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RS-09-046

10 CFR 50.55a

March 31, 2009

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

Braidwood Station, Units 1 and 2  
Facility Operating License Nos. NPF-72 and NPF-77  
NRC Docket Nos. STN 50-456 and STN 50-457

Subject: Relief Request I2R-50, Inservice Inspection Program Relief Regarding Examination Coverage for Second 10-Year Inservice Inspection Interval

In accordance with 10 CFR 50.55a, "Codes and standards," paragraph (g)(5)(iii), Exelon Generation Company, LLC, (EGC) requests NRC approval to use a proposed alternative to the existing American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," on the basis that compliance with the specified requirements is impractical due to plant design. EGC is submitting this relief request for those ASME Section XI weld examinations performed during the Second 10-Year Inservice Inspection (ISI) Interval where the inspection coverage achieved was less than or equal to 90%. The reduced examination coverage is due to the original design of these welds, physical obstructions, and geometric interferences.

The relief request supports the second ISI interval for both Unit 1 and Unit 2. The second ISI interval for Unit 1 began on July 29, 1998, and will end July 28, 2009. The second interval for Unit 2 began October 17, 1998, and ended October 16, 2008.

EGC requests approval of this relief request by March 31, 2010.

There are no regulatory commitments contained in this letter. If you have any questions concerning this letter, please contact Ms. Lisa A. Schofield at (630) 657-2815.

Respectfully,



Patrick R. Simpson  
Manager – Licensing

Attachment: 10 CFR 50.55a Relief Request I2R-50

A047  
NRR

**ATTACHMENT**

**10 CFR 50.55a Relief Request I2R-50**

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Relief Requested In Accordance with 10 CFR 50.55a(g)(5)(iii)**  
**Braidwood Station Limited Examinations**  
**Revision 0**  
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**1.0 ASME CODE COMPONENTS AFFECTED:**

Code Class:	1 and 2
Reference:	IWB-2500, Table IWB-2500-1, IWC-2500, Table IWC-2500-1, Code Case N-460
Examination Category:	B-A, B-D, C-A, and R-A
Item Number:	B1.40, B3.110, C1.10, C1.30, and R1.20
Description:	Limited Examination Coverage
Component Number:	See Attachments 1 and 2
Drawing Number:	See Attachments 1 and 2

**2.0 APPLICABLE CODE EDITION AND ADDENDA:**

The Second 10-Year Interval Inservice Inspection (ISI) program is based on the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, 1989 with no Addenda. The 1989 Edition requires essentially 100% examination coverage of required surfaces and volumes of various Class 1 and Class 2 components.

**3.0 APPLICABLE CODE REQUIREMENT:**

ASME Section XI, 1989 Edition requires a volumetric and/or surface examination, which includes essentially 100% of the weld and the applicable base metal, for the affected examination categories.

Braidwood Station has invoked ASME Section XI Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1." Code Case N-460 states, in part, "...when the entire examination volume or area cannot be examined... a reduction in examination coverage... may be accepted provided the reduction in coverage for that weld is less than 10%."

NRC Information Notice 98-42, "Implementation of 10 CFR 50.55a(g) Inservice Inspection Requirements," termed the reduction in coverage of less than 10% to be "essentially 100 percent." Information Notice 98-42 states, in part, "The NRC has adopted and further refined the definition of "essentially 100 percent" to mean "greater than 90 percent," which has been applied to all examinations of welds or other areas 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 the specified Code requirement has been determined to be impractical. Due to the original design, physical obstructions, and geometric interferences associated with these

**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Relief Requested In Accordance with 10 CFR 50.55a(g)(5)(iii)**  
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welds, it is not feasible to effectively perform examinations of 100% of the volume of these welds. Therefore, relief is requested on the basis that the Code requirements to examine essentially 100% of the welds' volume are impractical. Attaining the geometry required to achieve the Code required examination coverage would require major modifications to existing components without providing a corresponding increase in the level of quality and safety.

Attachments 1 and 2 detail the limitations for examination coverage encountered for Braidwood Station, Unit 1 and Unit 2, respectively.

**5.0 BURDEN CAUSED BY COMPLIANCE:**

Compliance with the examination requirements of ASME Section XI would require significant modification of plant components to remove obstructions, redesign of plant systems/components, and/or replacement of components where geometry is inherent to the component design.

**6.0 PROPOSED ALTERNATIVE AND BASIS FOR USE:**

In accordance with 10 CFR 50.55a(g)(5)(iii), relief is requested on the basis that the required "essentially 100%" coverage examination is impractical due to physical obstructions and limitations imposed by design, geometry, and/or physical obstructions for the components listed in Attachments 1 and 2.

Braidwood Station proposes to perform the Code required volumetric examinations to the maximum extent possible. Because of the original design of these welds, there are no alternative examination techniques currently available to increase the examination volume. There were no cases in any of the listed examination components where outside diameter surface features (i.e., weld crowns, weld shrinkage, surface roughness, etc.) could have been conditioned to maximize the coverage attained without major modification to the components.

As a minimum, all components received the required volumetric examination to the extent practical due to limited or lack of available access. There were no recordable indications requiring further evaluation noted in any of the volumetric examinations performed. For single-sided examinations of stainless steel or inconel welds, shear wave inspections were supplemented through additional scans that employed refracted longitudinal (RL) wave techniques. The examinations were conducted, and satisfactory results were confirmed, even though "essentially 100%" coverage was not attained. Additionally, multiple VT-2 examinations were performed on the subject components throughout the interval during the required system pressure tests (examinations required by ASME Section XI and Generic Letter 88-05) and no evidence of leakage was observed at these components, providing additional assurance that the structural integrity of the subject components was maintained throughout the interval.

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
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In addition to the periodic visual inspections performed under ASME Section XI and Generic Letter 88-05, reactor coolant pressure boundary leakage is monitored through a number of other activities, which provide a high level of confidence that in the unlikely event that leakage did occur, it would be detected and proper action taken. Specifically, system leak rate limitations imposed by Technical Specification 3.4.13, "RCS Operational Leakage," as well as the reactor makeup control system, reactor cavity and containment floor drain sump monitoring, containment radiation monitoring, and containment atmospheric monitoring, provide additional assurance that any leakage would be detected prior to gross failure of these components.

**7.0 DURATION OF PROPOSED ALTERNATIVE:**

Relief is requested for the Second 10-Year Inservice Inspection (ISI) Interval for Braidwood Station Units 1 and 2. For the examination categories under this relief, the Second Interval for Braidwood Unit 1 began on July 29, 1998, and will end on July 28, 2009 (interval end date was adjusted as allowed by IWA-2430(d)). The Second Interval for Braidwood Unit 2 began on October 17, 1998, and concluded on October 16, 2008.

**8.0 PRECEDENTS:**

Similar relief requests for limitations resulting in examination coverage less than 90% have been approved for other operating units throughout the Braidwood inspection interval. Attachments 1 and 2 reference other units where similar limitations existed and the achieved examination coverage was less than 90%.

**9.0 ATTACHMENTS:**

Attachment 1: Braidwood Station Unit 1 Limited Examinations

Attachment 1-1: Braidwood Station Unit 1 Limited Examinations (1 page total)

Attachment 1-2: Weld 1RV-03-001 (22 pages total)

Attachment 1-3: Weld 1PZR-01-N2 (13 pages total)

Attachment 1-4: Weld 1PZR-01-N3 (19 pages total)

Attachment 1-5: Weld 1RC-17-13 (7 pages total)

Attachment 1-6: Weld 1SG-05-SGSE-02 (9 pages total)

Attachment 2: Braidwood Station Unit 2 Limited Examinations

Attachment 2-1: Braidwood Station Unit 2 Limited Examinations (1 page total)

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Relief Requested In Accordance with 10 CFR 50.55a(g)(5)(iii)**  
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Attachment 2-2: Weld 2RV-03-001 (13 pages total)

Attachment 2-3: Weld 2PZR-01-N2 (24 pages total)

Attachment 2-4: Weld 2PZR-01-N3 (29 pages total)

Attachment 2-5: Weld 2SG-01-SGC-02 (7 pages total)

**ATTACHMENT 1**

**Braidwood Station Unit 1 Limited Examinations**

**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-1**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
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<b>Component ID Code Category Code Item</b>	<b>Outage Examined Month/ Year</b>	<b>Cumulative Examination Coverage Achieved</b>	<b>Reference Sketch/Coverage Plot</b>	<b>Remarks</b>
1RV-03-001 Category B-A Item B1.40	A1R07 (9/1998)	88.65%	Attachment 1-2	Reactor Vessel Upper Head-to-Flange weld. Examination coverage for surface examination (magnetic particle) was 100% with no recordable indications, no recordable indications noted in any of the ultrasonic scans.
1PZR-01-N2 Category B-D Item B3.110	A1R07 (9/1998)	69.84%	Attachment 1-3	Pressurizer Spray Nozzle-to-Shell Weld. Nozzle bore geometry recorded on 70 degree scan.
1PZR-01-N3 Category B-D Item B3.110	A1R07 (9/1998)	73.6%	Attachment 1-4	Pressurizer Relief Nozzle-to-Shell Weld. Nozzle bore geometry recorded on 70 degree scan.
1RC-17-13 Category R-A Item R1.20	A1R12 (4/2006)	50%	Attachment 1-5	Pipe-to-Valve weld under Risk Informed Program; single-sided examination from pipe side only. No recordable indications noted in any of the ultrasonic scans performed.
1SG-05-SGSE-02 Category R-A Item R1.20	A1R13 (10/2007)	79%	Attachment 1-6	Steam Generator Aux Feedwater Nozzle-to-Safe End weld; scanning limitation on nozzle side axial scans due to nozzle geometry. No recordable indications noted in any of the ultrasonic scans performed.

**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-2**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
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**1.0 Component**

Weld Number: 1RV-03-001  
Code Category / Item: B-A / B1.40  
Configuration: Reactor Vessel Head-to-Flange Weld

**2.0 Applicable Code Edition and Addenda**

ASME Section XI 1989 Edition with no Addenda (including Mandatory Appendices)

**3.0 Applicable Code Requirement**

Table IWB-2500-1, Examination Category B-A, requires volumetric examination of Item B1.40 (Head-to-Flange welds). Table IWB-2500-1 Note (2) states essentially 100% of the weld length shall be examined.

Figure IWB-2500-5 depicts the required examination volume (A-B-C-D), which includes the circumferential weld and the adjacent base metal on either side of the weld extending to a distance of one-half the thickness of the wall from the extremities of the weld crown.

ASME Section XI Mandatory Appendix I requires ultrasonic examination of vessel welds greater than 2" thick to be conducted in accordance with ASME Section V, Article 4.

ASME Section V, Article 4 requires:

T-441.3.2.4 Extent of Scanning: Wherever feasible, the scanning of the examination volume shall be carried out from both sides of the weld on the same surface. Where the configuration or adjacent parts of the component are such that scanning from both sides is not feasible, this fact shall be included in the report of the examination.

T-441.3.2.5 Angle Beam Scanning: Wherever feasible, each examination shall be performed in two directions, i.e., approaching the weld from the opposite directions and parallel to the weld from opposite directions.

T-441.3.2.6 Scanning for Reflectors Oriented Parallel to the Weld: The angle beam search units shall be aimed at right angles to the weld axis, with the search unit manipulated so that the ultrasonic beams pass through the entire volume of weld metal. The adjacent base metal in the examination volume must be completely scanned by two angle beams, but need not be scanned by both angle beams from both directions.

Code Case N-460, which accepts a reduction in examination coverage provided the reduction is less than 10%.

**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-2**  
**Braidwood Station Unit 1 Limited Examinations**  
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**4.0 Impracticality/Burden**

The reactor vessel head-to-flange weld has a nominal thickness of 7.0" and is clad with stainless steel on the inside diameter surface. The surface geometry of the flange obstructs the ultrasonic transducer movement that is needed to examine the Code required volume from the flange side. The propagation for the ultrasonic beam was in the shear mode. Normally this mode would allow the ultrasonic beam to reflect off the inside surfaces and create a two-beam axis at right angles to each other; however, the presence of the stainless steel cladding precludes the ultrasound beams from reflecting at the inside diameter from the head/cladding interface. In addition to the examination limitations encountered due to the flange configuration and inside diameter cladding, additional examination restrictions are caused by the presence of three lifting lugs located on the reactor vessel head. These limitations preclude complete coverage of the full volume for the required scanning directions mandated by ASME Section V and Section XI. These limitations are inherent to the original design of the reactor vessel head. Conformance with the ASME Section XI requirements for essentially 100% of the volumetric coverage would require extensive structural modifications to the reactor vessel head.

**5.0 Alternative Examinations or Testing**

In addition to performing the 0, 45, and 60 degree ultrasonic scans required by Appendix I, additional 30 and 40 degree ultrasonic scans were performed in lieu of the 70 degree scan as permitted by Section V, Article 4, T-441.3.2.1, to supplement coverage. The calculated volumetric coverage achieved for all combined scans was documented as 88.65%.

The Code required surface examination area (B-E as depicted in Figure IWB-2500-5) was fully achieved (100% coverage) utilizing the magnetic particle method. In addition to the required surface examination, numerous system leakage tests (ASME Section XI Category B-P and Generic Letter 88-05) at nominal system operating pressure (2235 psig) and temperature (557°F) as well as bare metal visual examinations of the upper reactor head associated with the First Revised Order EA-03-009 have been completed with no evidence of leakage associated with the reactor vessel head-to-flange weld noted during the course of the interval.

Radiography (RT) is not a desired option because RT is limited in the ability to detect expected degradation mechanisms such as service induced cracking. Additionally, RT has not been qualified through performance demonstration.

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-2**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
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**6.0 Justification for Granting Relief**

No additional examinations were completed during the inspection interval; however, the aggregate examination coverage achieved (88.65%) along with the results of the completed surface examination, system pressure tests, and bare metal visual inspections performed throughout the inspection interval provide reasonable assurance that pressure boundary integrity has been maintained for this component. There were no recordable indications (other than geometric conditions) noted during any of the examinations (surface, volumetric, and visual) performed during the course of the interval.

**7.0 Precedents**

Similar examination limitations for reactor head-to-flange welds were encountered and similar examination coverage was accepted for the following units:

Byron Station Units 1 and 2:

Letter from R. Gibbs (U. S. NRC) to C. G. Pardee (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2 – Inservice Inspection Program Second Interval Relief Requests I2R-22, I2R-23, I2R-25, and I2R-53 (TAC Nos. MD4099, MD4100, MD4101, MD4102, MD4103, MD4104, MD4105, and MD4106)," dated January 15, 2008

Relief Request I2R-50  
Attachment 1 - 2

NDT-C-30  
REV. 05

Component: 1RV-03-001  
Sheet 4 of 19

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February, 1998

EXAMINATION DATA SHEET

Station: BRAIDWOOD Unit: 1 Date: 9/14/98 Page 1 of 1  
 Calibration Sht #: <sup>0°</sup> 988E1-UTC-053 Circ. 988E1-UTC-N/A Data Sht.# 988E1-UTD-04  
 System IRCOR Component # 1RV-03-001 Weld Type REACTOR HEAD-FLA  
 Component Size 49' Schedule/Thickness 7.0 Material CS/SS CLAD  
 Component Temp./I.D.# 75°/118045 Couplant ULTRAGELTE Batch# 96225  
 Scan Gain: Axial N/A Circ. N/A Straight Beam 43dB  
 Lo Reference Point: 0° No Reference Point: WELD E

1. Base Metal Straight Beam
2. Angle Beam-Normal-Against Flow
3. Angle Beam-Normal-With Flow
4. Angle Beam-Along Weld-CW
5. Angle Beam-Along Weld-CCW
6. Straight Beam of Weld
7. Thickness Across Weld and Base Metal

Performed		Indications	
YES	NO	NO	YES
✓		✓	
	✓	N/A	
	✓	N/A	A
	✓	N/A	N
	✓	N/A	
✓		✓	
**			
		UP STRM	WELD
			DN STRM

Additional Comments

NO RECORDABLE INDICATIONS - NRI

X

\*\*Reference 988E1-UTD-052 for thickness & coverage information.

Examiner(s): Jason Polianky Level: II Date: 9/14/98  
 Reviewer: Jim Mill Level: II Date: 10-6-98  
 Others: Mike Level: III Date: 10-8-98  
 Station: Thomas Kubik Date: 10/21/98  
 NRI: h. h. h.

NDT-C-30  
REV. 05

Relief Request I2R-50  
Attachment 1 - 2  
Component: 1RV-03-001  
Sheet 5 of 19

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February, 1998

EXAMINATION DATA SHEET

Station: BRAIDWOOD Unit: 1 Date: 9/14/98 Page 1 of 1  
Calibration Sht #: Axial 98BR1-UTC-054 Circ. 98BR1-UTC-054 Data Sht # 98BR1-UTC-  
System IRCBIR Component # 1RV-03-001 Weld Type REACTOR HEAD - FLA  
Component Size 48" Schedule/Thickness 7.0 Material CS/SS CLAD  
Component Temp. / I.D.# 75°/110045 Couplant ULTRAGEL II Batch# 96225  
Scan Gain: Axial 61.2 dB Circ. 61.2 dB Straight Beam N/A  
Lo Reference Point: 0" Wo Reference Point: WELD E

1. Base Metal Straight Beam
2. Angle Beam-Normal-Against Flow
3. Angle Beam-Normal-With Flow
4. Angle Beam-Along Weld-CW
5. Angle Beam-Along Weld-CCW
6. Straight Beam of Weld
7. Thickness Across Weld and Base Metal

Performed		Indications	
YES	NO	NO	YES
	/	N/A	
/		/	
/		/	A
/		/	N
/		/	
	/	N/A	
**			
		UP STRM	WELD
			DN STRM

Additional Comments

NO RECORDABLE INDICATIONS - NRI

\* LIMITED EXAM PERFORMED AGAINST FLOW DUE TO FLANGE

\*\* Ref. 98BR1-UTC-052 for thickness & coverage information

45°/2.25MHz Ref 98BR1-UTC-005(20%) & 006(20%) for Beam Spreads

Examiner(s): Jam Polish Level: II Date: 9/14/98

Reviewer: Jay Miller Level: II Date: 10-6-98

Others: [Signature] Level: III Date: 10-8-98

Station: [Signature] Date: 10/21/98

NTS: [Signature]

EXAMINATION DATA SHEET

Station: BRAIDWOOD Unit 1 Date: 9/14/98 Page 1 of 1  
 Calibration Sht #: Axial 98BRI-UTC-055 Circ. 98BRI-UTC-055 Data Sht# 98BRI-UTC-C  
 System IRCBIR Component # 1RV-03-001 Weld Type REACTOR HEAD-FLA  
 Component Size 48" Schedule/Thickness 7.0 Material C5/SS CLAD  
 Component Temp. I.I.D.# 75°/118045 Couplant ULTRAGEET Batch# 96225  
 Scan Gain: Axial 70dB Circ. 70dB Straight Beam N/A  
 Lo Reference Point: 0" No Reference Point: WELD E

1. Base Metal Straight Beam
2. Angle Beam-Normal-Against Flow
3. Angle Beam-Normal-With Flow
4. Angle Beam-Along Weld-CW
5. Angle Beam-Along Weld-CCW
6. Straight Beam of Weld
7. Thickness Across Weld and Base Metal

Performed		Indications		
YES	NO	NO	YES	
	/	N/A	/	
/		/		
/		/		
/		/		
/		/		
	/	N/A		
**				
		UP STRM	WELD	DN STRM

Additional Comments

NO RECORDABLE INDICATIONS - NRI

\* LIMITED EXAM PERFORMED AGAINST FLOW DUE TO FLANGE

\*\* Ref. 98BRI-UTC-052 for thickness - coverage information

60° / 2.25 MHz

Ref. 98BRI-UTC-007(303) + 008(303) for Beam Spreads

Examiner(s): Jason Poliasch Level: II Date: 9/14/98  
 Reviewer: Jay Mill Level: II Date: 10-6-98  
 Others: Jim Level: III Date: 10-8-98  
 Station: James Hubert Date: 10/28/98

EXAMINATION DATA SHEET

Station: BRAIDWOOD Unit: 1 Date: 9/14/98 Page 1 of 13  
 Calibration Sht #: Axial 98821-UTC-056 Circ. 98821-UTC-056 Data Sht# 98821-UTC-05  
 System IRCOR Component # 1RV-03-001 Weld Type REACTOR HEAD-FLANG  
 Component Size 48' Schedule/Thickness 7.0 Material CS/SS CLAD  
 Component Temp./I.D.# 75°/118045 Couplant ULTRAGELTII Batch# 96225  
 Scan Gain: Axial 63dB Circ. 63dB Straight Beam N/A  
 Lo Reference Point: 0° Wo Reference Point: WELD E

1. Base Metal Straight Beam
2. Angle Beam-Normal-Against Flow
3. Angle Beam-Normal-With Flow
4. Angle Beam-Along Weld-CW
5. Angle Beam-Along Weld-CCW
6. Straight Beam of Weld
7. Thickness Across Weld and Base Metal

Performed		Indications		
YES	NO	NO	YES	
	/	N/A	/	
/		/		
/		/		A
/		/		N
/		/		
	/	N/A		
		UP STRM	WELD	DN STRM

Additional Comments

NO RECORDABLE INDICATIONS - NRI

\* LIMITED EXAM PERFORMED AGAINST FLOW DUE TO FLANGE

\*\* Ref. attached information for thickness & coverage data.

