 1.0"/24"

Limitations: NOZZLE/SHELL CONFIGURATION Start Time: 1420 Finish Time: 1435

Instrument Settings

Serial No.:	105209		
Manufacturer:	GEIT		
Model:	USN 60SW	Linearity:	L-15-002
Delay:	8.2403	Range:	11.0"
M'tl Cal/Vel:	0.1289	Pulser Type:	Square
Damping:	500 Ohms	Reject:	0%
PRF:	Auto High	SU Freq.:	2.25 MHz
Frequency:	2.25 MHz	Rectify:	Fullwave
Voltage:	450	Pulse Width:	220

Ax. Gain (dB): 46.0 Circ. Gain (dB): 46.0

10 Screen Div. = 11.0 in. of Sound Path

Calibration Block

Cal. Block No.: 045BR

Thickness: 3.0" Dia.: FLAT

Cal. Blk. Temp.: 69° Temp. Tool: 106893

Comp. Temp.: 71° Temp. Tool: 106893

Search Unit

Serial No.:	SE2123		
Manufacturer:	GEIT		
Size:	0.5"	Model:	Comp-G
Freq.:	2.25 MHz	Center Freq.:	N/A
Exam Angle:	60°	Squint Angle:	N/A
Measured Angle:	60°	Mode:	Shear
Exit Point:	0.60"	# of Elements:	1
Config.:	Single	Focus:	N/A
Shape:	Round	Contour:	Flat
Wedge Style:	Non-Integral		

Search Unit Cable

Type: RG-174 Length: 6' No. Conn.: 0

Scan Coverage

Upstream ☐ Downstream ☐ Scan dB: N/A

CW ☑ CCW ☑ Scan dB: 53.0

Exam Surface: OD

Surface Condition: As Found

Cal. Checks	Time	Date
Initial Cal.	1210	3/6/2015
Inter. Cal.	N/A	
Inter. Cal.	1419	3/6/2015
Inter. Cal.	N/A	
Final Cal.	1603	3/6/2015

Couplant

Cal. Batch:	14M076
Type:	Ultragel II
Mfg.:	Magnaflux
Exam Batch:	09225
Type:	Ultragel II
Mfg.:	Sonotech, Inc.

Reference Block

Serial No.: 104876

Type: Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
ID NOTCH	80%	5.4	5.841"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A	N/A	N/A	N/A

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
80.0	FSDH	80%	1.4	1.470"

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)

Results: Sat ☑ Unsat ☐ Eval ☐

Comments: Nozzle side circ scan +/- 118° to 132° skew.

Percent Of Coverage Obtained > 90%: 55% Reviewed Previous Data: Yes

Examiner	Level	Signature	Date	Reviewer		Signature	Date
Jennings, Jason J.	II-PDI		3/6/2015	David King, Lvl III			3/8/2015
Examiner	Level	Signature	Date	Site Review		Signature	Date
N/A	N/A			Scott Larson			3/8/2015
Other	Level	Signature	Date	ANII Review		Signature	Date
N/A	N/A			David M. Reynolds			3/12/2015

UT Calibration/Examination

NGG Nuclear Generation Group

Site/Unit: BNP / 2 | Procedure: WDI-STD-006 | Outage No.: B222R1
Summary No.: 2-E11-3748 | Procedure Rev.: 7 | Report No.: UT-15-013
Workscope: ISI | Work Order No.: 2252945 | Page: 3 of 8

Code: ASME XI, 2001 Ed., 03 Ad. | Cat./Item: C-B/C2.22 | Location: See ISO
Drawing No.: C-02404 Sht. 075-1 | Description: RHR HTX 2A OUTLET NOZZLE INNER RADIUS
System ID: 2045
Component ID: 2E11HX-2A-N4NIR | Size/Length: 24"/75" | Thickness/Diameter: 1.0"/24"
Limitations: NOZZLE/SHELL CONFIGURATION | Start Time: 1438 | Finish Time: 1454

Instrument Settings

Serial No.: 105209
Manufacturer: GEIT
Model: USN 60SW | Linearity: L-15-002
Delay: 10.3859 | Range: 10.0"
M'tl Cal/Vel: 0.1297 | Pulser Type: Square
Damping: 500 Ohms | Reject: 0%
PRF: Auto High | SU Freq.: 2.25 MHz
Frequency: 2.25 MHz | Rectify: Fullwave
Voltage: 450 | Pulse Width: 220