30°/2.25MHZ

Examiner(s): Nal B. Pr... Level: II Date: 9.14.98  
 Reviewer: Jay Mill Level: II Date: 10-6-98  
 Others: W. Green Level: III Date: 10-8-98  
 Station: ... Date: 10/21/98

**ComEd**

Report # 98BR1-UTD-052

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Coverage Summary

SITE: Braidwood UNIT: ONE  
SYSTEM: Reactor Vessel  
WELD ID: 1RV-03-01  
CONFIG: Upper Center Disk to Flange  
8-27-98 10-27-98 UPPER FLOW →  
Procedure # NDT-Z-1  
NDE METHOD X UT      PT      MT

Examiner: [Signature] Level: II  
Examiner: NAP S. P. Level: II  
[Signature]  
Calibration Sht. # 98BR1-UTC- 53,54,55,56 & 57  
Notes: Supplemental Exams 30° & 40°

**VESSEL COVERAGE SUMMARY**

W = 9.45" ( 2.25" WELD CROWN AND 3.60" (T) SIDE 3.60" (B) SIDE ) T = 7.20" WELD LENGTH = 525.15"  
Total Weld Metal Volume = 5823.91 in.<sup>3</sup> Total Base Metal Volume = 31503.81 in.<sup>3</sup>

WELD METAL EXAMINATION			BASE METAL EXAMINATION		
SCAN	EXAM VOLUME / TOTAL VOLUME =	% EXAM	SCAN	EXAM VOLUME / TOTAL VOLUME =	% EXAM
0°	5823.91 in. <sup>3</sup> / 5823.91 in. <sup>3</sup>	100.00%	0°	25160.00 in. <sup>3</sup> / 31503.81 in. <sup>3</sup>	79.86%
30° (B)	4721.06 in. <sup>3</sup> / 5823.91 in. <sup>3</sup>	81.07%	45°	30788.81 in. <sup>3</sup> / 31503.81 in. <sup>3</sup>	97.73%
30° (T)	5823.91 in. <sup>3</sup> / 5823.91 in. <sup>3</sup>	100.00%	60°	30938.27 in. <sup>3</sup> / 31503.81 in. <sup>3</sup>	98.21%
40° (B)	2883.07 in. <sup>3</sup> / 5823.91 in. <sup>3</sup>	49.50%	45° CW	25160.00 in. <sup>3</sup> / 31503.81 in. <sup>3</sup>	79.86%
40° (T)	5817.97 in. <sup>3</sup> / 5823.91 in. <sup>3</sup>	99.90%	45° CCW	25160.00 in. <sup>3</sup> / 31503.81 in. <sup>3</sup>	79.86%
45° CW	5823.91 in. <sup>3</sup> / 5823.91 in. <sup>3</sup>	100.00%	60° CW	25160.00 in. <sup>3</sup> / 31503.81 in. <sup>3</sup>	79.86%
45° CCW	5823.91 in. <sup>3</sup> / 5823.91 in. <sup>3</sup>	100.00%	60° CCW	25160.00 in. <sup>3</sup> / 31503.81 in. <sup>3</sup>	79.86%
60° CW	5823.91 in. <sup>3</sup> / 5823.91 in. <sup>3</sup>	100.00%	TOTAL 595.24% + 7 = 85.03% BMV EXAMINED		
60° CCW	5823.91 in. <sup>3</sup> / 5823.91 in. <sup>3</sup>	100.00%			

TOTAL 830.47 % + 9 = 92.27 % WMV EXAMINED

( 92.27 % + 85.03 % ) + 2 = 88.65 % EXAMINATION COVERAGE

Reviewed: [Signature] 10-27-98

AN/ANII REVIEW  
[Signature] 10-27-98

**1RV-03-01**

Weld Material	Percent Calculated	Comments	
0°	100%		
45° B	81.07%	30° used to supplement 45°, % coverage was based on 30°	See sketch Cov. 2
45° T	100%	30° used to supplement 45°, % coverage was based on 30°	
60° B	49.50%	40° used to supplement 60°, % coverage was based on 40°	See sketch Cov. 1
60° T	99.90%	40° used to supplement 60°, % coverage was based on 40°	See sketch Cov. 3
45° CW	100%		
45° CCW	100%		
60° CW	100%	Average	
60° CCW	100%	92.27%	

Base Material	Percent Calculated	Comments	
0°	79.86%		See sketch Cov. 6
45°	97.73%		See sketch Cov. 4
60°	98.21%		See sketch Cov. 5
45° CW	79.86%		See sketch Cov. 6
45° CCW	79.86%		See sketch Cov. 6
60° CW	79.86%	Average	See sketch Cov. 6
60° CCW	79.86%	85.03%	See sketch Cov. 6



"B" Flange side of weld  
 "T" Head side of weld

Total Weld Metal 92.27%  
 Total Base Material 85.03%

**Total Examination Coverage 88.65%**

*7/11/50 10-22-50*  
*10/22/50*

Signed By: *[Signature]*  
 10-22-50

Reviewed By: *[Signature]* 10-22-50

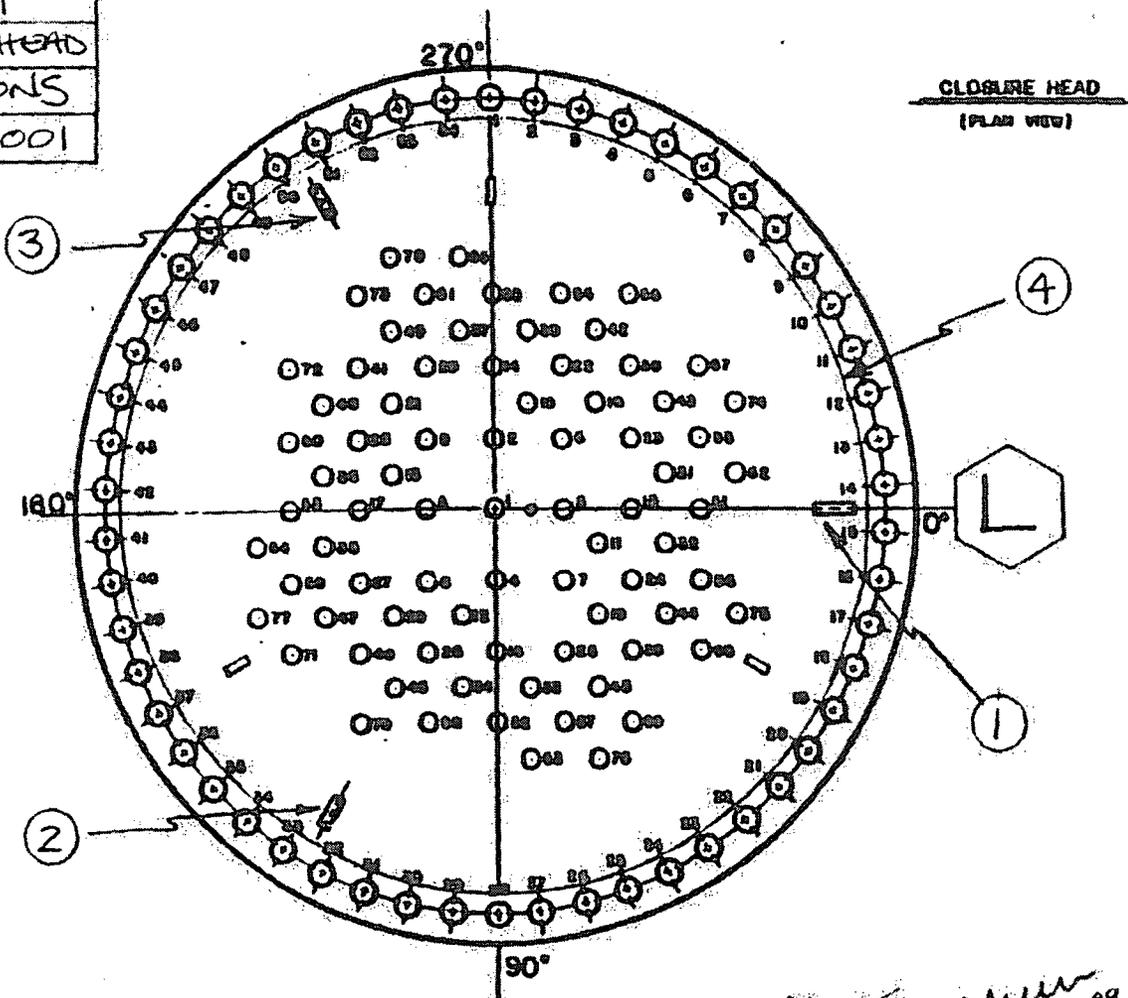
**AN/ANII REVIEW**  
*mittal* 10-22-50

SKETCH SHEET

BRAIDWOOD UNIT 1  
 REACTOR CLOSURE HEAD  
 U.T. SCAN LIMITATIONS  
 ISI ID # IRV-03-001

TENSIONING LUGS  
 EACH 6" WIDE  
 #1 - 0° FROM L  
 #2 - 162° CW FROM L  
 #3 - 324° CW FROM L

FLANGE  
 #4 - 360°



Relief Request 12R-50  
 Attachment 1 - 2  
 Component: 1RV-03-001  
 Sheet 10 of 19

EXAMINER Neil B. P...

DATE 9.14.98

*10/21/98*  
 10-8-98

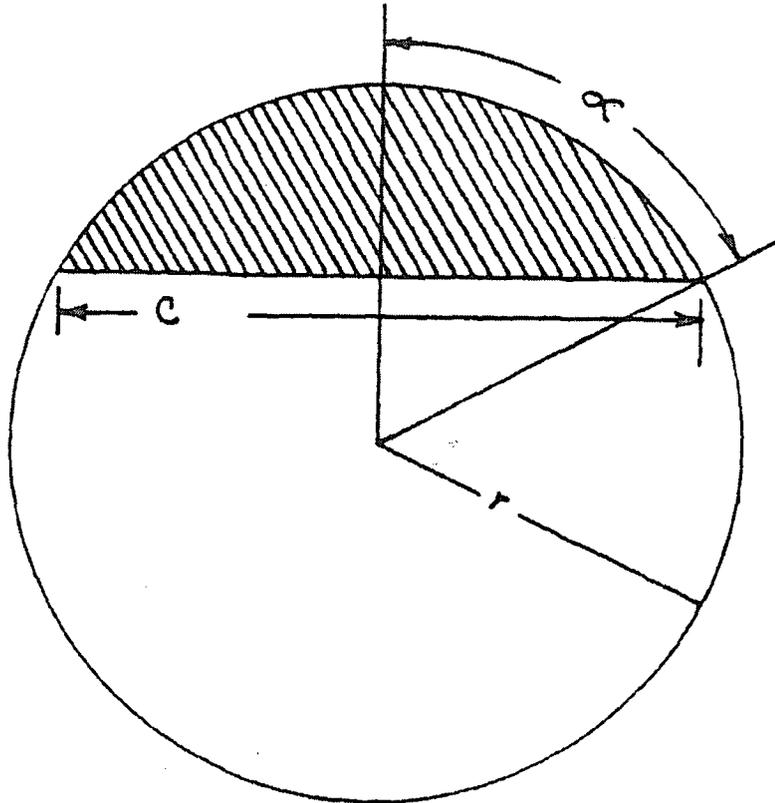
REVIEW Amel...

DATE ... ..

ANI/ANII REVIEW

SKETCH SHEET

1RV-03-01



$95.12''$  ( OUTSIDE RADIUS ) -  $87.85''$  ( INSIDE RADIUS ) =  $7.27''$

$7.27'' \div 2 = 3.635''$  OR  $3.64''$   $3.64'' + 87.85'' = 91.49''$

$C = (2r) (\sin \alpha)$

$C = (2) (91.49'') (\sin 66^\circ)$

$C = (2) (91.49'') (0.9135)$

$C = 167.16''$

CIRCUMFERENCE =  $\pi d = \pi C = \pi (167.16) = 525.15''$

ANI/ANII REVIEW  
10-7-98

EXAMINER

*[Signature]*

DATE

10-6-98

REVIEWER

*[Signature]*

DATE

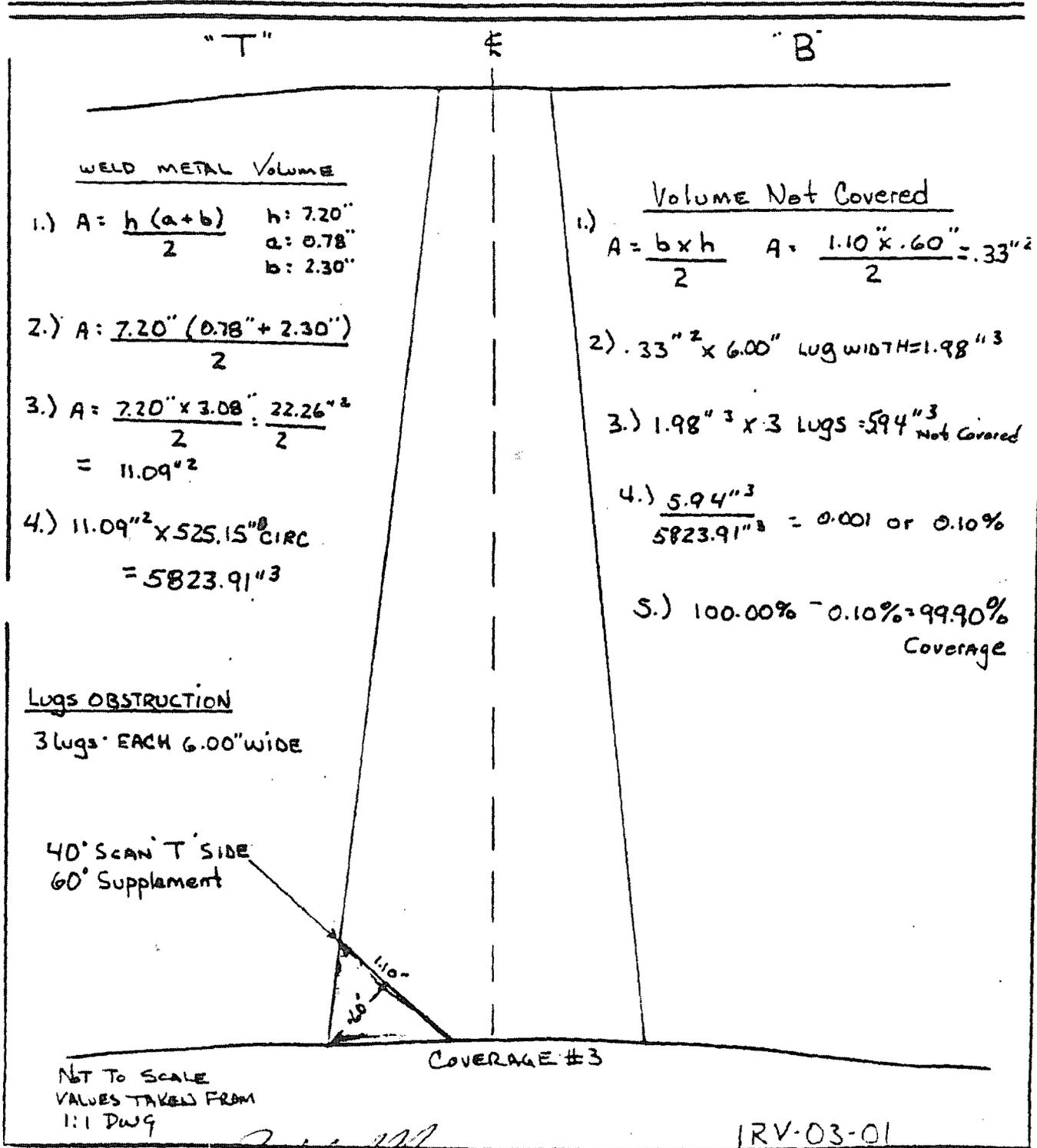
10-6-98

*[Signature]*  
10-8-98





SKETCH SHEET



Lugs OBSTRUCTION

3 lugs EACH 6.00" WIDE

40° SCAN T SIDE  
60° Supplement

NOT TO SCALE  
VALUES TAKEN FROM  
1:1 DWG

COVERAGE #3

LAMINER

*[Signature]*

DATE

10-20-98

REVIEWER

*[Signature]*

DATE

10-22-98

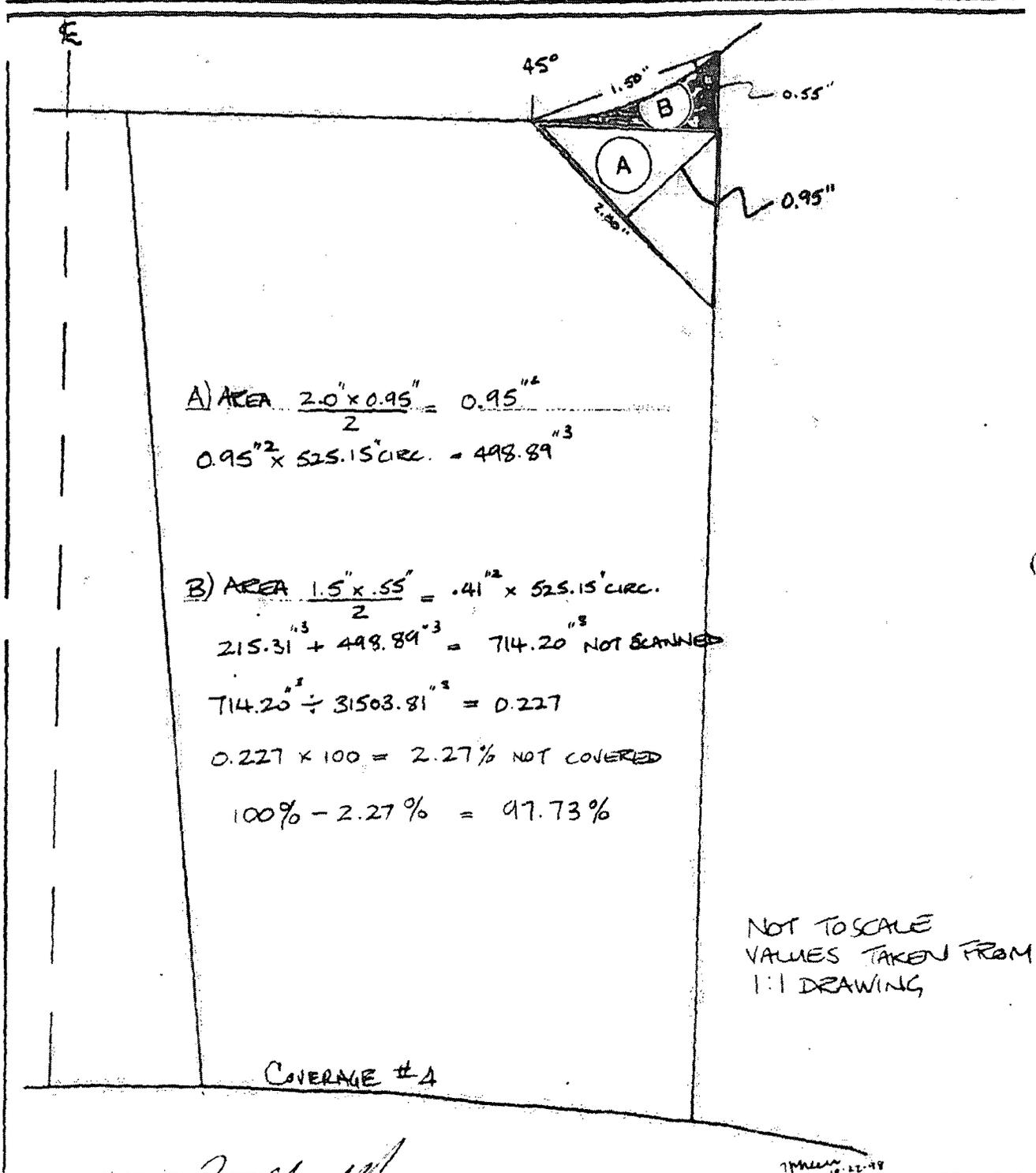
1RV-03-01

*[Signature]*

ANIRANII REVIEW

*[Signature]*

SKETCH SHEET



A) AREA  $\frac{2.0 \times 0.95}{2} = 0.95 \text{ "}^2$   
 $0.95 \text{ "}^2 \times 525.15 \text{ CIRC.} = 498.89 \text{ "}^3$

B) AREA  $\frac{1.5 \times .55}{2} = .41 \text{ "}^2 \times 525.15 \text{ CIRC.}$   
 $215.31 \text{ "}^3 + 498.89 \text{ "}^3 = 714.20 \text{ "}^3$  NOT SCANNED

$714.20 \text{ "}^3 \div 31503.81 \text{ "}^3 = 0.227$

$0.227 \times 100 = 2.27\% \text{ NOT COVERED}$

$100\% - 2.27\% = 97.73\%$

NOT TO SCALE  
VALUES TAKEN FROM  
1:1 DRAWING

COVERAGE #4

EXAMINER

*[Signature]*

DATE

10-22-99

RV-03-01

REVIEWER

*[Signature]*

DATE

10-22-99

AN/ANII REVIEW  
10-22-99

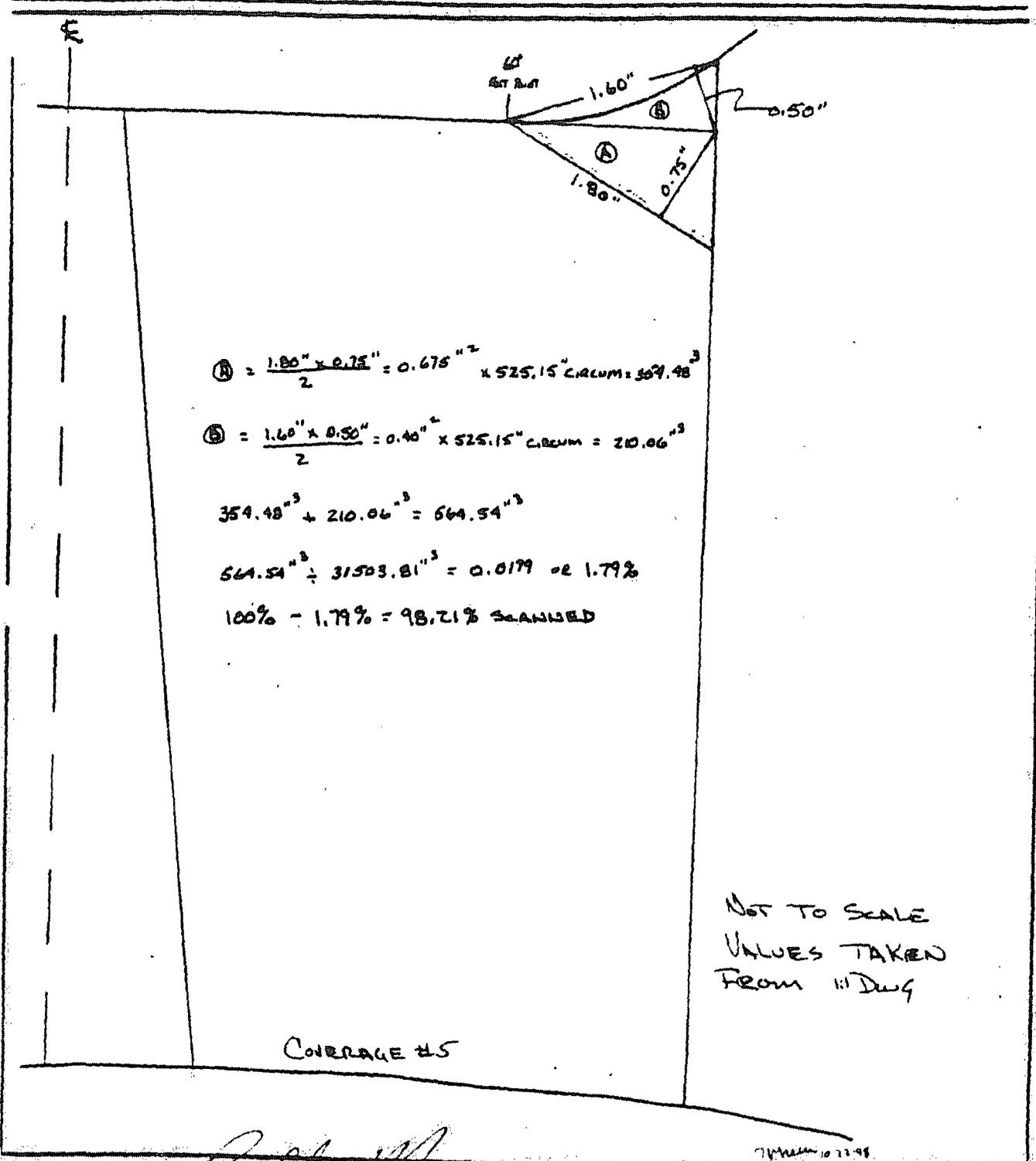
COMED

Relief Request I2R-50  
Attachment 1 - 2  
Component: 1RV-03-001  
Sheet 16 of 19

PAGE 11 OF 13

DATA SHEET No. 98SRI-LTD-0

SKETCH SHEET



$$A = \frac{1.80" \times 0.75"}{2} = 0.675"^2 \times 525.15" \text{ CIRCUM} = 354.48"^3$$

$$B = \frac{1.60" \times 0.50"}{2} = 0.40" \times 525.15" \text{ CIRCUM} = 210.06"^3$$

$$354.48"^3 + 210.06"^3 = 564.54"^3$$

$$564.54"^3 \div 31503.81"^3 = 0.0179 \text{ or } 1.79\%$$

$$100\% - 1.79\% = 98.21\% \text{ SCANNED}$$

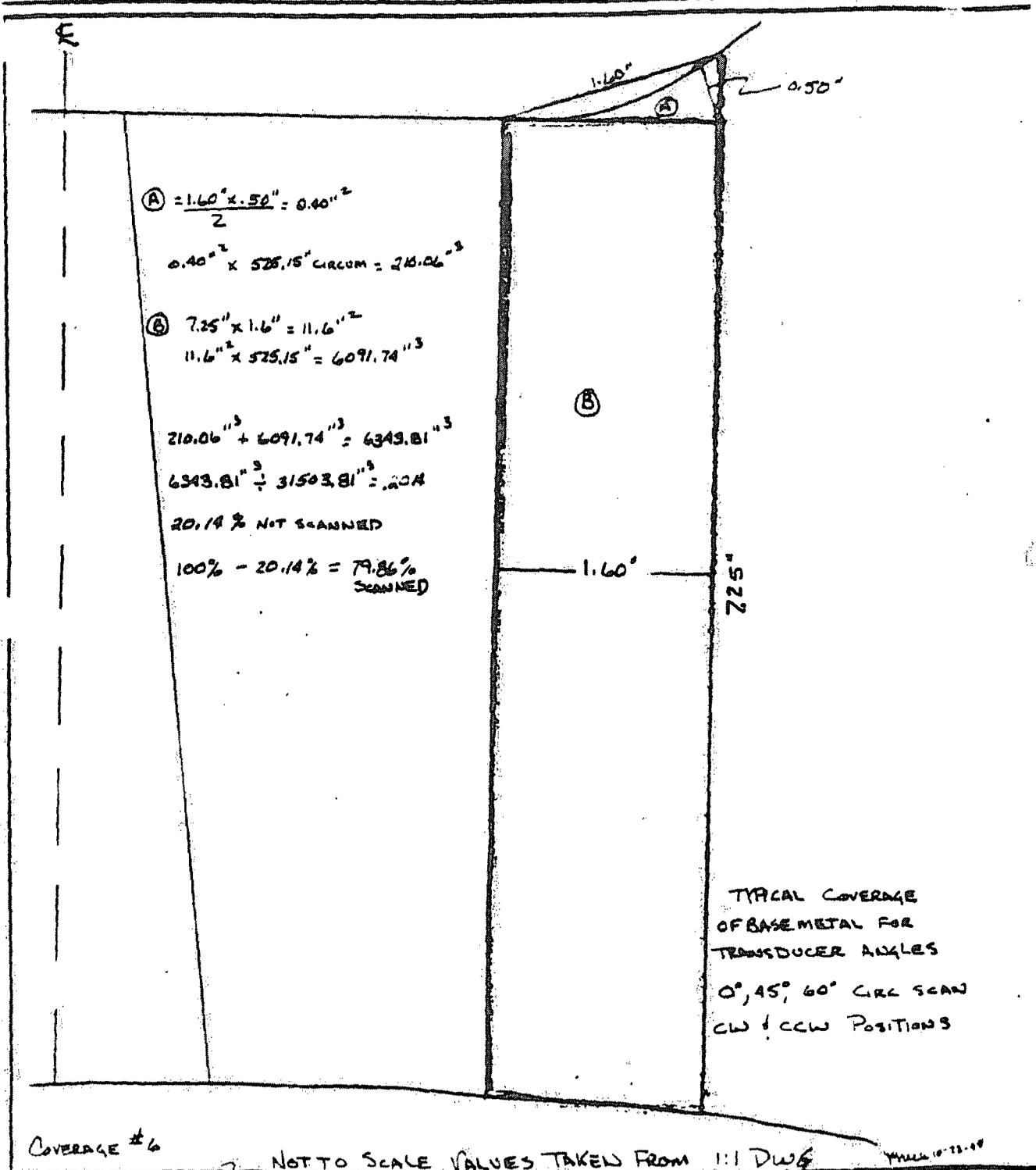
NOT TO SCALE  
VALUES TAKEN  
FROM "DIG"

COVER AGE #5

EXAMINER *[Signature]* DATE 10-22-98  
 REVIEWER *[Signature]* DATE 10-22-98

IRV-03-01  
 ANI/ANII REVIEW  
 10-22-98

SKETCH SHEET



Coverage #6

NOT TO SCALE VALUES TAKEN FROM 1:1 DWG

10-22-98

EXAMINER

*[Signature]*

DATE

10-22-98

1RV-03-01

REVIEWER

*[Signature]*

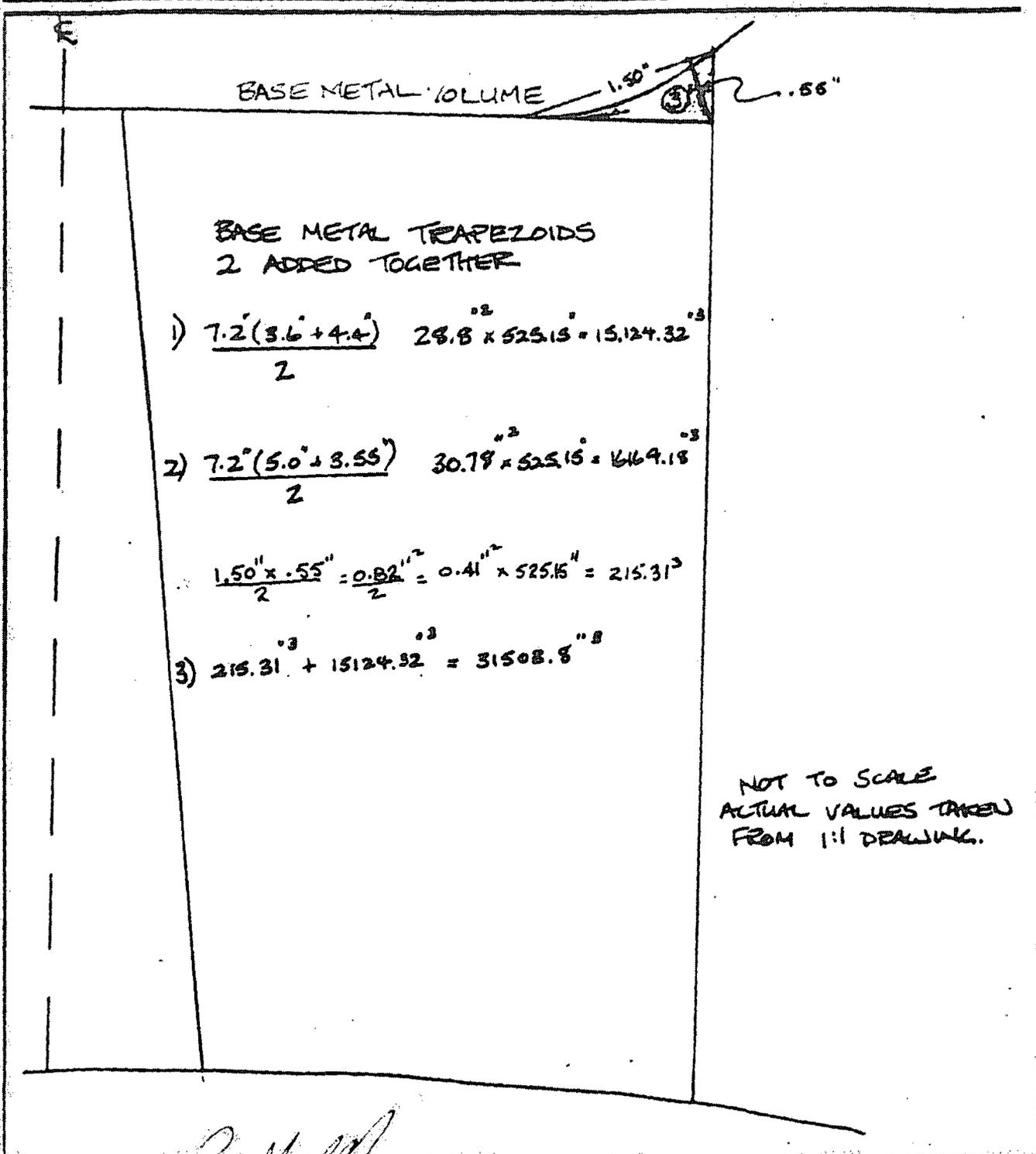
DATE

10-22-98

AN/ANII REVIEW

10-22-98

SKETCH SHEET



BASE METAL TRAPEZOIDS  
2 ADDED TOGETHER

$$1) \frac{7.2(3.6 + 4.4)}{2} \quad 28.8 \times 525.15 = 15,124.32 \text{ } ^3$$

$$2) \frac{7.2(5.0 + 3.55)}{2} \quad 30.78 \times 525.15 = 16,164.18 \text{ } ^3$$

$$\frac{1.50 \times .55}{2} = 0.41 \text{ } ^2 \quad 0.41 \times 525.15 = 215.31 \text{ } ^3$$

$$3) 215.31 + 15,124.32 = 15,339.63 \text{ } ^3$$

NOT TO SCALE  
ACTUAL VALUES TAKEN  
FROM 1:1 DRAWING.

EXAMINER

*[Signature]*

DATE 10-22-98

1RV-03-01

REVIEWER

*[Signature]*

DATE 10-22-98

*[Signature]*  
10-24-98

ANTIANT REVIEW

*[Signature]* 10-22-98

EXAMINATION DATA SHEET

Station: BRAIDWOOD Unit: 1 Date: 9/14/98 Page 1 of 1  
 Calibration Sht #: Axial 98BR-UTC-057 Circ. 98BR-UTC-057 Data Sht.# 98BR-UTC-053  
 System IRCOR Component # 1RV-03-001 Weld Type REACTIONHEAD FLAW  
 Component Size 48" Schedule/Thickness 7.0 Material CS/SS CLAD  
 Component Temp. / I.D.# 75°/118045 Couplant ULTRAGEL Batch# 96225  
 Scan Gain: Axial 56dB Circ. 56dB Straight Beam N/A  
 Lo Reference Point: 0° Wo Reference Point: WELD E

1. Base Metal Straight Beam
2. Angle Beam-Normal-Against Flow
3. Angle Beam-Normal-With Flow
4. Angle Beam-Along Weld-CW
5. Angle Beam-Along Weld-CCW
6. Straight Beam of Weld
7. Thickness Across Weld and Base Metal

Performed		Indications	
YES	NO	NO	YES
	/	N/A	
/		✓	
/		✓	A
✓		✓	N
/		✓	
	/	N/A	
*			
		UP STRM	WELD DN STRM

Additional Comments

NO RECORDABLE INDICATIONS - MRI  
\* LIMITED EXAM PERFORMED AGAINST FLOW DUE TO FLANGE

\* Ref. 98BR-UTC-053 for thickness & coverage information.  
40°/2.25MHz

Examiner(s): Nail B. P. Level: II Date: 9.14.98  
 Reviewer: Jim Mill Level: II Date: 10-6-98  
 Others: Jim Level: III Date: 10-8-98  
 Station: Home Date: 10/21/98  
 ANIP: L. H.

**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-3**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 1 of 13)

**1.0 Component**

Weld Number: 1PZR-01-N2  
Code Category / Item: B-D / B3.110  
Configuration: Pressurizer Spray Nozzle-to-Vessel Weld

**2.0 Applicable Code Edition and Addenda**

ASME Section XI 1989 Edition with no Addenda (including Mandatory Appendices)

**3.0 Applicable Code Requirement**

Table IWB-2500-1, Examination Category B-D requires volumetric examination of Item B3.110 (Pressurizer Nozzle-to-Vessel welds).

Figure IWB-2500-7(b) depicts the required examination volume (A-B-C-D-E-F-G-H), which includes the actual circumferential weld and adjacent base metal on either side of the weld extending to a distance of one-half the thickness of the wall from the extremities of the weld crown.

ASME Section XI Mandatory Appendix I requires ultrasonic examination of vessel welds greater than 2" thick to be conducted in accordance with ASME Section V, Article 4.

ASME Section V, Article 4 requires:

T-441.3.2.4 Extent of Scanning: Wherever feasible, the scanning of the examination volume shall be carried out from both sides of the weld on the same surface. Where the configuration or adjacent parts of the component are such that scanning from both sides is not feasible, this fact shall be included in the report of the examination.

T-441.3.2.5 Angle Beam Scanning: Wherever feasible, each examination shall be performed in two directions, i.e., approaching the weld from the opposite directions and parallel to the weld from opposite directions.

T-441.3.2.6 Scanning for Reflectors Oriented Parallel to the Weld: The angle beam search units shall be aimed at right angles to the weld axis, with the search unit manipulated so that the ultrasonic beams pass through the entire volume of weld metal. The adjacent base metal in the examination volume must be completely scanned by two angle beams, but need not be scanned by both angle beams from both directions.

T-441.3.2.7 Scanning for Reflectors Oriented Transverse to the Weld: The angle beam search units shall be aimed parallel to the axis of the longitudinal and circumferential welds. The search unit shall be manipulated so that the ultrasonic beams pass through

**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-3**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 2 of 13)

of the examination volume. Scanning shall be done in two directions 180 degrees to each other to the extent possible. Areas blocked by geometric conditions shall be examined from at least one direction.

Code Case N-460, which accepts a reduction in examination coverage provided the reduction is less than 10%.

#### **4.0 Impracticality/Burden**

The pressurizer vessel spray nozzle-to-vessel weld is approximately 2.7" thick. The pressurizer nozzle and vessel are clad with stainless steel on the inside diameter surface. The geometry of the nozzle along with the presence of the cladding on the inside diameter of the pressurizer result in limited access to the entire examination volume. The propagation for the ultrasonic beam was in the shear mode. Normally this mode would allow the ultrasonic beam to reflect off the inside surfaces and create a two-beam axis at right angles to each other; however, the presence of the stainless steel cladding precludes the ultrasound beams from reflecting at the inside diameter from the shell/cladding interface. The nozzle geometry tapers away from the weld resulting in limited scanning surfaces available for transducer coupling on the nozzle side of the weld resulting in additional examination limitations. These factors result in limited examination coverage from the scan directions required by ASME Section V and Section XI. These limitations are inherent to the original design of the pressurizer vessel. Conformance with the ASME Section XI requirements for essentially 100% of the volumetric coverage would require extensive structural modifications to the pressurizer vessel.

#### **5.0 Alternative Examinations or Testing**

In addition to performing the 0, 45, 60, and 70 degree scans to the extent practical as required by Appendix I, additional 30 and 40 degree scans were performed to supplement coverage. The aggregate examination coverage achieved was 69.84%.

In addition to completing the required volumetric examination to the extent practical, numerous system leakage tests (ASME Section XI Category B-P and Generic Letter 88-05) at nominal system operating pressure (2235 psig) and temperature (557°F) as well as the bare metal visual examinations associated with NRC Bulletin 2004-01 of the upper pressurizer vessel head were completed with no evidence of leakage associated with the pressurizer spray nozzle-to-vessel weld noted during the course of the interval.

Radiography as an alternative is not feasible because access is not available for film placement. No alternative examinations are planned for the weld during the current inspection interval.

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-3**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 3 of 13)

**6.0 Justification for Granting Relief**

No additional examinations were completed during the inspection interval; however, the examination coverage of 69.84% along with the results of the pressure test and bare metal visual inspections provide reasonable assurance that pressure boundary integrity has been maintained for this component throughout the interval.

**7.0 Precedents**

Similar examination limitations for pressurizer spray nozzle-to-shell welds were encountered and similar examination coverage was accepted for the following units:

Byron Station Units 1 and 2:

Letter from R. Gibbs (U. S. NRC) to C. G. Pardee (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2 – Inservice Inspection Program Second Interval Relief Requests I2R-22, I2R-23, I2R-25, and I2R-53 (TAC Nos. MD4099, MD4100, MD4101, MD4102, MD4103, MD4104, MD4105, and MD4106)," dated January 15, 2008

Callaway Unit 1:

Letter from D. Terao (U. S. NRC) to C. D. Naslund (Union Electric Company), "Callaway Plant, Unit 1 - Relief Request ISI-41 for the Second 10-Year Inservice Inspection Interval (TAC No. MD3437)," dated January 18, 2007

Wolf Creek Unit 1:

Letter from D. Terao (U. S. NRC) to R. A. Muench (Wolf Creek Nuclear Operating Corporation), "Wolf Creek Generating Station – Relief Request I2R-34 for the Second Ten-Year Interval Inservice Inspection (TAC No. MD0288)," dated November 20, 2006

Catawba Unit 1:

Letter from E. C. Marinos (U. S. NRC) to D. Jamil (Catawba Nuclear Station), "Catawba Nuclear Station, Unit 1, Request for Relief 05-CN-004, Limited Weld Examinations During End-of-Cycle 15 Refueling Outage (TAC Nos. MC8337, MC9171, MC9172, MC9199, MC9173, MC9202, MC9174, MC9175, MC9176, MC9177, MC9178 and MC9179)," dated September 25, 2006

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***ISI Program Plan***  
***Braidwood Station Units 1 & 2, Second Interval***

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-3**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 4 of 13)

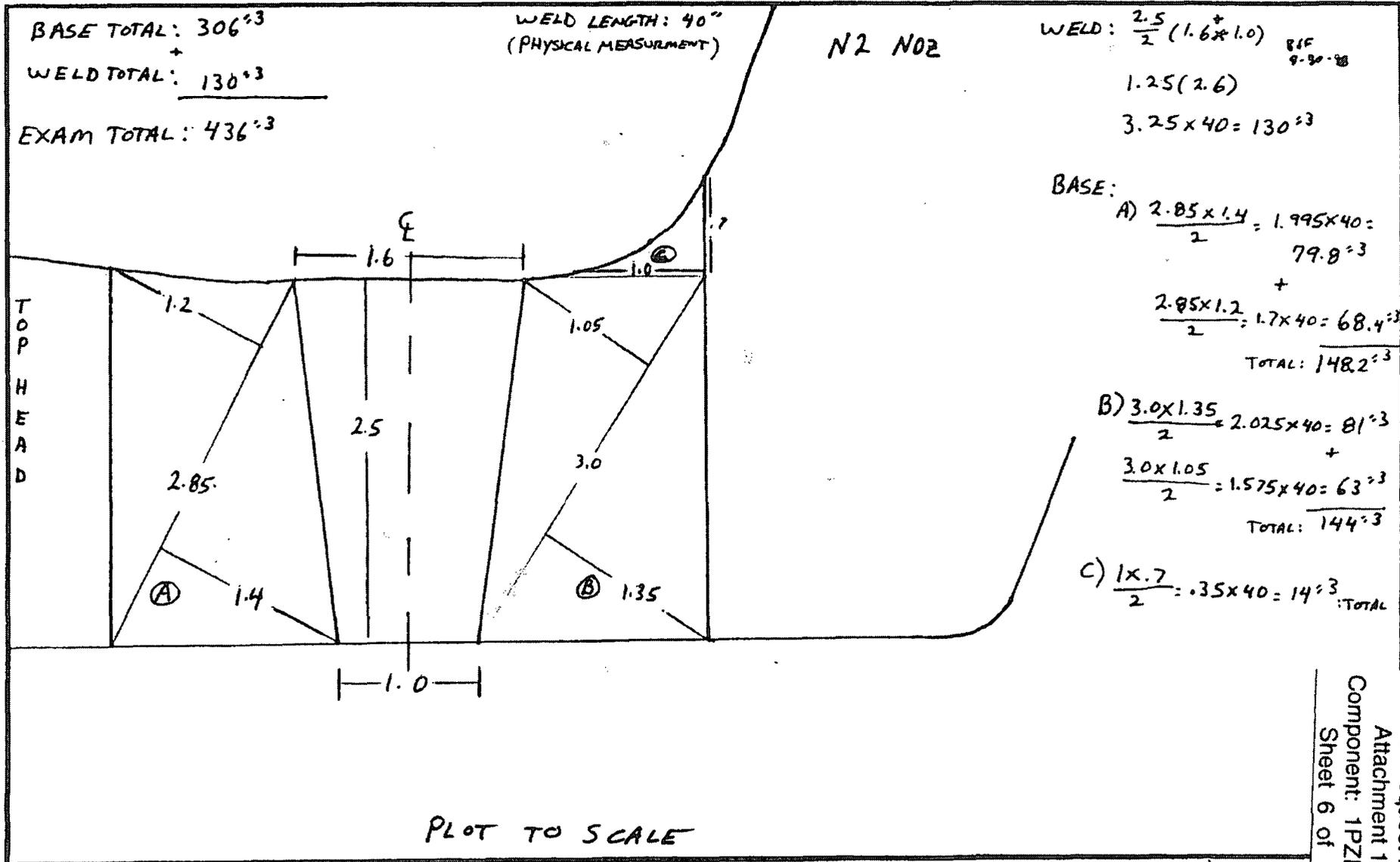
Catawba Unit 2:

Letter from E. C. Marinos (U. S. NRC) to D. Jamil (Catawba Nuclear Station), "Catawba Nuclear Station, Unit 2, Request for Relief from the Requirements of the ASME Code (TAC Nos. MC7004, MC9197, MC9198, MC9199, MC9200, MC9202, MC9203, MC9204, MC9205, MC9206 and MC9207)," dated April 3, 2006



SKETCH SHEET

REQUIRED EXAMINATION VOLUME COVERAGE



EXAMINER Frank Phoenix II DATE 9/19/98  
 REVIEWER Bob H. Allen II DATE 9-30-98

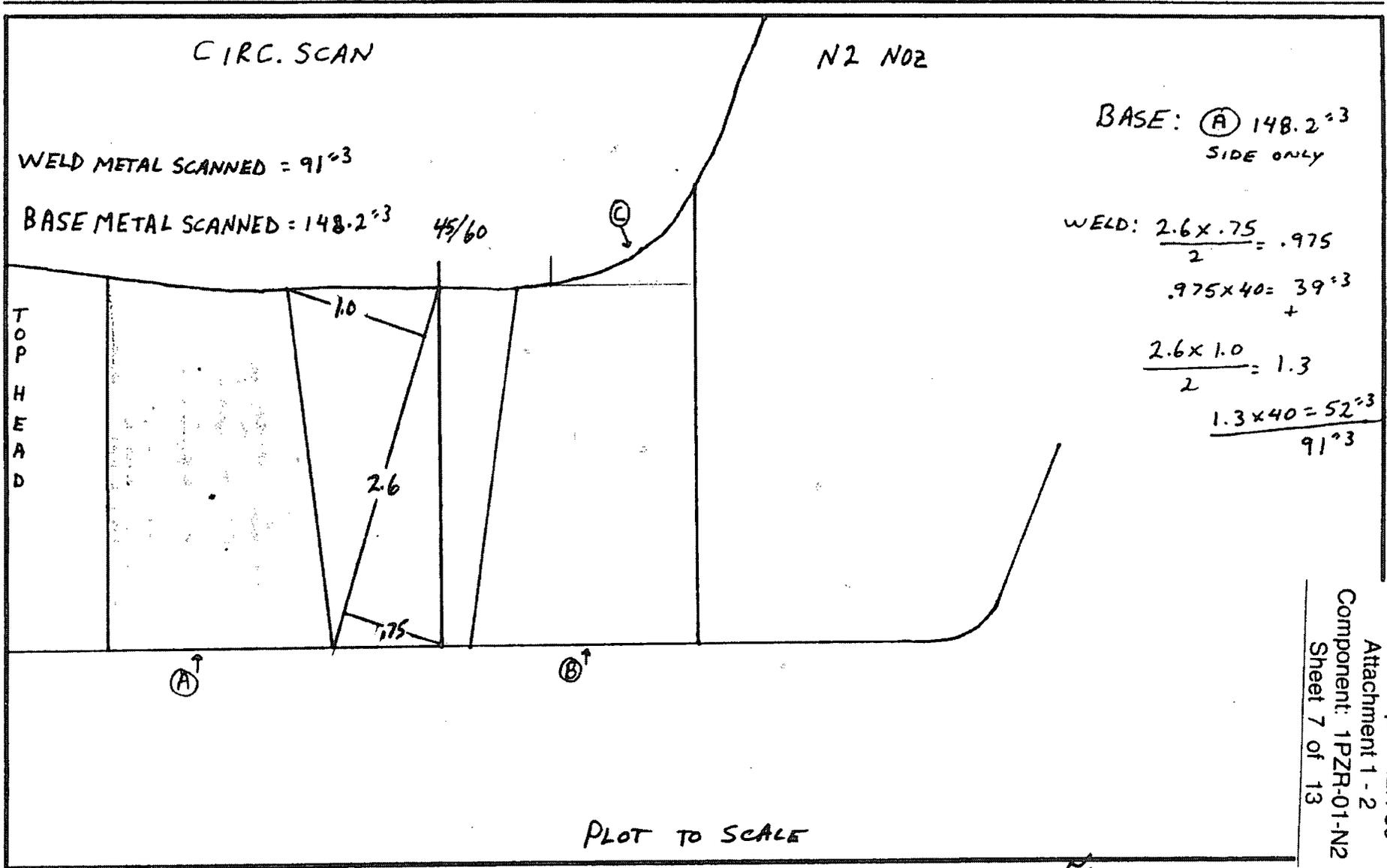
ANI/ANII REVIEW  
10-1-98

10-1-98  
10-1-98

Relief Request 12R-50  
 Attachment 1 - 2  
 Component: 1PR-01-N2  
 Sheet 6 of 13

SKETCH SHEET

REQUIRED EXAMINATION VOLUME COVERAGE



Relief Request 12R-50  
Attachment 1 - 2  
Component: 1PZR-01-N2  
Sheet 7 of 13

EXAMINER James Poljanec II  
REVIEWER Bruce [Signature] II

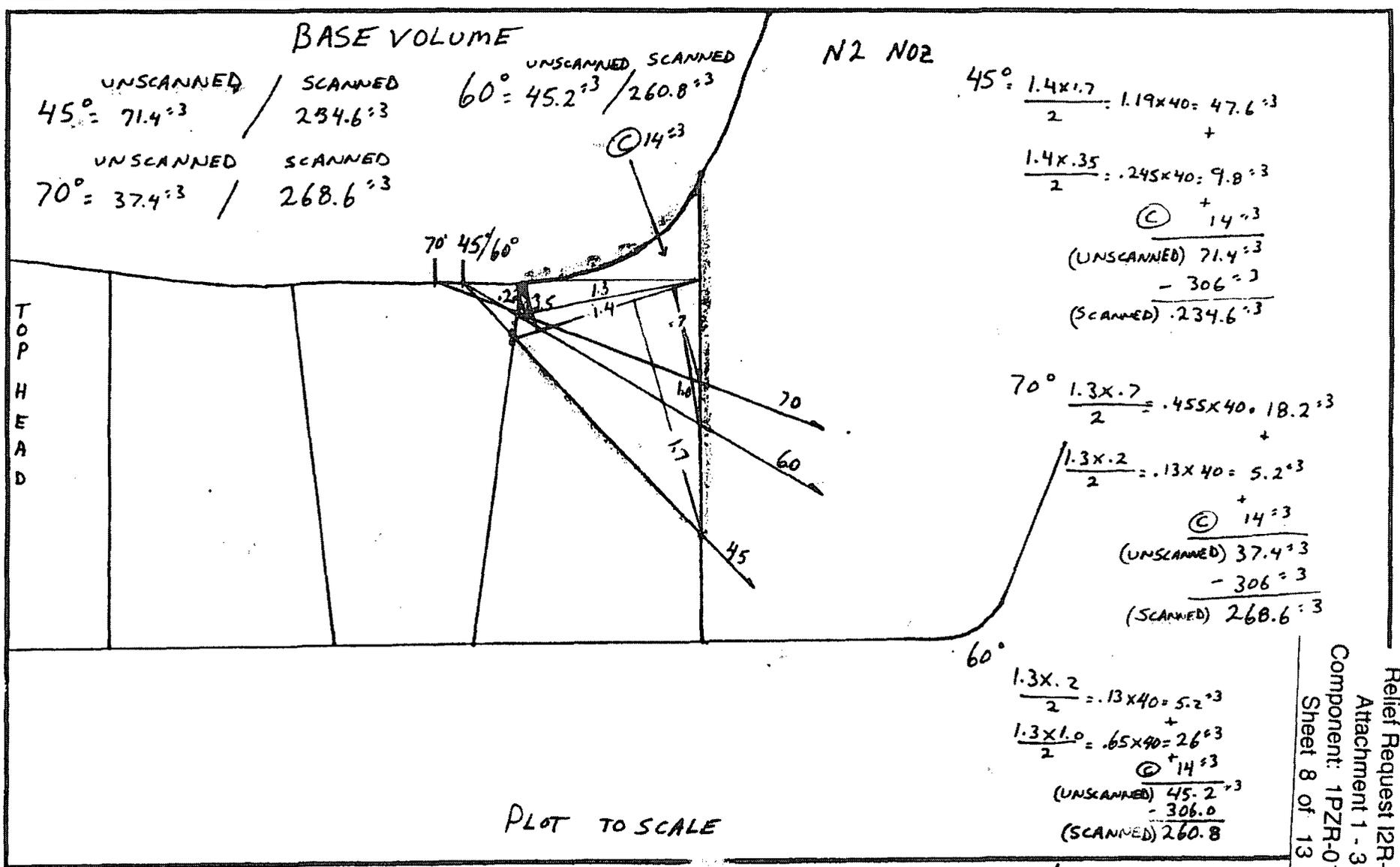
DATE 9/19/98  
DATE 9-30-98

ANI/ANII REVIEW  
[Signature] 10-1-98  
10-1-98

Thomas [Signature]  
10/7/98

SKETCH SHEET

REQUIRED EXAMINATION VOLUME COVERAGE



BASE VOLUME  
 UNSCANNED / SCANNED  
 45° = 71.4<sup>3</sup> / 234.6<sup>3</sup>  
 UNSCANNED / SCANNED  
 70° = 37.4<sup>3</sup> / 268.6<sup>3</sup>

UNSCANNED / SCANNED  
 60° = 45.2<sup>3</sup> / 260.8<sup>3</sup>

N2 NO2

45°  $\frac{1.4 \times 1.7}{2} = 1.19 \times 40 = 47.6^3$   
 +  
 $\frac{1.4 \times .35}{2} = .245 \times 40 = 9.8^3$   
 (UNSCANNED) 71.4<sup>3</sup>  
 - 306<sup>3</sup>  
 (SCANNED) 234.6<sup>3</sup>

70°  $\frac{1.3 \times .7}{2} = .455 \times 40 = 18.2^3$   
 +  
 $\frac{1.3 \times .2}{2} = .13 \times 40 = 5.2^3$   
 (UNSCANNED) 37.4<sup>3</sup>  
 - 306<sup>3</sup>  
 (SCANNED) 268.6<sup>3</sup>

$\frac{1.3 \times .2}{2} = .13 \times 40 = 5.2^3$   
 +  
 $\frac{1.3 \times 1.0}{2} = .65 \times 40 = 26^3$   
 (UNSCANNED) 45.2<sup>3</sup>  
 - 306.0  
 (SCANNED) 260.8

PLOT TO SCALE

Relief Request 12R-50  
 Attachment 1 - 3  
 Component: 1PZR-01-N2  
 Sheet 8 of 13

EXAMINER Tom Polgar II  
 REVIEWER Bruce [Signature] II

DATE 9/19/98  
 DATE 9-30-98

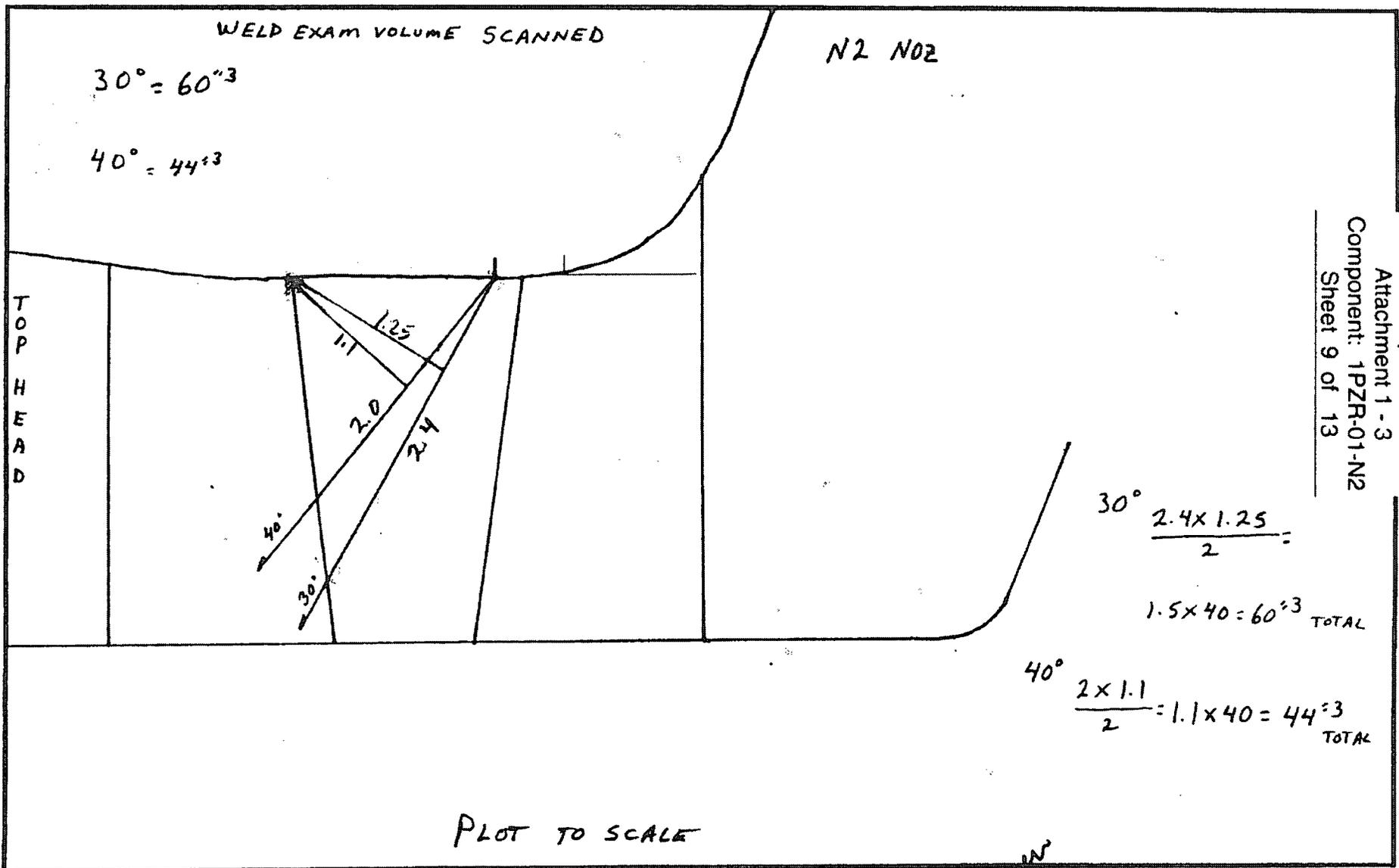
MANII REVIEW  
 10-11-98

[Signature]  
 10-1-98

[Signature]  
 10

### SKETCH SHEET

REQUIRED EXAMINATION VOLUME COVERAGE



Relief Request 12R-50  
 Attachment 1 - 3  
 Component: 1PZR-01-N2  
 Sheet 9 of 13

EXAMINER Jean Polach II

REVIEWER Brad Miller II

DATE 9/19/98

DATE 9-30-98

ANI/ANII REVIEW

Miller 10-11-98

↑ P. Miller  
10-1-98

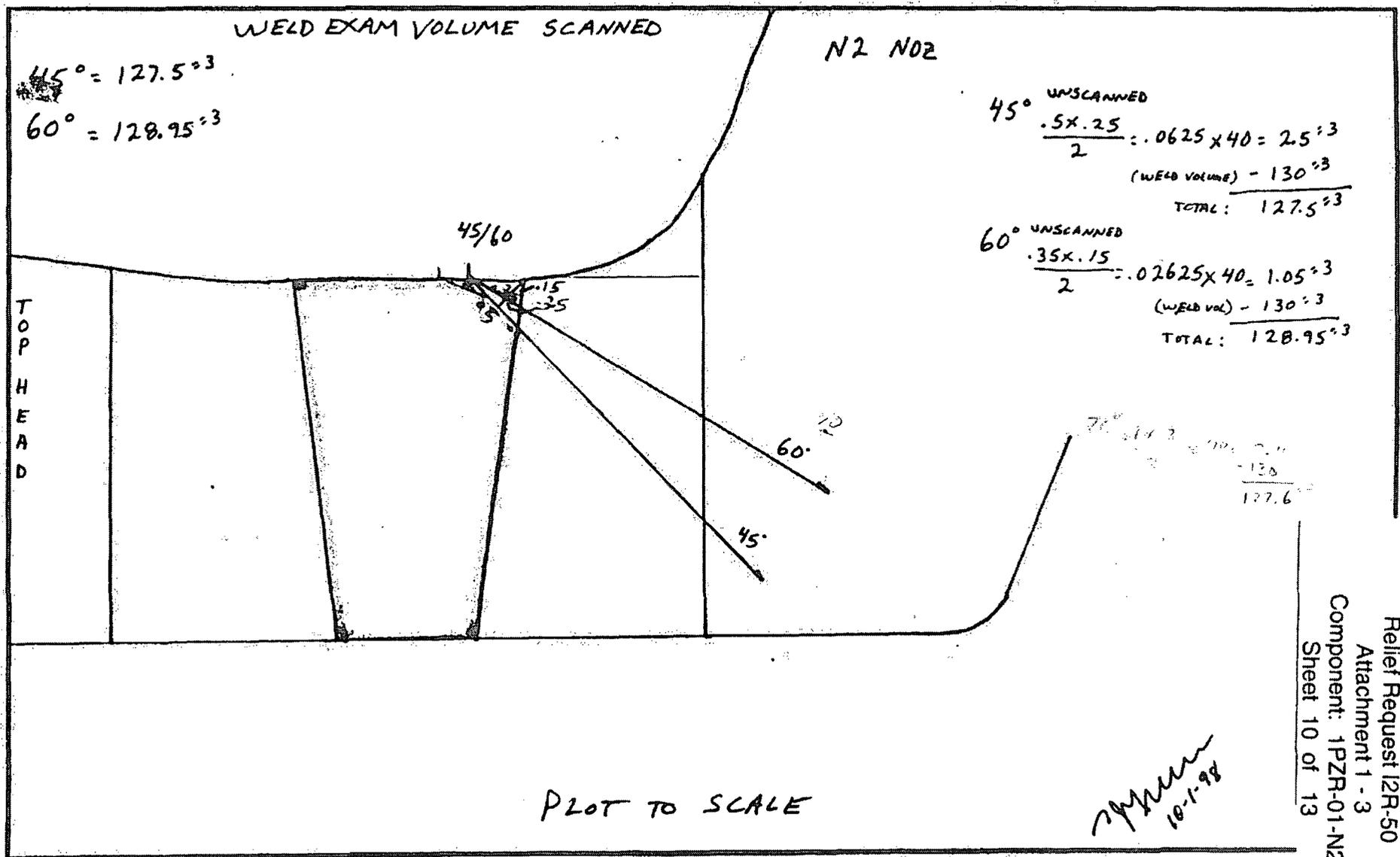
Thomas Fisher  
10/7/98

Data Sheet No. 98BRI-UTD-064

1PZR-01-N2

SKETCH SHEET

REQUIRED EXAMINATION VOLUME COVERAGE



Relief Request 12R-50  
Attachment 1 - 3  
Component: 1PZR-01-N2  
Sheet 10 of 13

EXAMINER Frank Palumbo II  
REVIEW Frank Palumbo II

DATE 9/19/98  
DATE 9-30-98

ANI/ANII REVIEW  
10-11-98

Thomas [Signature]  
10/1/98



Relief Request I2R-50  
Attachment 1 - 3  
Component: 1PZR-01-N2  
Sheet 11 of 13

Report # 98BR1-UTD-064

PAGE 7 OF 7

Coverage Summary

SITE: Braidwood UNIT: ONE  
SYSTEM: Pressurizer  
WELD ID: 1PZR-01-N2  
CONFIG: Spray Nozzle to Pressurizer

Examiner: *James Poling* Level: II  
Examiner: \_\_\_\_\_ Level: \_\_\_\_\_

FLOW →

Procedure # NDT-Z-1  
NDE METHOD X UT \_\_\_\_\_ PT \_\_\_\_\_ MT \_\_\_\_\_

Calibration Sht. # 98BR1-UTC-69,70,71,72,73,74 & 75  
Notes: Supplemental Exams 30°, 40°, 60° & 70°

VESSEL COVERAGE SUMMARY

W = 4.1" ( 1.60" WELD CROWN AND 1.30" ON EACH SIDE )

T = 2.52" WELD LENGTH = 40.0"

Total Weld Metal Volume = 130 in.<sup>3</sup>

Total Base Metal Volume = 306 in.<sup>3</sup>

WELD METAL EXAMINATION

BASE METAL EXAMINATION

SCAN	EXAM VOLUME / TOTAL VOLUME =	% EXAM	SCAN	EXAM VOLUME / TOTAL VOLUME =	% EXAM
0°	130.0 in <sup>3</sup> / 130.0 in <sup>3</sup> =	100%	0°	306.0 in <sup>3</sup> / 306.0 in <sup>3</sup>	100%
45° (B)	127.5 in <sup>3</sup> / 130.0 in <sup>3</sup> =	98.07%	60° (B)	260.8 in <sup>3</sup> / 306.0 in <sup>3</sup>	85.23%
30° (T)	60.0 in <sup>3</sup> / 130.0 in <sup>3</sup> =	46.15%	70° (B)	268.6 in <sup>3</sup> / 306.0 in <sup>3</sup>	87.77%
60° (B)	128.95 in <sup>3</sup> / 130.0 in <sup>3</sup> =	99.19%	45° CW	148.2 in <sup>3</sup> / 306.0 in <sup>3</sup>	48.40%
40° (B)	44.0 in <sup>3</sup> / 130.0 in <sup>3</sup> =	33.84%	45° CCW	148.2 in <sup>3</sup> / 306.0 in <sup>3</sup>	48.40%
45° CW	91.0 in <sup>3</sup> / 130.0 in <sup>3</sup> =	70.00%	60° CW	148.2 in <sup>3</sup> / 306.0 in <sup>3</sup>	48.40%
45° CCW	91.0 in <sup>3</sup> / 130.0 in <sup>3</sup> =	70.00%	60° CCW	148.2 in <sup>3</sup> / 306.0 in <sup>3</sup>	48.40%
60° CW	91.0 in <sup>3</sup> / 130.0 in <sup>3</sup> =	70.00%	TOTAL 466.6 % ÷ 7 = 66.65 % BMV EXAMINED		
60° CCW	91.0 in <sup>3</sup> / 130.0 in <sup>3</sup> =	70.00%			