Ax. Gain (dB): 52.0 | Circ. Gain (dB): 52.0
10 Screen Div. = 10.0 in. of Sound Path

Calibration Block

Cal. Block No.: 045BR
Thickness: 3.0" | Dia.: FLAT
Cal. Blk. Temp.: 69° | Temp. Tool: 106893
Comp. Temp.: 71° | Temp. Tool: 106893

Search Unit

Serial No.: SE2123
Manufacturer: GEIT
Size: 0.5" | Model: Comp-G
Freq.: 2.25 MHz | Center Freq.: N/A
Exam Angle: 65° | Squint Angle: N/A
Measured Angle: 65° | Mode: Shear
Exit Point: 0.65" | # of Elements: 1
Config.: Single | Focus: N/A
Shape: Round | Contour: Flat
Wedge Style: Non-Integral

Search Unit Cable

Type: RG-174 | Length: 6' | No. Conn.: 0

Scan Coverage

Upstream ☐ | Downstream ☐ | Scan dB: N/A
CW ☑ | CCW ☑ | Scan dB: 55.0
Exam Surface: OD
Surface Condition: As Found

Cal. Checks	Time	Date
Initial Cal.	1220	3/6/2015
Inter. Cal.	N/A	
Inter. Cal.	1437	3/6/2015
Inter. Cal.	N/A	
Final Cal.	1606	3/6/2015

Couplant

Cal. Batch: 14M076
Type: Ultragel II
Mfg.: Magnaflux
Exam Batch: 09225
Type: Ultragel II
Mfg.: Sonotech, Inc.

Reference Block

Serial No.: 104876
Type: Rompas

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
ID NOTCH	80%	7.10	7.058"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Sound Path
N/A	N/A	N/A	N/A

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Sound Path
27.0	NSDH	80%	0.80	0.791"

Recordable Indication(s): Yes ☐ No ☑ (If Yes, Ref. Attached Ultrasonic Indication Report.)
Results: Sat ☑ Unsat ☐ Eval ☐
Comments: Nozzle side circ scan +/- 128° skew.

Percent Of Coverage Obtained > 90%: 55% | Reviewed Previous Data: Yes

Examiner	Level	Signature	Date	Reviewer	Signature	Date
Jennings, Jason J.	II-PDI		3/6/2015	David King, Lvl III		3/8/2015
Examiner	Level	Signature	Date	Site Review	Signature	Date
N/A	N/A			Scott Larson		3/8/2015
Other	Level	Signature	Date	ANII Review	Signature	Date
N/A	N/A			David M. Reynolds		3/12/2015

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Examiner:	Jennings, Jason J.	Level:	II-PDI	Reviewer:	David King, Lvl III	Date:	3/8/2015
Examiner:	N/A	Level:	N/A	Site Review:	Scott Larson	Date:	3/12/2015
Other:	N/A	Level:	N/A	ANII Review:	David M. Reynolds	Date:	3/12/2015

Comments: **Reference Scan Plan WDI-PJF-1314381-EPP-001, Rev. 2 (Table parameters below).**

The 70° Exam prescribed by EPRI model Report # IR-2010-396 was not performed. Due to excessive R-Dimensions and Metal Paths, it was deemed impractical and ineffective as the beam would have to complete as many as eight legs (bounces) in order to cover the volume. This is a result of the relatively thin shell wall in contrast to the thicker walled nozzle.

Conclusion of the 70° shell-side prescription in IR-2010-396 was discussed with the EPRI Project Manager that was responsible for the IR. The EPRI Project Manager agreed with the conclusion that this angle would be ineffective based on beam spread at such distances.