TOTAL 657.25 % + 9 = 73.03 % WMV EXAMINED

( 73.03 % + 66.65 % ) ÷ 2 = 69.84 % EXAMINATION COVERAGE

NOTES : 30° (B) SUPPLEMENTAL FOR 45° (B)

40° (B) SUPPLEMENTAL FOR 60° (B)

60° (B) SUPPLEMENTAL FOR 45° (B)

70° (B) SUPPLEMENTAL FOR 60° (B)

*James Poling*  
10/2/98

ANWANTH REVIEW  
*ANWANTH*  
10/1/98

*James Poling*  
9-22-98

*James Poling*  
10/1/98

Relief Request I2R-50

Attachment 1 - 3

NDT-C-59  
Rev. 1

Component: 1PZR-01-N2  
Sheet 12 of 13

Page 17 of 19  
Sept., 1996

EXAMINATION DATA SHEET

Station: BRAIDWOOD Unit: 1 Page 1 of 2  
 System: PRESSURIZER Nozzle # 1PZR-01-N2  
 Nozzle Diameter: 6.0 Nozzle Material: CS/SS CLAD  
 Nozzle Temp.: 76°F/159175 Couplant: ULTRAGEL II Batch # 96225  
98BRI-UTC-077 (118° skew 65°)  
 Calibration Sheet # 98BRI-UTC-076 (24°) Data Sheet # 98BRI-UTD-065  
98BRI-UTC-078 (218° skew 65°) <sup>65°</sup> 98BRI-UTC-079 (70°)

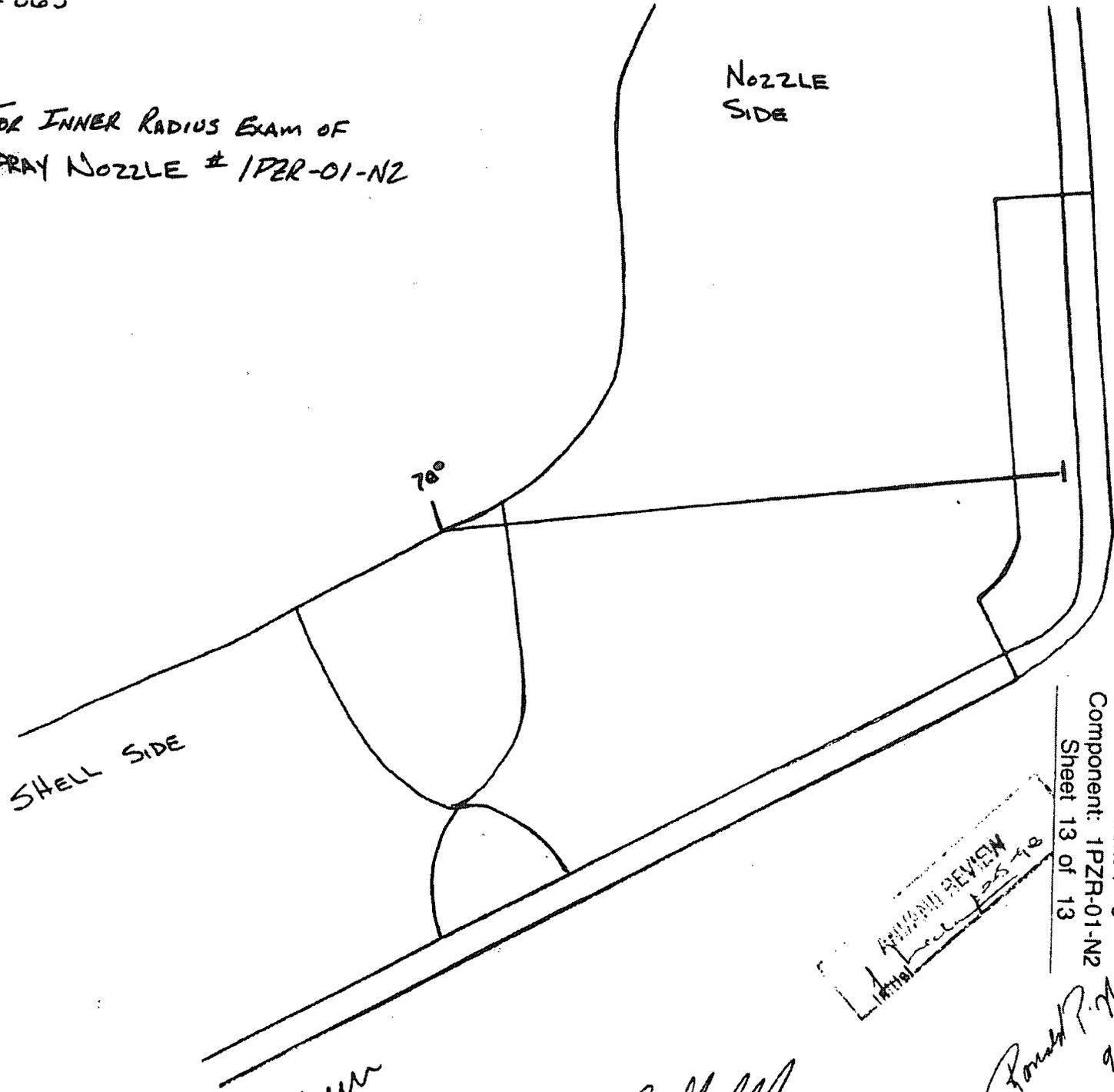
Comments: INDICATION #1 IS A GEOMETRIC REFLECTOR FROM THE BORE AREA  
SEEN 360° AT VARYING AMPLITUDES. NOTE: 100% EXAM VOLUME SCANNED.  
ADDED +14 dB TO MAINTAIN A 10% - 20% ID ROLL WHILE SCANNING.  
Ref 98BRI-UTB-019 (20%) + 020 (50%) for Beam Spreads.

EXAM. NO.	IND. NO.	AZIMUTH / LENGTH (L°)	DISTANCE AXIAL (W)	SCAN CW/CCW	MAX. AMP.	SWEEP (W°)			EVALUATION COMMENTS
						START	MAX.	STOP	
<u>70°</u>	<u>1</u>	<u>0-360°</u>	<u>.8" *</u>	<u>N/A</u>	<u>200%</u>	<u>N/A</u>	<u>4.4°</u>	<u>N/A</u>	<u>GEOMETRIC REFLECTOR FROM TUBE</u>
				<u>N</u>					
				<u>A</u>					

\* FROM TUBE OF BLEND AREA

Examiner(s): Robert P. Majors / from Polished Level: II Date: 9/19/98  
 Reviewer: Bradley Miller Level: II Date: 9-26-98  
 Others: W. Miller Level: III Date: 9-29-98  
 Station: Thomas J. Fisher Date: 10/2/98  
 ANII: L. Miller Date: 10-5-98

INDICATION # 1 FOR INNER RADIUS EXAM OF  
SPRAY NOZZLE # 1PER-01-N2



Relief Request 12R-50  
 Attachment 1 - 3  
 Component: 1PZR-01-N2  
 Sheet 13 of 13

REVIEW  
 MEMBER NUMBER  
 10578

*[Signature]*  
 10-2-98

*[Signature]* II 9-26-98

*[Signature]*  
 9-26-98

**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-4**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 1 of 19)

**1.0 Component**

Weld Number: 1PZR-01-N3  
Code Category / Item: B-D / B3.110  
Configuration: Pressurizer Relief Nozzle-to-Vessel Weld

**2.0 Applicable Code Edition and Addenda**

ASME Section XI 1989 Edition with no Addenda (including Mandatory Appendices)

**3.0 Applicable Code Requirement**

Table IWB-2500-1, Examination Category B-D requires volumetric examination of Item B3.110 (Pressurizer Nozzle-to-Vessel welds).

Figure IWB-2500-7(b) depicts the required examination volume (A-B-C-D-E-F-G-H), which includes the actual circumferential weld and adjacent base metal on either side of the weld extending to a distance of one-half the thickness of the wall from the extremities of the weld crown.

ASME Section XI Mandatory Appendix I requires ultrasonic examination of vessel welds greater than 2" thick to be conducted in accordance with ASME Section V, Article 4.

ASME Section V, Article 4 requires:

T-441.3.2.4 Extent of Scanning: Wherever feasible, the scanning of the examination volume shall be carried out from both sides of the weld on the same surface. Where the configuration or adjacent parts of the component are such that scanning from both sides is not feasible, this fact shall be included in the report of the examination.

T-441.3.2.5 Angle Beam Scanning: Wherever feasible, each examination shall be performed in two directions, i.e., approaching the weld from the opposite directions and parallel to the weld from opposite directions.

T-441.3.2.6 Scanning for Reflectors Oriented Parallel to the Weld: The angle beam search units shall be aimed at right angles to the weld axis, with the search unit manipulated so that the ultrasonic beams pass through the entire volume of weld metal. The adjacent base metal in the examination volume must be completely scanned by two angle beams, but need not be scanned by both angle beams from both directions.

T-441.3.2.7 Scanning for Reflectors Oriented Transverse to the Weld: The angle beam search units shall be aimed parallel to the axis of longitudinal and circumferential welds. The search unit shall be manipulated so that the ultrasonic beams pass through all of the examination volume. Scanning shall be done in two directions 180 degrees to each

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-4**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 2 of 19)

other to the extent possible. Areas blocked by geometric conditions shall be examined from at least one direction.

Code Case N-460, which accepts a reduction in examination coverage provided the reduction is less than 10%.

#### **4.0 Impracticality/Burden**

The pressurizer vessel relief nozzle-to-vessel weld is approximately 2.7" thick. The pressurizer nozzle and vessel are clad with stainless steel on the inside diameter surface. The geometry of the nozzle along with the presence of the cladding on the inside diameter of the pressurizer result in limited access to the entire examination volume. The propagation for the ultrasonic beam was in the shear mode. Normally this mode would allow the ultrasonic beam to reflect off the inside surfaces and create a two-beam axis at right angles to each other; however, the presence of the stainless steel cladding precludes the ultrasound beams from reflecting at the inside diameter from the shell/cladding interface. The nozzle geometry tapers away from the weld resulting in limited scanning surfaces available for transducer coupling on the nozzle side of the weld resulting in additional examination limitations. These factors result in limited examination coverage from the scan directions required by ASME Section V and Section XI. These limitations are inherent to the original design of the pressurizer vessel. Conformance with the ASME Section XI requirements for essentially 100% of the volumetric coverage would require extensive structural modifications to the pressurizer vessel.

#### **5.0 Alternative Examinations or Testing**

In addition to performing the 0, 45, 60, and 70 degree scans to the extent practical as required by Appendix I, additional 30 and 40 degree scans were performed to supplement coverage. The aggregate examination coverage achieved was 73.6%.

In addition to completing the required volumetric examination to the extent practical, numerous system leakage tests (ASME Section XI Category B-P and Generic Letter 88-05) at nominal system operating pressure (2235 psig) and temperature (557°F) as well as the bare metal visual examinations associated with NRC Bulletin 2004-01 of the upper pressurizer vessel head were completed with no evidence of leakage associated with the pressurizer relief nozzle-to-vessel weld noted during the course of the interval.

Radiography as an alternative is not feasible because access is not available for film placement. No alternative examinations are planned for the weld during the current inspection interval.

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-4**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 3 of 19)

**6.0 Justification for Granting Relief**

No additional examinations were completed during the inspection interval; however, the examination coverage of 73.6% along with the results of the pressure test and bare metal visual inspections provide reasonable assurance that pressure boundary integrity has been maintained for this component throughout the interval.

**7.0 Precedents**

Similar examination limitations for pressurizer relief nozzle-to-shell welds were encountered and similar examination coverage was accepted for the following units:

Byron Station Units 1 and 2:

Letter from R. Gibbs (U. S. NRC) to C. G. Pardee (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2 – Inservice Inspection Program Second Interval Relief Requests I2R-22, I2R-23, I2R-25, and I2R-53 (TAC Nos. MD4099, MD4100, MD4101, MD4102, MD4103, MD4104, MD4105, and MD4106)," dated January 15, 2008

Callaway Unit 1:

Letter from D. Terao (U. S. NRC) to C. D. Naslund (Union Electric Company), "Callaway Plant, Unit 1 - Relief Request ISI-41 for the Second 10-Year Inservice Inspection Interval (TAC No. MD3437)," dated January 18, 2007

Wolf Creek Unit 1:

Letter from D. Terao (U. S. NRC) to R. A. Muench (Wolf Creek Nuclear Operating Corporation), "Wolf Creek Generating Station – Relief Request I2R-34 for the Second Ten-Year Interval Inservice Inspection (TAC No. MD0288)," dated November 20, 2006

Catawba Unit 1:

Letter from E. C. Marinos (U. S. NRC) to D. Jamil (Catawba Nuclear Station), "Catawba Nuclear Station, Unit 1, Request for Relief 05-CN-004, Limited Weld Examinations During End-of-Cycle 15 Refueling Outage (TAC Nos. MC8337, MC9171, MC9172, MC9199, MC9173, MC9202, MC9174, MC9175, MC9176, MC9177, MC9178 and MC9179)," dated September 25, 2006

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-4**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 4 of 19)

Catawba Unit 2:

Letter from E. C. Marinos (U. S. NRC) to D. Jamil (Catawba Nuclear Station), "Catawba Nuclear Station, Unit 2, Request for Relief from the Requirements of the ASME Code (TAC Nos. MC7004, MC9197, MC9198, MC9199, MC9200, MC9202, MC9203, MC9204, MC9205, MC9206 and MC9207)," dated April 3, 2006

EXAMINATION DATA SHEET

Pg 1 of 13

BSP  
9-10-98

STATION: BRAIDWOOD UNIT: 1 SYSTEM: PRESSURIZER DATE: 9-20-98 DATA SHEET #: 98891-UTD-061  
(0°/90°) 98891-UTC-080  
COMPONENT I.D.: 1PZR-01-N3 THICKNESS: 3.1" MATERIAL: CS/95 CLAD CALIB. SHEET # (S): 098891-UTC-081 459889-UTC-

COMPONENT SERIAL #: 1RY01S COMPONENT TEMP.: 76°F COUPLANT: ULTRACEL II 609889-UTC-085 709889-UTC-  
159175 BATH 96225

For Beam Spreads Ref: 98891-UTC-

30°- 98891-UTC-021(20%) + 022 (50%) / 60°- 98891-UTC-017 (20%) + 018 (50%)  
40°- 98891-UTC-013 (20%) + 014 (50%) / 70°- 98891-UTC-019 (20%) + 020 (50%)  
45°- 98891-UTC-015 (20%) + 016 (50%)

VERTICAL VESSEL UP

300 98891-UTC-082

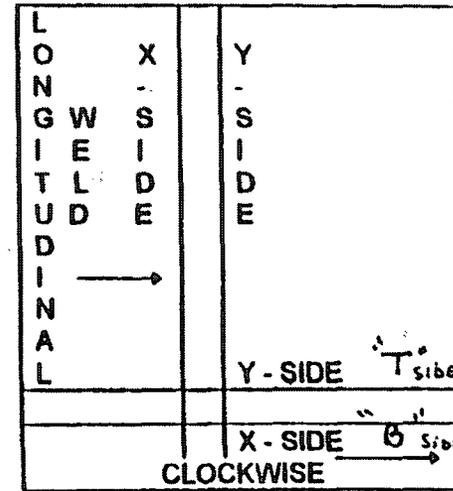
450 98891-UTC-083

WELD TYPE: CIRCUMFERENTIAL N/A LONGITUDINAL N/A OTHER \_\_\_\_\_

EXAMINATIONS PERFORMED

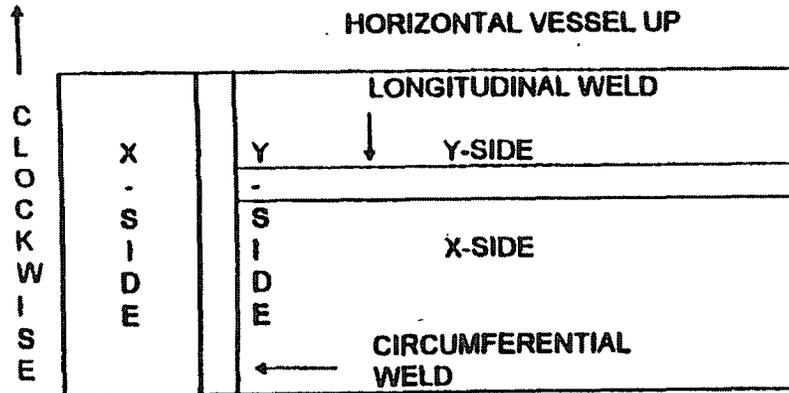
- SCAN 1, L-WAVE (BASE METAL & WELD)
- SCAN 2, ANGLE BEAM (PERPENDICULAR TO WELD CLOCKWISE "X" SIDE)
- SCAN 3, ANGLE BEAM (PERPENDICULAR TO WELD CLOCKWISE "Y" SIDE)
- SCAN 4, ANGLE BEAM (PARALLEL TO WELD CLOCKWISE)
- SCAN 5, ANGLE BEAM (PARALLEL TO WELD COUNTERCLOCKWISE)
- SCAN 6, L-WAVE AVERAGE THICKNESS

"X" SIDE 2.5" WELD 2.68" "Y" SIDE N/A  
(SHELL) (NOZZLE)



.50" Ø  $\theta$  Supplement  
30° Supplement for  
40° Supplement for 6  
2/2/98  
9.28.98

NOZZLE SIDE  
CIRC. WELD  
SHELL SIDE



EXAMINER: [Signature] LEVEL: II DATE: \_\_\_\_\_  
 REVIEWER: [Signature] LEVEL: II DATE: \_\_\_\_\_  
 OTHER: [Signature] LEVEL: III DATE: \_\_\_\_\_  
 STATION: [Signature] DATE: 10/3/98  
 ANII: [Signature] DATE: 10-11-98

Relief Request 12R-50  
Attachment 1-4  
Component: 1PZR-01-N3  
Sheet 5 of 19

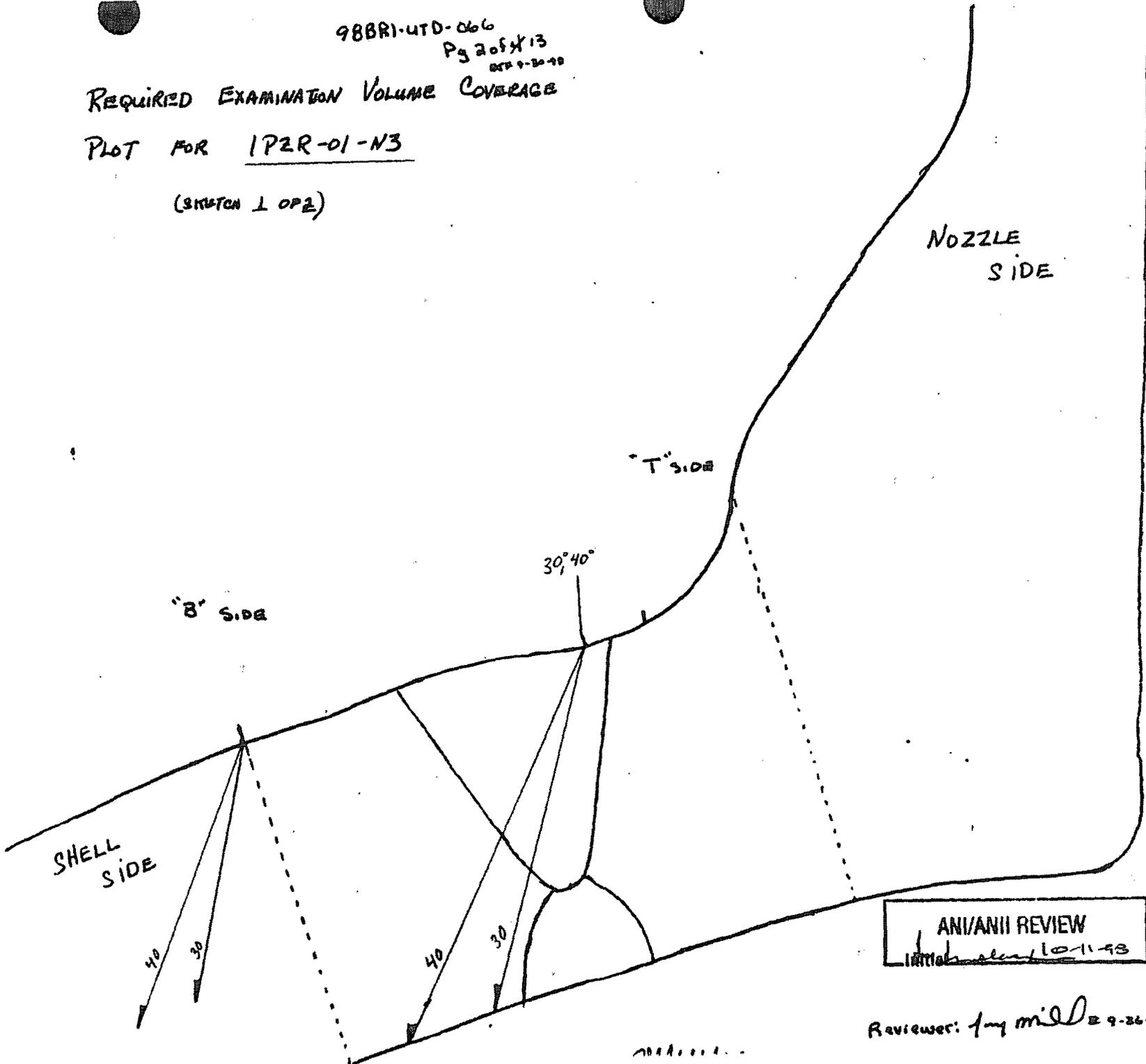
COMMENTS: SEE ATTACHED COVERAGE PLOTS AND CALCULATION SHEETS FOR THE ANGLES APPLICABLE TO EACH SCAN AND FOR THE RESPECTIVE SCANNING LIMITATIONS. SCANNED VESSEL SIDE ONLY DUE TO NOZZLE CONFIGURATION. NO PENETRANT INDICATION.

98BR1-UTD-066  
Pg 2 of 13  
REV 1-26-98

# REQUIRED EXAMINATION VOLUME COVERAGE

PLOT FOR 1PZR-01-N3

(SKETCH 1 OF 2)



Relief Request 12R-50  
Attachment 1 - 4  
Component: 1PZR-01-N3  
Sheet 6 of 19

AN/ANII REVIEW  
10-11-98

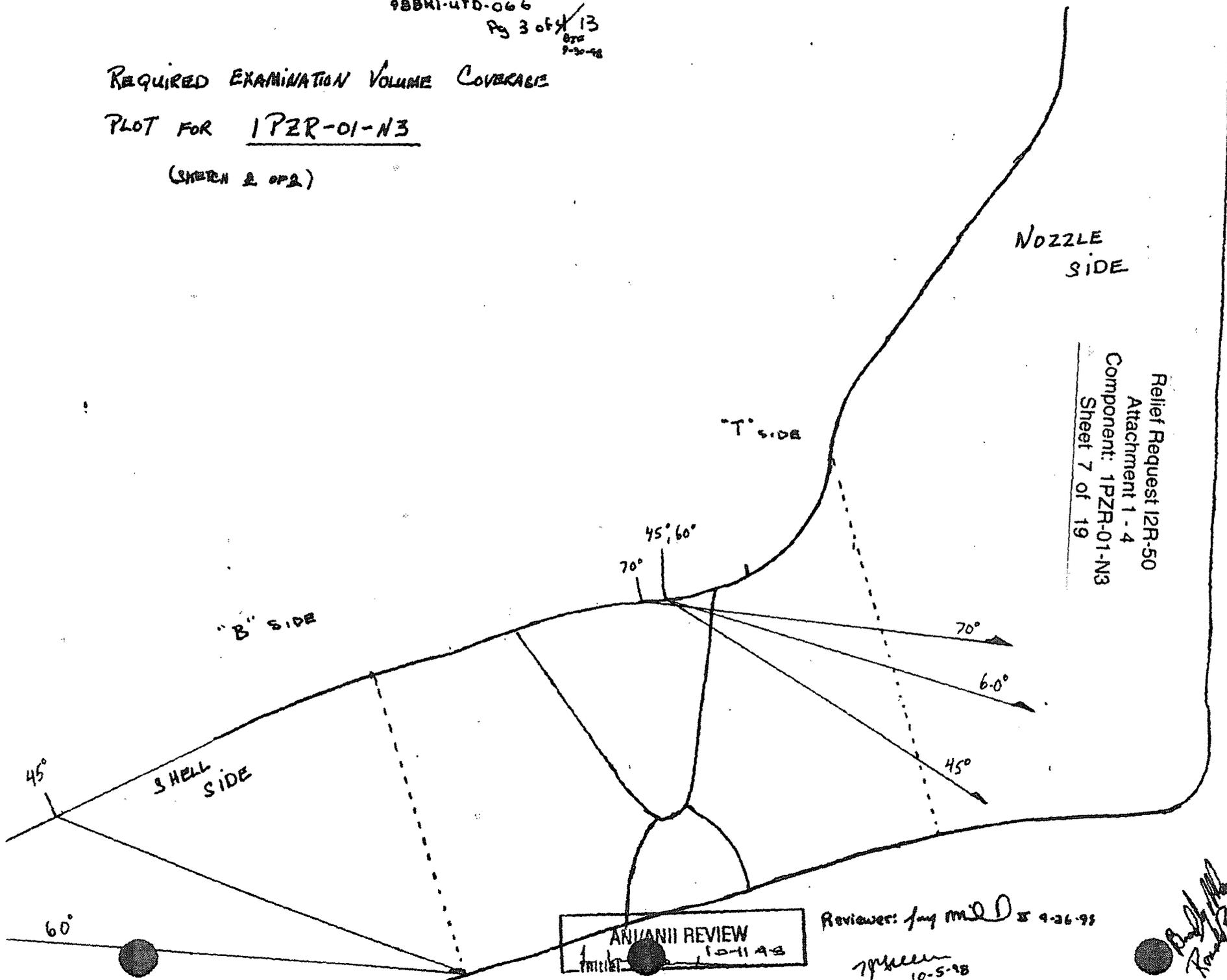
Reviewer: *Tom Miller* 9-26-98

*Buddy A. ...*  
*Paul P. ...*  
9-26-98

# REQUIRED EXAMINATION VOLUME COVERAGE

## PLOT FOR 1PZR-01-N3

(SHEET 2 OF 2)



Relief Request 12R-50  
 Attachment 1 - 4  
 Component: 1PZR-01-N3  
 Sheet 7 of 19

ANJANI REVIEW  
 10-11-98

Reviewer: Jay m... 9-26-98  
 10-5-98

Handwritten signatures and dates:  
 9-26-98  
 9-26-98

# CIDE COVERAGE CALCULATIONS

98821-UTD-066

## REFERENCE SHEET

$T = 2.5''$       WELD LENGTH =  $47.1''$  (NOTE: LENGTH =  $\pi \cdot D = 3.14 \times 15' = 47.1''$ )

WELD METAL VOLUME =  $\left[ \frac{\text{AREA } C}{2} + \frac{\text{AREA } G}{2} \right] \times L = \left[ \frac{2.4(1.14+1.7)}{2} + \frac{(1.2)(1.7)}{2} \right] \times (47.1)$   
 $= [3.5] \times 47.1 = 164.9 \text{ in}^3$

BASE METAL VOLUME =  $\left[ \text{AREA } A + \text{AREA } B + \text{AREA } D + \frac{\text{AREA } E}{2} + \frac{\text{AREA } F}{2} \right] \times (47.1)$   
 $= [3.0 + .25 + .48 + 2.88 + .17] \times (47.1)$   
 $= [6.78 \text{ in}^2 \times 47.1 \text{ in}] = 319.3 \text{ in}^3$

AREA 'A' =  $l \times w = 1.2'' \times 2.5'' = 3.0 \text{ in}^2$

AREA 'B' =  $\frac{b \times h}{2} = \frac{.2'' \times 2.5''}{2} = .25 \text{ in}^2$

AREA 'C' =  $\frac{1}{2}(a+b)h = \frac{1}{2}(1.14+1.7)2.4 = 3.4 \text{ in}^2$

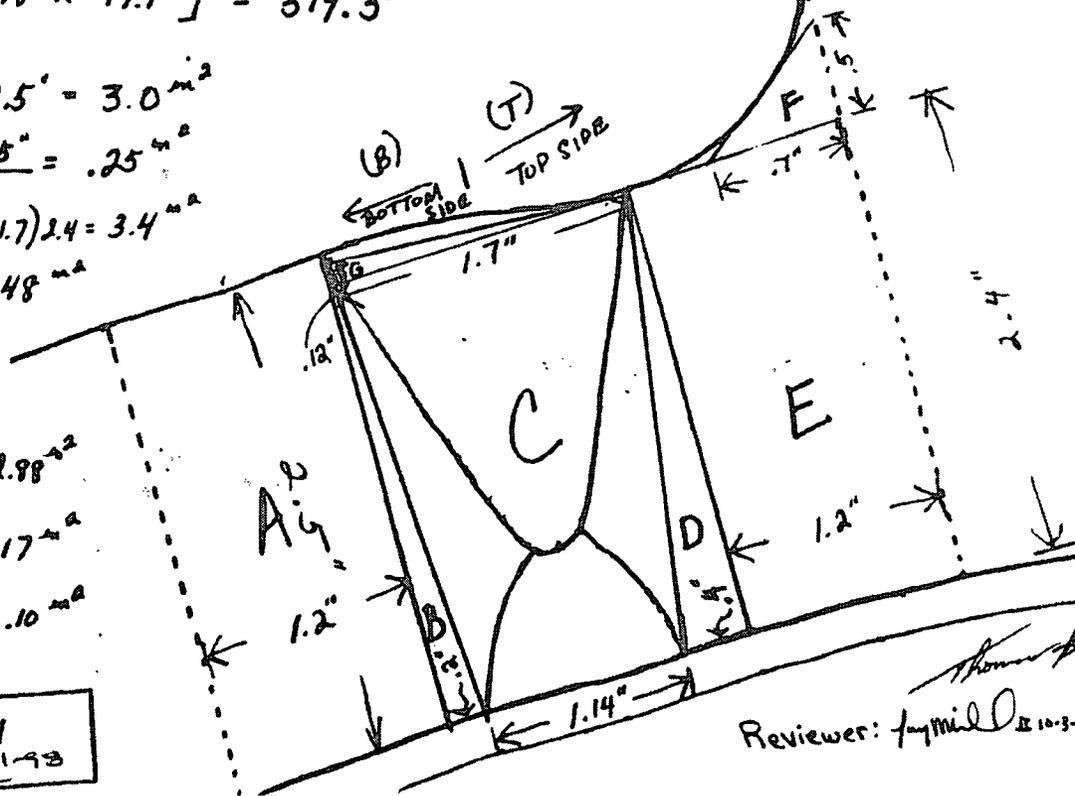
AREA 'D' =  $\frac{b \times h}{2} = \frac{.4 \times 2.4}{2} = .48 \text{ in}^2$

AREA 'E' =  $l \times w = 2.4 \times 1.2 = 2.88 \text{ in}^2$

AREA 'F' =  $\frac{b \times h}{2} = \frac{.7 \times .5}{2} = .17 \text{ in}^2$

AREA 'G' =  $\frac{b \times h}{2} = \frac{.12 \times 1.7}{2} = .10 \text{ in}^2$

AN/ANII REVIEW  
10-11-98



N3

Relief Request I2R-50  
Attachment 1 - 4  
Component: 1PZR-01-N3  
Sheet 8 of 19

Reviewer: *Thomas K. K... 10-15-98*  
*Ronald F. M... 9-20-98*  
*W... 10-5-98*

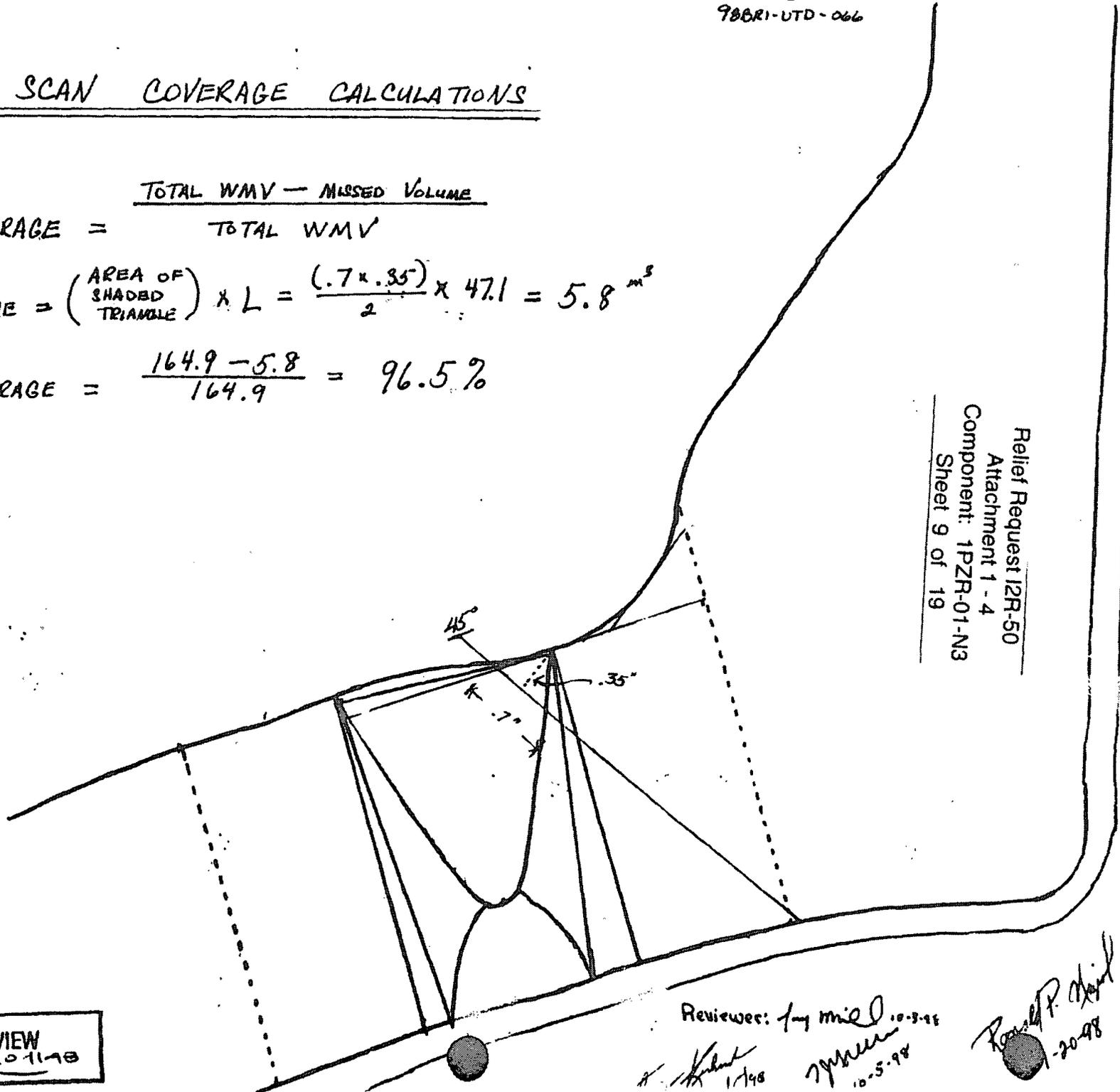
# 45° (B) SCAN COVERAGE CALCULATIONS

$$\text{EXAM COVERAGE} = \frac{\text{TOTAL WMV} - \text{MISSED VOLUME}}{\text{TOTAL WMV}}$$

$$\text{MISSED VOLUME} = \left( \frac{\text{AREA OF SHADED TRIANGLE}}{2} \right) \times L = \frac{(.7 \times .35)}{2} \times 47.1 = 5.8 \text{ m}^3$$

$$\text{EXAM COVERAGE} = \frac{164.9 - 5.8}{164.9} = 96.5\%$$

Relief Request 12R-50  
 Attachment 1 - 4  
 Component: 1PZR-01-N3  
 Sheet 9 of 19



AMMANI REVIEW  
 10-11-98

Reviewer: Tony Miel 10-5-98

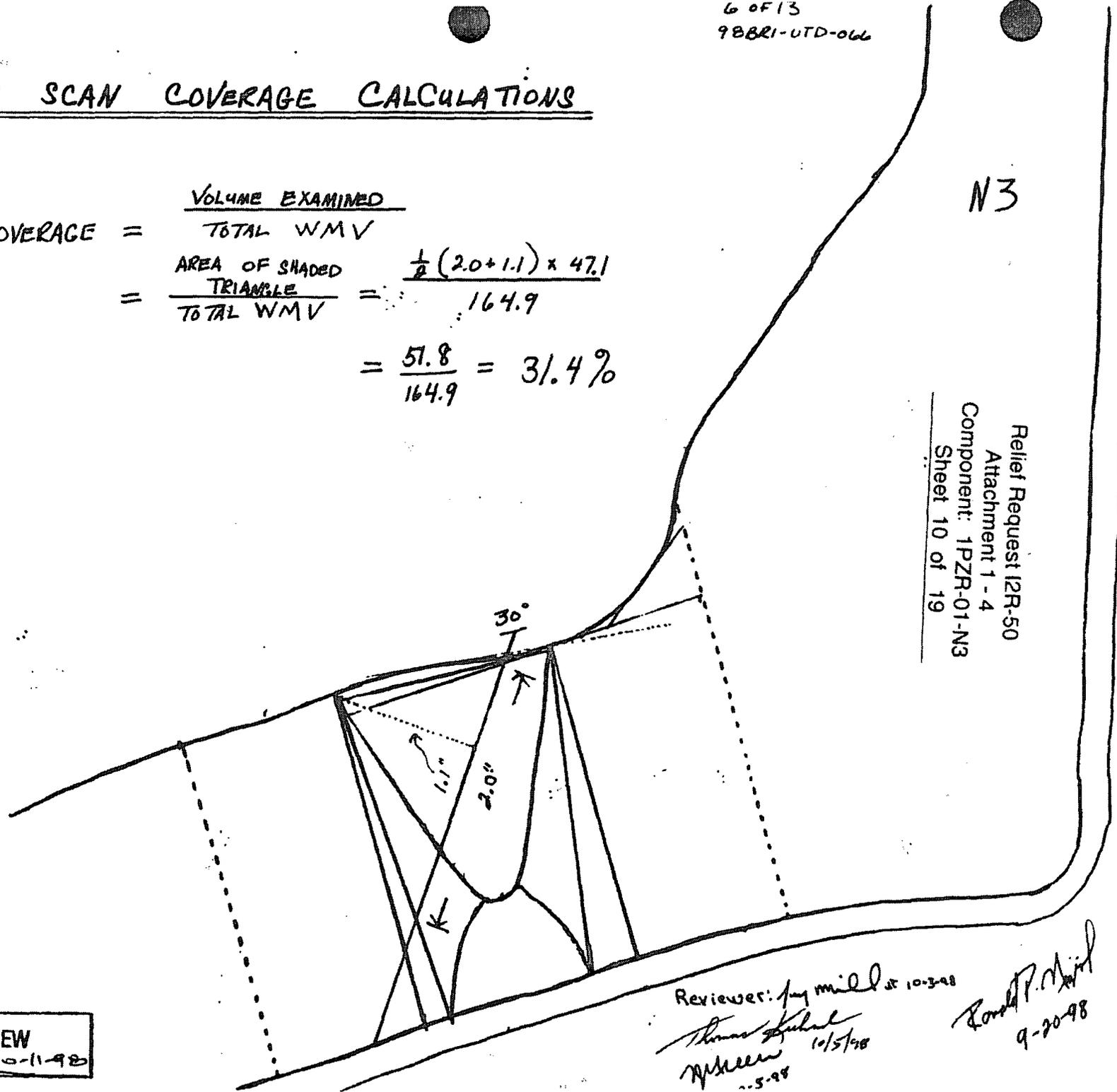
1/198

10-5-98

88-02-20-98

# 30° (T) SCAN COVERAGE CALCULATIONS

$$\begin{aligned} \text{EXAM COVERAGE} &= \frac{\text{VOLUME EXAMINED}}{\text{TOTAL WMV}} \\ &= \frac{\text{AREA OF SHADED TRIANGLE}}{\text{TOTAL WMV}} = \frac{\frac{1}{2}(2.0+1.1) \times 47.1}{164.9} \\ &= \frac{51.8}{164.9} = 31.4\% \end{aligned}$$



N3  
Relief Request 12R-50  
Attachment 1 - 4  
Component: 1PZR-01-N3  
Sheet 10 of 19

Reviewer: *py mill* 10-3-98  
*Thomas Schulz*  
*Wheeler* 10/5/98  
..5-98

*Robert P. Mill*  
9-20-98

ANI/ANII REVIEW  
Initial: *haley* 10-11-98

# 70° (B) SCAN COVERAGE CALCULATIONS

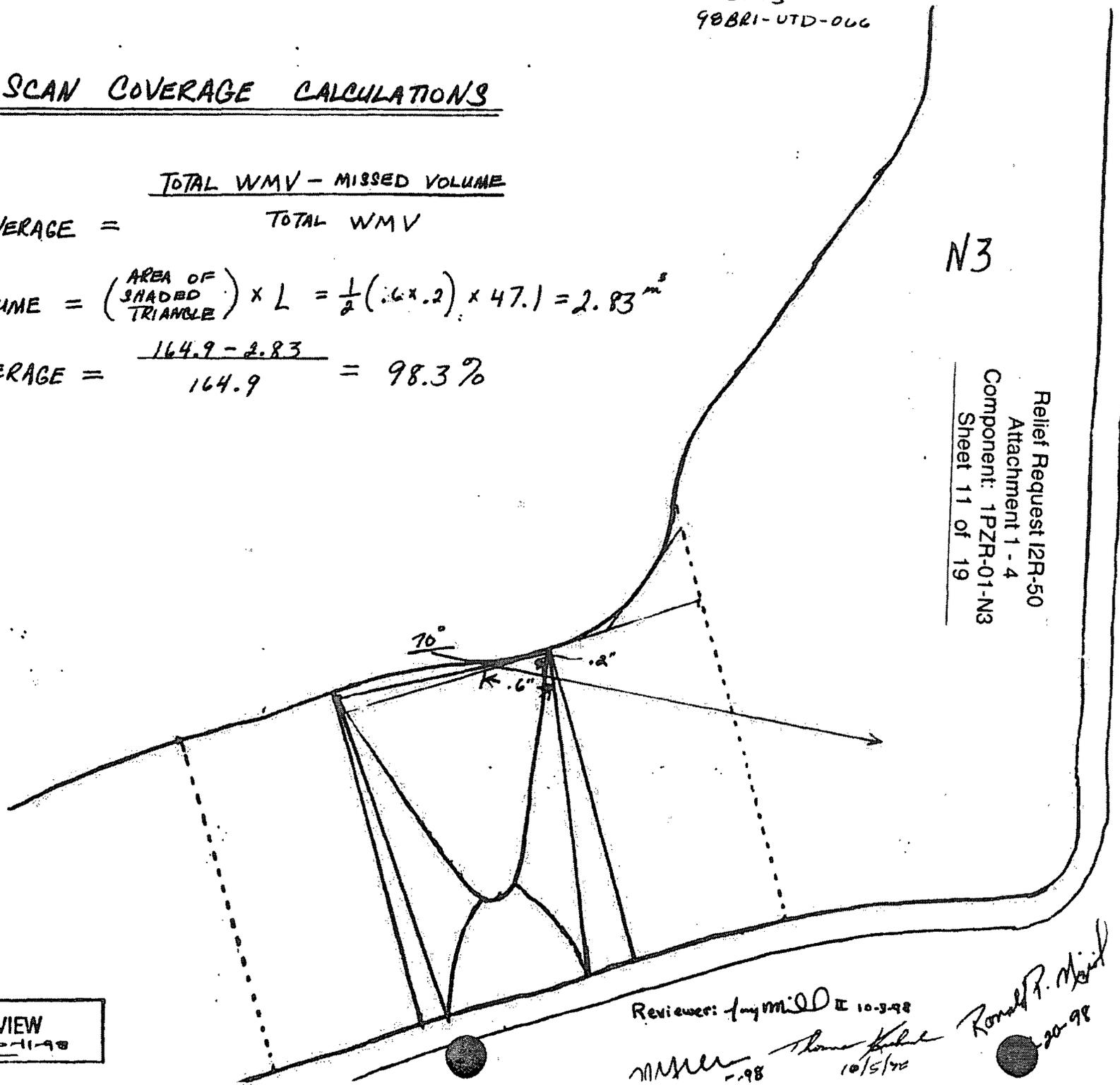
$$\text{EXAM COVERAGE} = \frac{\text{TOTAL WMV} - \text{MISSED VOLUME}}{\text{TOTAL WMV}}$$

$$\text{MISSED VOLUME} = \left( \frac{\text{AREA OF SHADED TRIANGLE}}{\text{TRIANGLE}} \right) \times L = \frac{1}{2} (.6 \times .2) \times 47.1 = 2.83 \text{ m}^3$$

$$\text{EXAM COVERAGE} = \frac{164.9 - 2.83}{164.9} = 98.3\%$$

N3

Relief Request I2R-50  
 Attachment 1 - 4  
 Component: 1PZR-01-N3  
 Sheet 11 of 19