Sketch or Photo: K:\Shared\Iddeal\B222R1 Scanned Data\2E11HX-2A-N4NIR(1).jpg

Refracted Angle	55°	60°	65°	70°
Wedge Radius	Flat	Flat	Flat	Flat
Skew Angle	± 123°	± (118° to 132°)	± 128°	± (17° to 37°)
Misorientation Angle (Max)	9°	22°	22°	14°
Inspection Surface	Nozzle Boss	Nozzle Boss	Nozzle Boss	Vessel Shell
Scan Area("R" or "Z" from barrel O.D. surface or shell surface	2.15" – 2.66" (Z)	2.12 – 2.85" (Z)	2.12" – 2.42" (Z)	3.03" – 13.11" (R)
Min. Metal Path	~7.09"	~6.89"	~6.80"	~10.68"
Max. Metal Path	~8.11"	~10.23"	~9.57"	~23.07"

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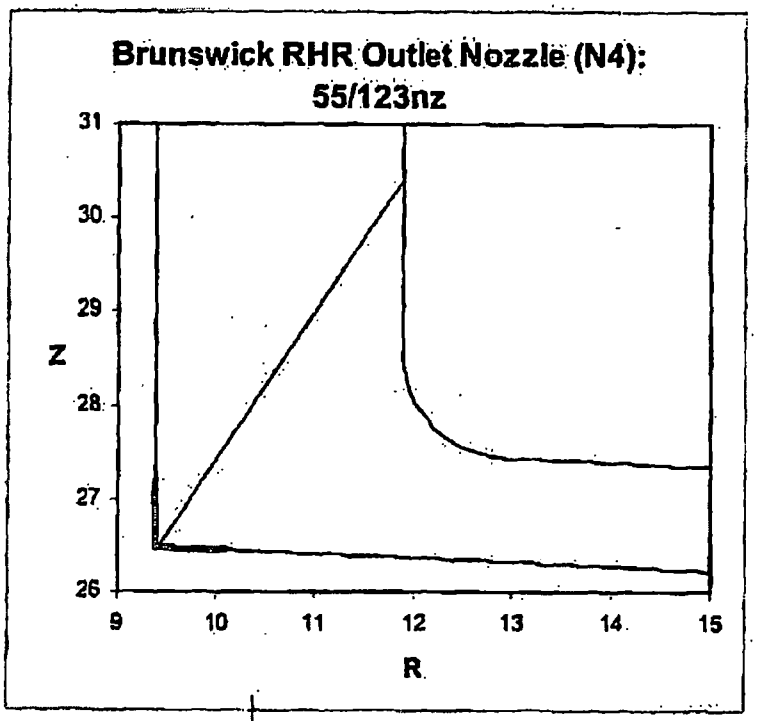
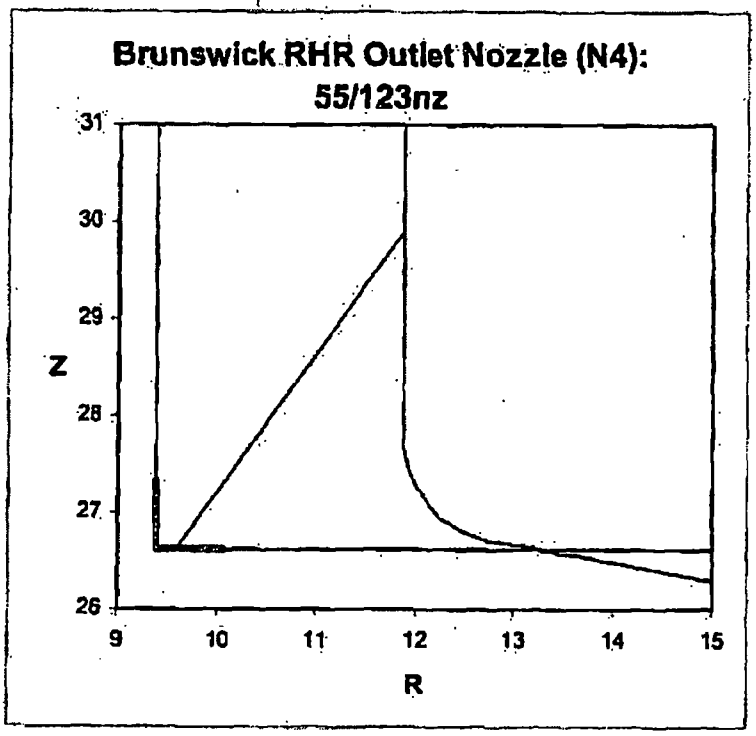
Sketch or Photo: K:\Shared\Iddeal\B222R1 Scanned Data\2E11HX-2A-N4NIR(2).jpg