ANI/ANII REVIEW  
 10/11/98

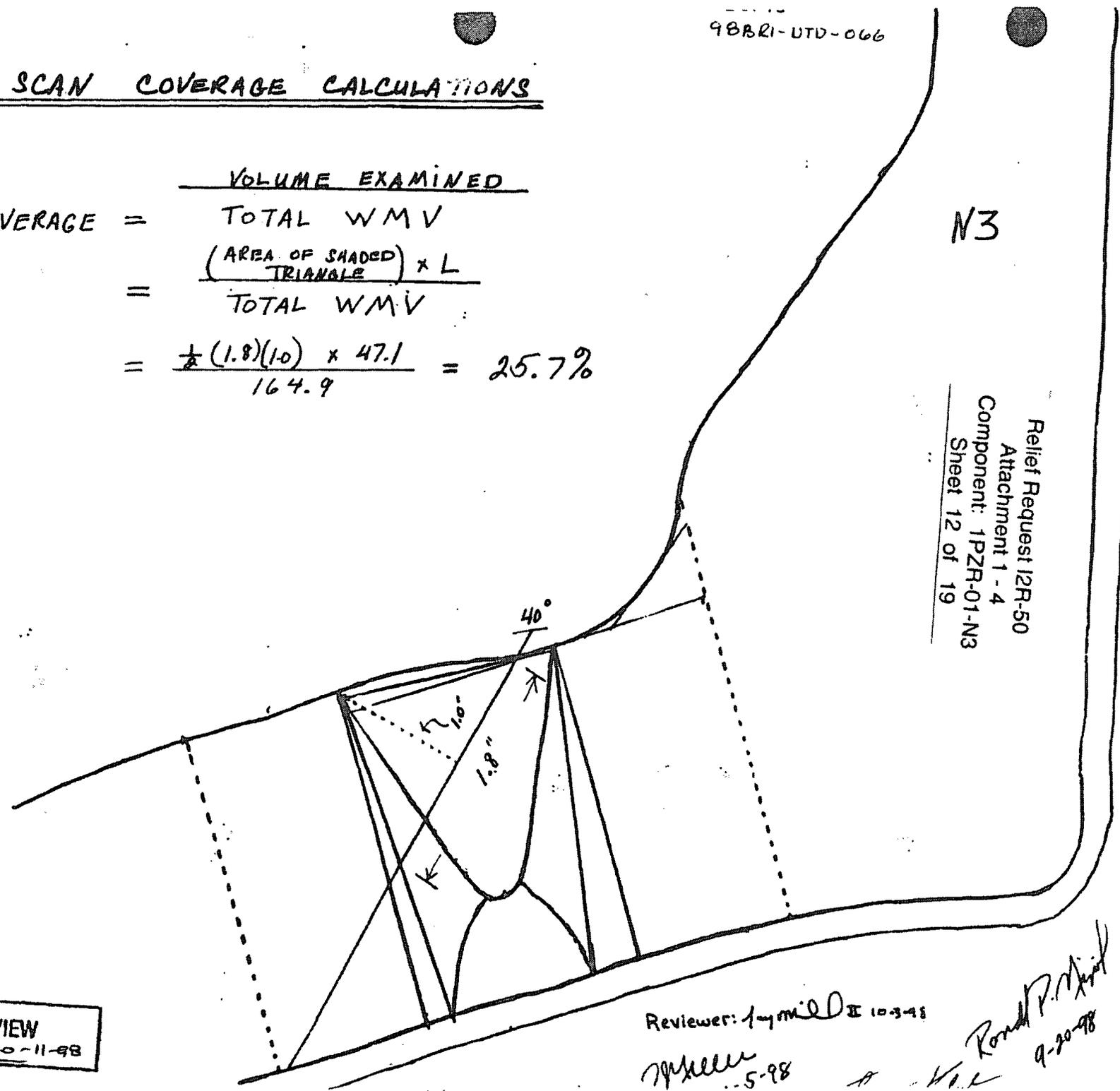
Reviewer: Amy M. D. 10-3-98

10/5/98

Ronald P. Merrill  
 10-20-98

# 40° (T) SCAN COVERAGE CALCULATIONS

$$\begin{aligned}
 \text{EXAM COVERAGE} &= \frac{\text{VOLUME EXAMINED}}{\text{TOTAL WMV}} \\
 &= \frac{(\text{AREA OF SHADED TRIANGLE}) \times L}{\text{TOTAL WMV}} \\
 &= \frac{\frac{1}{2} (1.8)(10) \times 47.1}{164.9} = 25.7\%
 \end{aligned}$$



N3

Relief Request 12R-50  
 Attachment 1 - 4  
 Component: 1PZR-01-N3  
 Sheet 12 of 19

ANI/ANII REVIEW  
 10-11-98

Reviewer: *[Signature]* 10-3-98

*[Signature]* 5-98

*[Signature]*  
 9-20-98

# 45°(CW), 45°(CCW), 60°(CW), 60°(CCW) SCAN COVERAGE CALCULATIONS

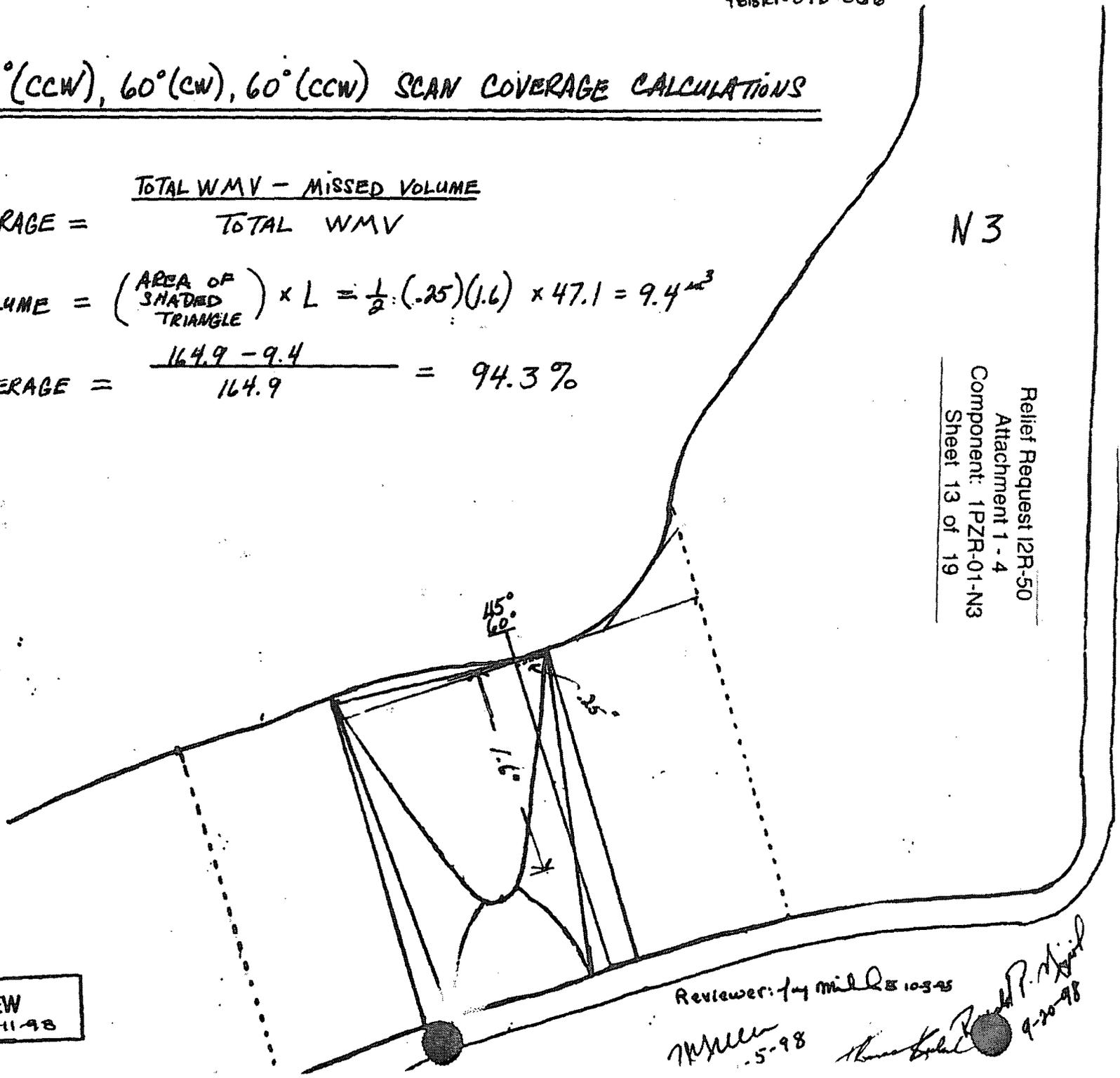
$$\text{EXAM COVERAGE} = \frac{\text{TOTAL WMV} - \text{MISSED VOLUME}}{\text{TOTAL WMV}}$$

$$\text{MISSED VOLUME} = \left( \frac{\text{AREA OF SHADED TRIANGLE}}{\text{TRIANGLE}} \right) \times L = \frac{1}{2} \cdot (.25)(1.6) \times 47.1 = 9.4 \text{ m}^3$$

$$\text{EXAM COVERAGE} = \frac{164.9 - 9.4}{164.9} = 94.3\%$$

N 3

Relief Request 12R-50  
 Attachment 1 - 4  
 Component: 1PZR-01-N3  
 Sheet 13 of 19



AN/ANII REVIEW  
 10/11/98

Reviewer: 14 mill 8 10345

11/11/98

9-20-98

60°  
45°(B) SCAN COVERAGE CALCULATIONS

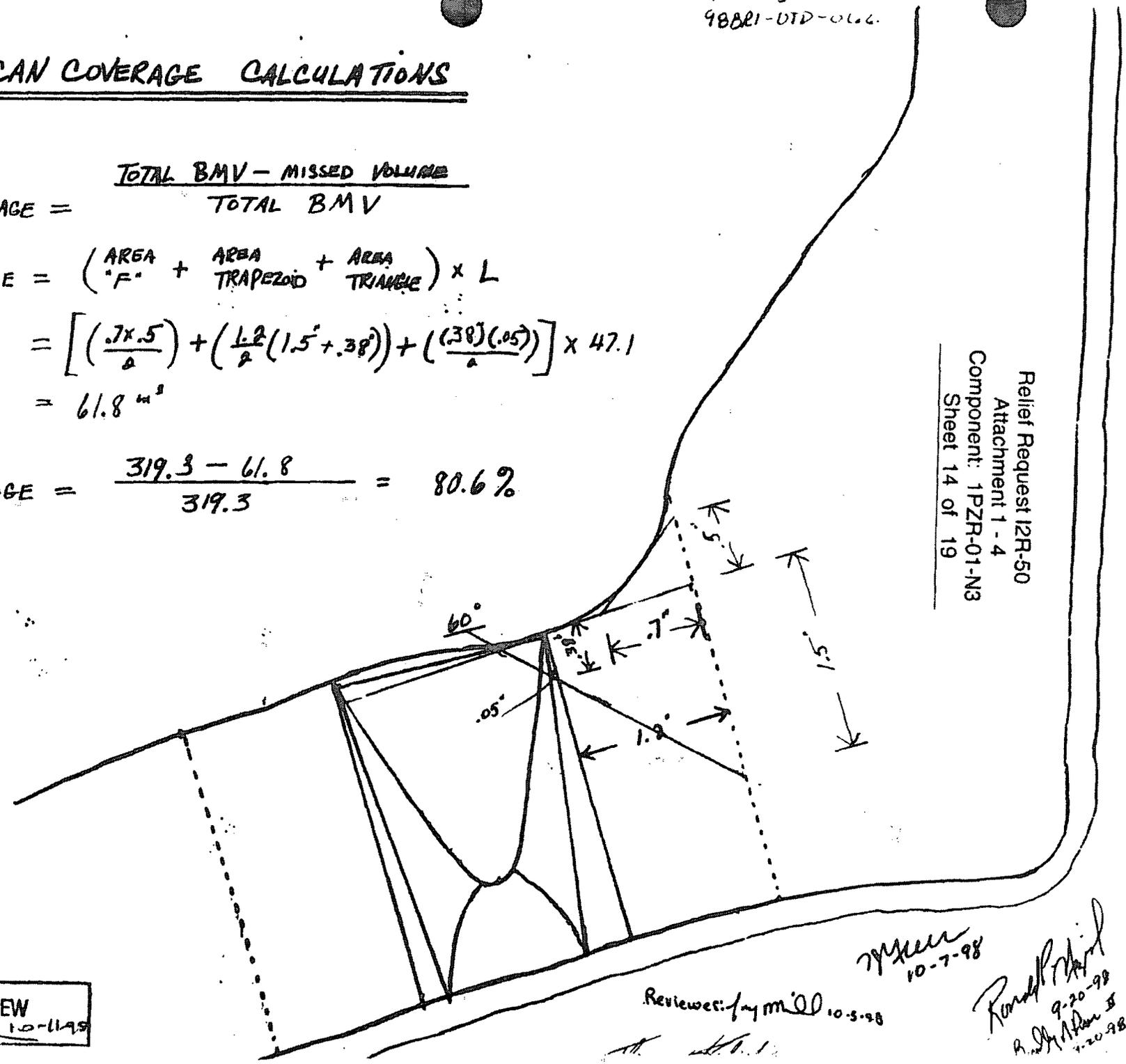
RPN 9-20-98

$$\text{EXAM COVERAGE} = \frac{\text{TOTAL BMV} - \text{MISSED VOLUME}}{\text{TOTAL BMV}}$$

$$\begin{aligned} \text{MISSED VOLUME} &= \left( \text{AREA "F"} + \text{AREA TRAPEZOID} + \text{AREA TRIANGLE} \right) \times L \\ &= \left[ \left( \frac{.7 \times .5}{2} \right) + \left( \frac{1.2}{2} (1.5 + .38) \right) + \left( \frac{(.38)(.05)}{2} \right) \right] \times 47.1 \\ &= 61.8 \text{ m}^3 \end{aligned}$$

$$\text{EXAM COVERAGE} = \frac{319.3 - 61.8}{319.3} = 80.6\%$$

Relief Request 12R-50  
Attachment 1 - 4  
Component: 1PZR-01-N3  
Sheet 14 of 19



AN/ANII REVIEW  
10-11-98

Reviewed by [Signature] 10-5-98

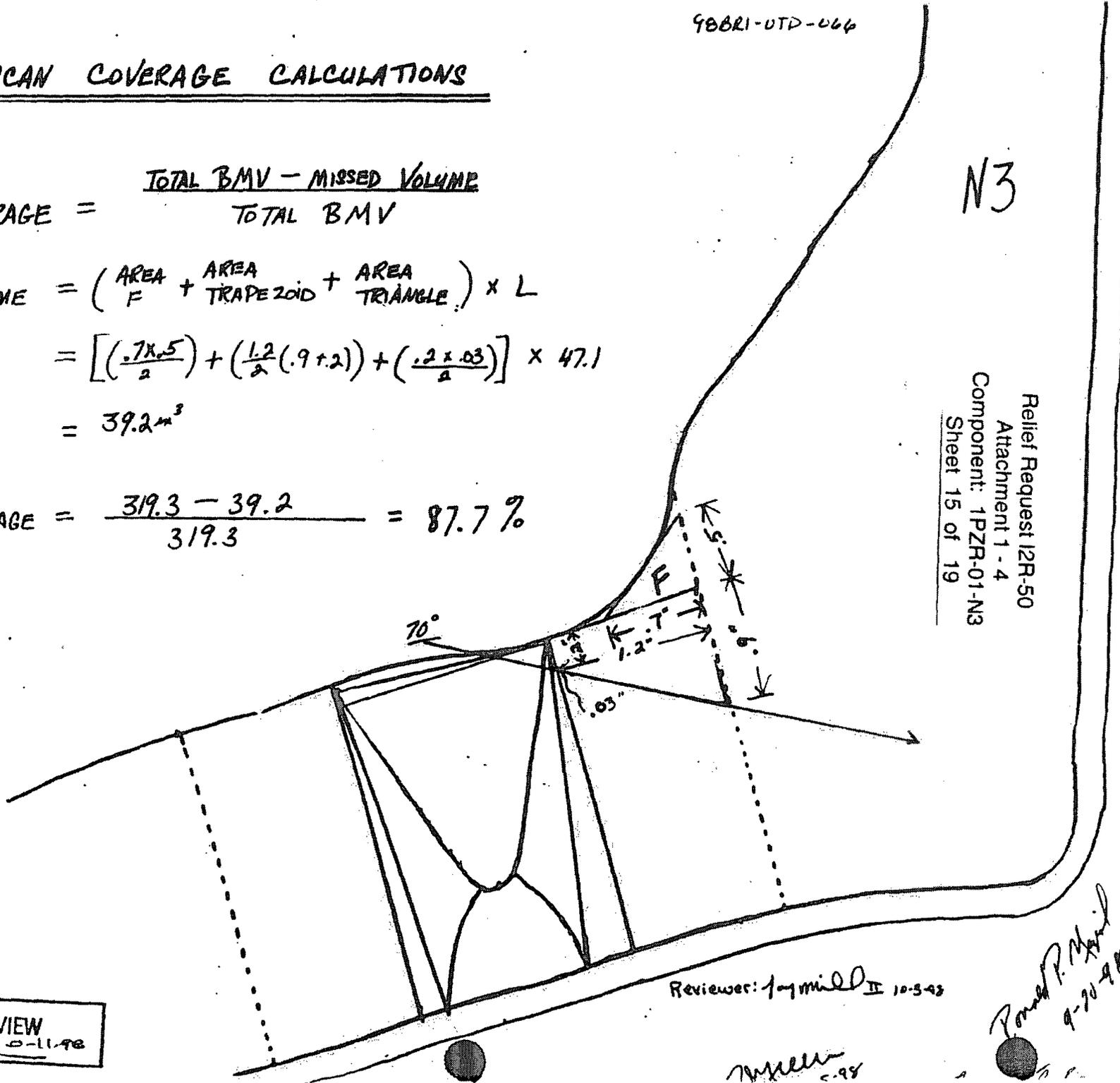
[Signature] 9-20-98  
1-20-98

70° (B) SCAN COVERAGE CALCULATIONS

$$\text{EXAM COVERAGE} = \frac{\text{TOTAL BMV} - \text{MISSED VOLUME}}{\text{TOTAL BMV}}$$

$$\begin{aligned} \text{MISSED VOLUME} &= \left( \text{AREA}_F + \text{AREA}_{\text{TRAPEZOID}} + \text{AREA}_{\text{TRIANGLE}} \right) \times L \\ &= \left[ \left( \frac{.7 \times .5}{2} \right) + \left( \frac{1.2}{2} (.9 + .2) \right) + \left( \frac{.2 \times .03}{2} \right) \right] \times 47.1 \\ &= 39.2 \text{ m}^3 \end{aligned}$$

$$\text{EXAM COVERAGE} = \frac{319.3 - 39.2}{319.3} = 87.7\%$$



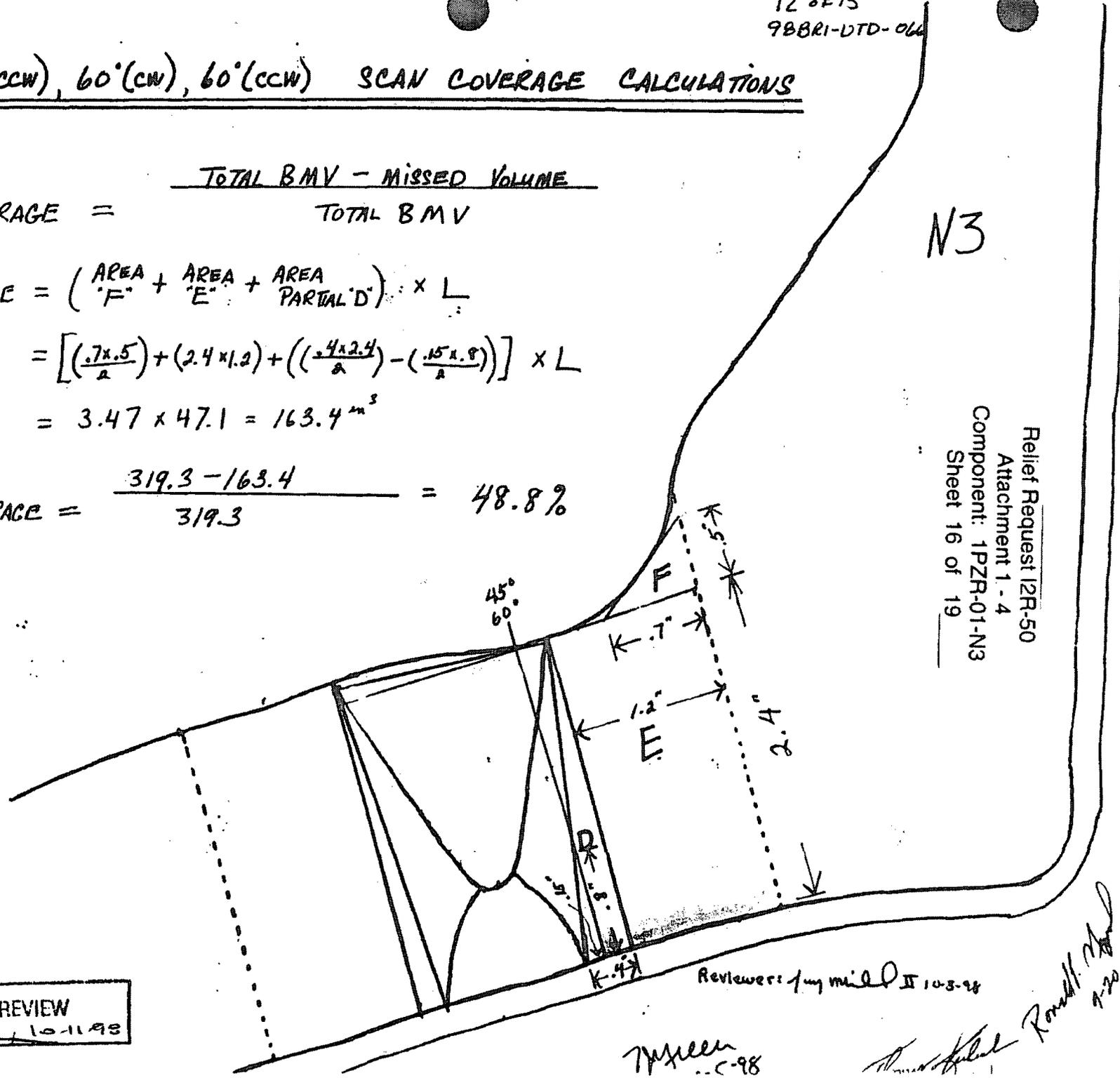
AN/ANII REVIEW  
INITIAL [Signature] 10-11-98