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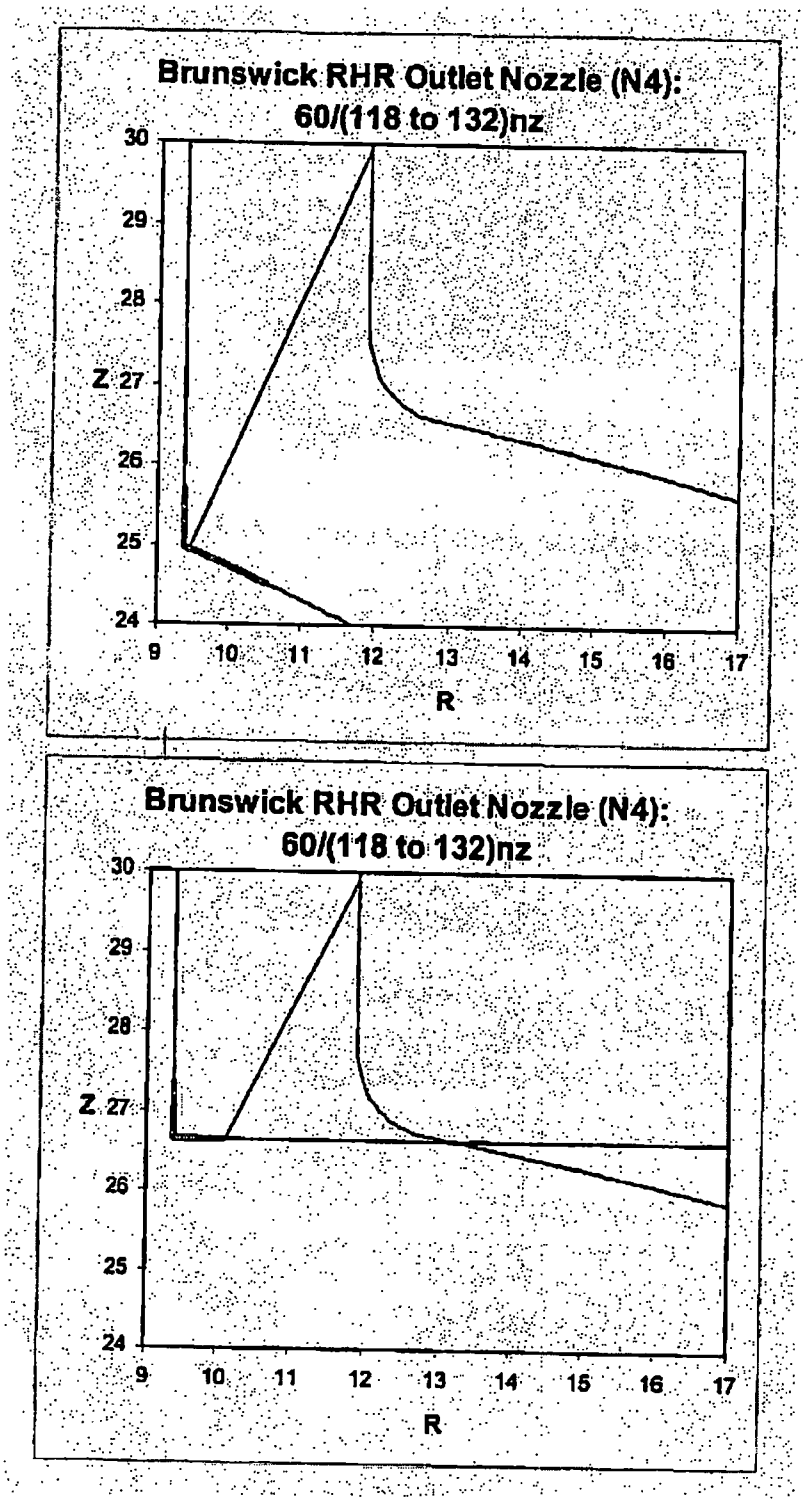
Summary No.: 2-E11-3748

Sketch or Photo: K:\Shared\lddeal\B222R1 Scanned Data\2E11HX-2A-N4NIR(3).jpg



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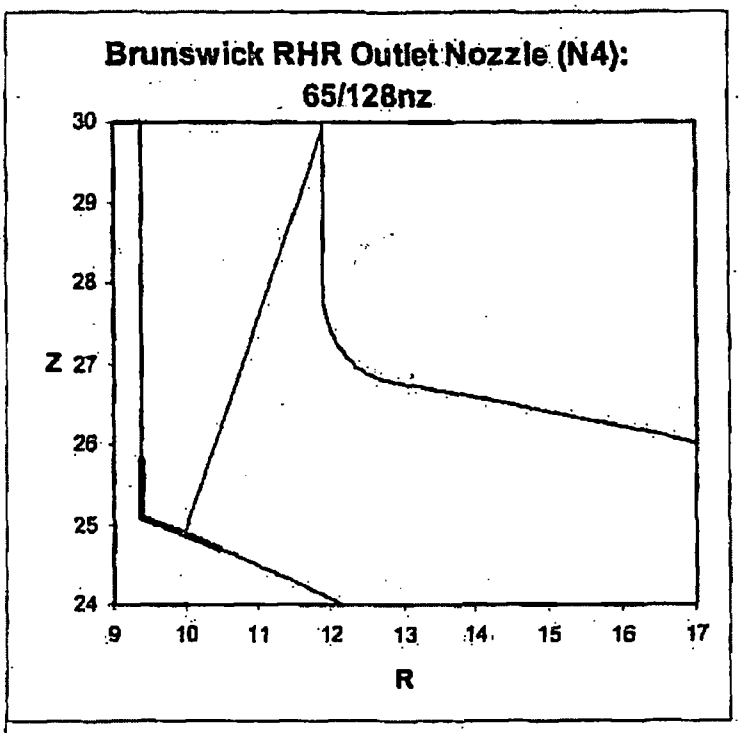

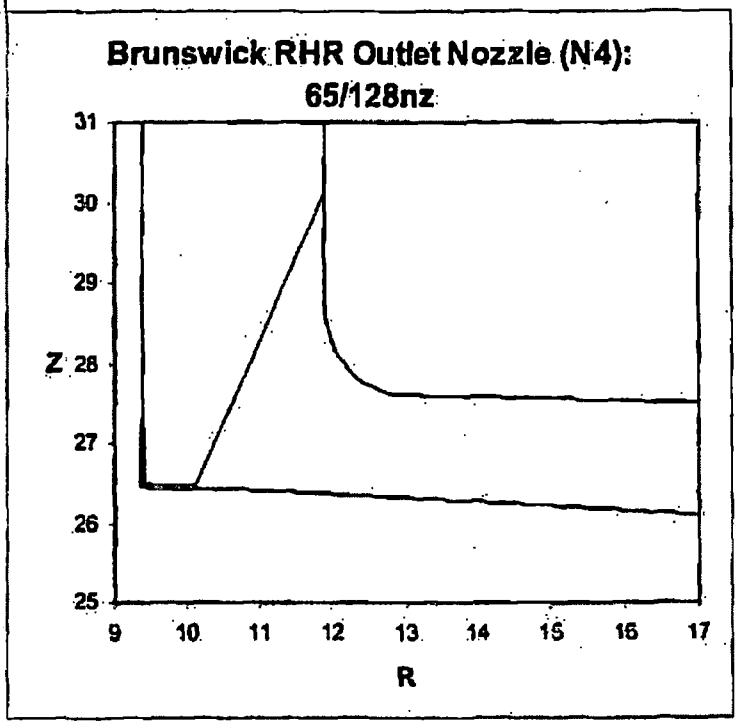

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Sketch or Photo: K:\Shared\lddeal\B222R1 Scanned Data\2E11HX-2A-N4NIR(5).jpg

Table 6-2 lists the summary of the modeling parameters for the detection techniques to examine the Brunswick nozzle inner corner regions.

Table 6-2
Brunswick Detection Technique Inner Corner Region Modeling Parameters

Nozzle ID	Metal Path		Beam Angle at Flaw		Maximum Misorientation	Percent Coverage
	Min	Max	Min	Max		
RHR Outlet (N4)	6.80	23.07	65	90	22	79