45°(CW), 45°(CCW), 60°(CW), 60°(CCW) SCAN COVERAGE CALCULATIONS

$$\text{EXAM COVERAGE} = \frac{\text{TOTAL BMV} - \text{MISSED VOLUME}}{\text{TOTAL BMV}}$$

$$\begin{aligned} \text{MISSED VOLUME} &= (\text{AREA 'F'} + \text{AREA 'E'} + \text{AREA PARTIAL 'D'}) \times L \\ &= \left[ \left( \frac{.7 \times .5}{2} \right) + (2.4 \times 1.2) + \left( \frac{.4 \times 2.4}{2} \right) - \left( \frac{.15 \times .8}{2} \right) \right] \times L \\ &= 3.47 \times 47.1 = 163.4 \text{ m}^3 \end{aligned}$$

$$\text{EXAM COVERAGE} = \frac{319.3 - 163.4}{319.3} = 48.8\%$$



N3

Relief Request I2R-50  
Attachment 1 - 4  
Component: 1PZR-01-N3  
Sheet 16 of 19

ANI/ANII REVIEW  
10-11-98

Reviewer: Jim Mill II 10-8-98

Mylen  
...C-98

Ronald M. ...  
9-20-98



Relief Request I2R-50  
Attachment 1 - 4  
Component: 1PZR-01-N3  
Sheet 17 of 19  
Coverage Summary

Report # 98BR1-UTD-066

Page 13 of 13

SITE: Braidwood UNIT: ONE  
SYSTEM: Pressurizer  
WELD ID: 1PZR-01-N3  
CONFIG: Pressurizer to Relief Nozzle

Examiner: Ronald P. Nail Level: II  
Examiner: Ronald P. Nail Level: I

FLOW →

Procedure # NDT-Z-1  
NDE METHOD X UT      PT      MT     

Calibration Sht. # 98BR1-UTC- 80,81, 82, 83, 84 & 85  
Notes: Supplemental Exams 30° 40° & 70° 60°

### VESSEL COVERAGE SUMMARY

W = 4.1" ( 1.70" WELD CROWN AND 1.20" ON EACH SIDE )

T = 2.50" WELD LENGTH = 47.10"

Total Weld Metal Volume = 164.9 in.<sup>3</sup>

Total Base Metal Volume = 319.3 in.<sup>3</sup>

#### WELD METAL EXAMINATION

#### BASE METAL EXAMINATION

SCAN	EXAM VOLUME / TOTAL VOLUME =	% EXAM	SCAN	EXAM VOLUME / TOTAL VOLUME =	% EXAM
0°	164.9 in <sup>3</sup> / 164.9 in <sup>3</sup> =	100%	0°	319.3 in <sup>3</sup> / 319.3 in <sup>3</sup>	100%
45° (B)	159.1 in <sup>3</sup> / 164.9 in <sup>3</sup> =	96.50%	60° (B)	257.5 in <sup>3</sup> / 319.3 in <sup>3</sup>	80.60%
30° (T)	51.8 in <sup>3</sup> / 164.9 in <sup>3</sup> =	31.40%	70° (B)	280.8 in <sup>3</sup> / 319.3 in <sup>3</sup>	87.70%
70° (B)	162.1 in <sup>3</sup> / 164.9 in <sup>3</sup> =	98.30%	45° CW	155.8 in <sup>3</sup> / 319.3 in <sup>3</sup>	48.80%
40° (T)	42.4 in <sup>3</sup> / 164.9 in <sup>3</sup> =	25.70%	45° CCW	155.8 in <sup>3</sup> / 319.3 in <sup>3</sup>	48.80%
45° CW	155.5 in <sup>3</sup> / 164.9 in <sup>3</sup> =	94.30%	60° CW	155.8 in <sup>3</sup> / 319.3 in <sup>3</sup>	48.80%
45° CCW	155.5 in <sup>3</sup> / 164.9 in <sup>3</sup> =	94.30%	60° CCW	155.8 in <sup>3</sup> / 319.3 in <sup>3</sup>	48.80%
60° CW	155.5 in <sup>3</sup> / 164.9 in <sup>3</sup> =	94.30%	TOTAL 463.5 % + 7 = 66.2 % BMV EXAMINED		
60° CCW	155.5 in <sup>3</sup> / 164.9 in <sup>3</sup> =	94.30%			

TOTAL 729.1 % ÷ 9 = 81.0 % WMV EXAMINED

( 81.0 % + 66.2 % ) ÷ 2 = 73.6 % EXAMINATION COVERAGE

NOTES : 30° (T) SUPPLEMENTAL FOR 45° (T)

40° (T) SUPPLEMENTAL FOR 60° (T)

60° (B) SUPPLEMENTAL FOR 45° (B)

70° (B) SUPPLEMENTAL FOR 60° (B)

Reviews: Ray M. [Signature] II 10-3-98

AN/ANII REVIEW  
[Signature] 10/3/98

[Signature]  
10/3/98

[Signature]  
10/3/98

EXAMINATION DATA SHEET

Station: BRAIDWOOD Unit: 1 Page 1 of 2  
 System: PRESSURIZER Nozzle # 1PZR-01-N3  
 Nozzle Diameter: 6.0 Nozzle Material: CS/SS CLAD  
 Nozzle Temp.: 76°F/159175 Couplant: ULTRAGEL II Batch # 96225  
 Calibration Sheet # 98BR1-UTC-058 (65°/18° skew) Data Sheet # 98BR1-UTD-067  
98BR1-UTC-087(24°) 98BR1-UTC-090(70°) 98BR1-UTC-089(65°/18° skew) ATF 9-28-98

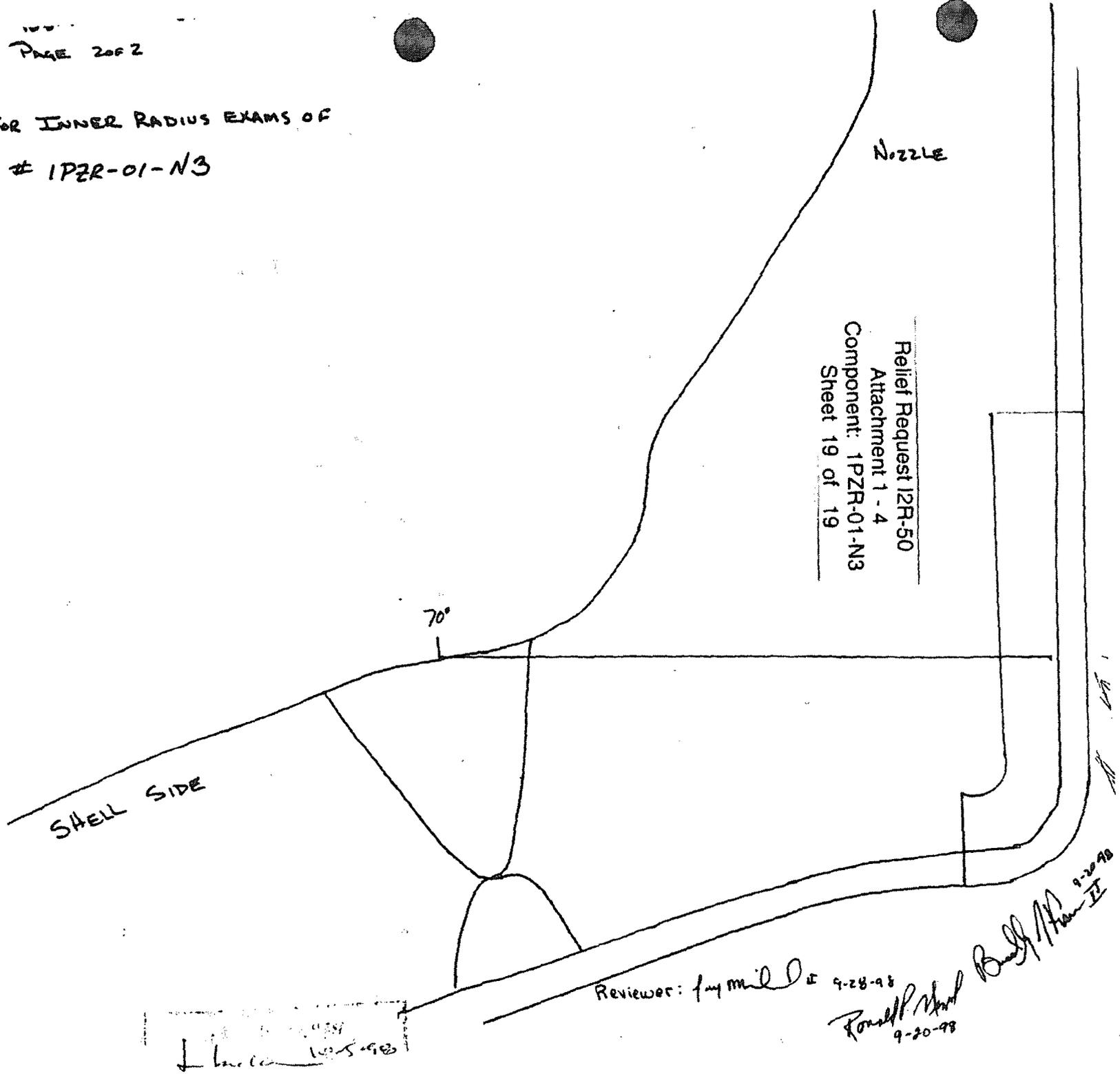
Comments: IRIDATION #1 IS A GEOMETRIC REFLECTOR FROM THE BORE AREA  
SEEN 360° AT VARYING AMPLITUDES. NOTE: 100% EXAM VOLUME SCANNED  
SCANNED +12dB TO MAINTAIN 10% TO 20% ID Roll.  
Ref. 98BR1-UTB-019 (20%) + 020 (50%) for beam spreads.

EXAM. NO.	IND. NO.	AZIMUTH / LENGTH (L°)	DISTANCE AXIAL (W°)	SCAN CW/CCW	MAX. AMP.	SWEEP (W°)			EVALUATION COMMENTS
						START	MAX.	STOP	
70°	1	0-360°	1.0° *	N/A	100%	N/A	4.8"	N/A	GEOMETRIC REFLECTOR FROM THE BORE

\* FROM TOE OF BLEND AREA

Examiner(s): Ronald P. Nijil Bradley Fisher Level: II/II Date: 9/20/98  
 Reviewer: J. M. O'D Level: II Date: 9-28-98  
 Others: W. S. M. Level: III Date: 10-2-98  
 Station: Thomas G. Hubert Date: 10/2/98  
 ANII: L. H. M. Date: 10-5-98

INDICATION #1 FOR INNER RADIUS EXAMS OF  
RELIEF NOZZLE # 1PZR-01-N3



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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-5**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 1 of 7)

**1.0 Component**

Weld Number: 1RC-17-13  
Code Category / Item: R-A / R1.20, Elements not Subject to a Damage Mechanism  
Configuration: Pipe-to-Valve Circumferential Weld

**2.0 Applicable Code Edition and Addenda**

ASME Section XI 1989 Edition with no Addenda

**3.0 Applicable Code Requirement**

Table IWB-2500-1, Examination Category B-J, Figure IWB-2500-8(c) as supplemented by Figure 4-3 of EPRI TR-112657 Revision B-A (Reference 8.1).

Figure 4-3 of Reference 8.1 depicts the required examination volume (A-B-C-D), which includes the lower 1/3 thickness of the circumferential weld. There was no counterbore detected, so the volume 1/2" each side of the weld toes (shown in Figure 4-2 of Reference 8.1) was used to define the required examination volume.

As required by 10 CFR 50.55a, ASME Section XI 1995 Edition with 1996 Addenda Appendix VIII, Performance Demonstration for Ultrasonic Examination System was used for examination procedures, equipment, and personnel.

Code Case N-460, which accepts a reduction in examination coverage provided the reduction is less than 10%.

**4.0 Impracticality/Burden**

This austenitic stainless steel pipe-to-valve weld and associated base materials are 4" NPS with a nominal wall thickness of 0.531" (Schedule 160) and forms the break between the "RC" and "RY" subsystem for the pressurizer spray line. Under the Braidwood Risk-Informed ISI Program, the welds associated with this particular piping segment are considered Category R-A, Item R1.20 which are not subject to any specific degradation mechanisms. This weld had been examined during the first ISI inspection interval as a "structural discontinuity" and was reselected again in the second interval under the Risk-Informed ISI Program. These examinations were performed using examination procedures and personnel qualified under the Performance Demonstration Initiative (PDI) program administered through the EPRI NDE Center, specifically, PDI-UT-2 which is qualified for manual IGSCC detection and length sizing for austenitic stainless steel welds. The PDI procedure is not qualified for the detection of flaws on the far side of single sided access examinations on austenitic stainless steel piping welds. The valve geometry tapers away from the weld resulting in limited scanning

**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-5**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 2 of 7)

surface available on the valve side. Volumetric examinations were also completed on five additional Category R-A, Item R1.20 welds upstream of this weld during the same refuel outage. The limited access of some welds or the presence of component supports adjacent to other welds on the line limited the population of welds for this particular segment.

#### **5.0 Alternative Examinations or Testing**

In accordance with PDI-UT-2 requirements, axial and circumferential 45 degree shear wave scans and axial 60 degree refracted longitudinal wave (RL) scans of this weld were performed to the extent practical. The aggregate examination coverage achieved was 50%.

In addition to completing the required volumetric examination scans to the extent practical, numerous system leakage tests (ASME Section XI Category B-P and Generic Letter 88-05) at nominal system operating pressure (2235 psig) and temperature (557°F) were completed with no evidence of leakage associated with this weld noted during the course of the interval.

The required 100% coverage was attained for the remaining five welds with no recordable indications noted in any of the welds. Since all six of these welds experience the same system conditions without any known degradation mechanism, reasonable assurance exists that there is no adverse condition associated with population of welds including the weld where limited inspection coverage was achieved.

Radiography (RT) is not a desired option because RT is limited in the ability to detect expected degradation mechanisms such as thermal fatigue cracking and stress corrosion crack initiating at the pipe inside surface. Additionally, RT has not been qualified through the performance demonstration process.

#### **6.0 Justification for Granting Relief**

No additional examinations were completed during the inspection interval; however, the examination coverage of 50% along with the results of volumetric examinations performed on the other five welds in the population, as well as the numerous pressure tests completed over the course of the interval provide reasonable assurance that pressure boundary integrity has been maintained for this component.

#### **7.0 Precedents**

Similar single-side limitations and associated limited examination coverage on Risk-Informed welds were encountered and accepted for the following units:

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-5**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 3 of 7)

Comanche Peak 2:

Letter from J. N. Donohew (U. S. NRC) to M. R. Blevins (Luminant Generation Company, LLC), "Comanche Peak Steam Electric Station, Unit 2 – Request for Relief B-2 for Second 10-Year Inservice Inspection Interval from 10 CFR 50.55a Inspection Requirements Due to Physical Interferences (TAC No. MD7527)," dated August 22, 2008

Prairie Island 1:

Letter from L. M. James (U. S. NRC) to M. D. Wadley (Prairie Island Nuclear Generating Plant), "Prairie Island Nuclear Generating Plant, Unit 1 – Relief Request 1-RR-4-6 for Piping Weld Examination Coverage for the Fourth Inspection Interval (TAC No. MD5593)," dated May 9, 2008

**8.0 References**

- 8.1 EPRI TR-112657 Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure"



# Calibration Data Sheet

Plant / Unit BRAIDWOOD / 1  
 Company EXELON  
 Comp / System RC  
 Procedure No. EXE-UT-350  
 Rev / Chng. No. 1  
 Cal. Block No. 103471  
 Cal. Block Temp. 75°  
 Thermometer S/N: 104246  
 Size 4" Sch. 0.531" "T"

Data Sheet # A1R12-UT-046  
 Page 1 of 4



Ferritic  Austenitic  
 Each Major CRT Div. = 0.10"

Cal. Direction:  Axial  Circ.  Both

Scan Area: || to Weld  to Weld

Cal. Checks	Time
Initial Calib.	0810
Initial Calib. Date	4/21/06
Intermediate	N/A
Intermediate	N/A
Final Calib.	1206
Final Calib. Date	4/21/06

Code Category: R-A Code Item: R01.20 Type: ULTRAGEL II  
 Batch: 04325 D

Couplant

Search Unit #1  
 Manufacture: KBA  
 Serial No.: 57462976.3  
 No. of Elements: 2  
 Size: 2 (3.5 x 10) Shape: Rect.  
 Freq. 4.0 MHz Style: MSEB4E  
 Exam Angle: 0° Mode: Long.  
 Measured Angle: N/A  
 Wedge Style: Integral

Search Unit #2  
 Manufacture: \_\_\_\_\_  
 Serial No.: \_\_\_\_\_  
 No. of Elements: \_\_\_\_\_  
 Size: \_\_\_\_\_ Shape: \_\_\_\_\_  
 Freq. \_\_\_\_\_ Style: \_\_\_\_\_  
 Exam Angle: \_\_\_\_\_ Mode: \_\_\_\_\_  
 Measured Angle: \_\_\_\_\_  
 Wedge Style: \_\_\_\_\_

Search Unit Cable

Type: RG-174  
 Length: 6' No. of Con.: 0

Search Unit Cable

Type: \_\_\_\_\_  
 Length: \_\_\_\_\_ No. of Con.: \_\_\_\_\_

Instrument Settings

Make / Model: Krautkramer USN 58L SW  
 Serial No.: SAP 104391  
 Delay: 0.000 Range: 1.0"  
 M'tl Cal / Vel: 0.2262 Pulser: Square  
 Damping: 500 Reject: 0%  
 Rep. Rate: Auto High Freq: 4.0 MHz  
 Filter: Fixed Mode: Dual  
 Rectify: Fullwave Voltage: 450  
 Pulse Width: 250  
 Reference Sensitivity (Sens.)  
 Axial: 34.0 Circ: N/A  
 SDH Sensitivity: N/A  
 Zero: 9.3644

Instrument Settings

Make / Model: \_\_\_\_\_  
 Serial No.: \_\_\_\_\_  
 Delay: \_\_\_\_\_ Range: \_\_\_\_\_  
 M'tl Cal / Vel: \_\_\_\_\_ Pulser: \_\_\_\_\_  
 Damping: \_\_\_\_\_ Reject: \_\_\_\_\_  
 Rep. Rate: \_\_\_\_\_ Freq: \_\_\_\_\_  
 Filter: \_\_\_\_\_ Mode: \_\_\_\_\_  
 Rectify: \_\_\_\_\_ Voltage: \_\_\_\_\_  
 Pulse Width: \_\_\_\_\_  
 Reference Sensitivity (Sens.)  
 Axial: \_\_\_\_\_ Circ: \_\_\_\_\_  
 SDH Sensitivity: \_\_\_\_\_  
 Zero: \_\_\_\_\_

Examination Area / Weld	Access	Recordable Indications			Exam Sens.
		Yes	No	Geom	
<u>1RC-17-13</u>	<u>Both</u>				
<u>N/A</u>					

Remarks / Reason for Incomplete Scan(s) COMPONENT TEMP: 60"  
0° cal for thickness and contour only.

Examiners: Jordan M. Lindew Level II Date 4/21/06  
[Signature] Level II Date 4/21/06

Reviewers: [Signature] Further Evaluation Required?  Yes  No

EXELON LEVEL II REVIEW / DATE 17 mil [Signature] 4-23-06

AMR REVIEW / DATE [Signature] 4-24-06

Relief Request 12R-50  
 Attachment 1 - 5  
 Component: 1RC-17-13  
 Sheet 4 of 7





Westinghouse

# Calibration Data Sheet

Plant / Unit BRAIDWOOD / 1  
Company EXELON

Data Sheet # A1R12-UT-046  
Page 3 of 4



Comp / System RC  
Procedure No. EXE-PDI-UT-2  
Rev / Chng. No. 4  
Cal. Block No. 4654 / 103775  
Cal. Block Temp. 72°  
Thermometer S/N: 104246  
Size 4" Sch. 0.531" "T"

Cal. Checks	Time
Initial Calib.	0800
Initial Calib. Date	4/24/06
Intermediate	N/A
Intermediate	N/A
Final Calib.	0915
Final Calib. Date	4/24/06

Ferritic  Austenitic  
Each Major CRT Div. = 0.2"

Cal. Direction:  Axial  Circ.  Both

Scan Area:  to Weld  to Weld  N/A

Code Category: R-A Code Item: R01.20 Type: Couplant ULTRAGEL II  
Batch: 04325 D

Search Unit #1  
Manufacture: Megasonics  
Serial No.: G0121  
No. of Elements: 2  
Size: 0.14" x 0.30" Shape: Rect.  
Freq. 4.0 MHz Style: CGD  
Exam Angle: 60° Mode: Long.  
Measured Angle: 60°  
Wedge Style: Integral

Search Unit #2  
Manufacture: \_\_\_\_\_  
Serial No.: \_\_\_\_\_  
No. of Elements: \_\_\_\_\_  
Size: \_\_\_\_\_ Shape: \_\_\_\_\_  
Freq. \_\_\_\_\_ Style: \_\_\_\_\_  
Exam Angle: \_\_\_\_\_ Mode: \_\_\_\_\_  
Measured Angle: \_\_\_\_\_  
Wedge Style: N/A

Search Unit Cable  
Type: RG-174  
Length: 6' No. of Con.: 0

Search Unit Cabl  
Type: \_\_\_\_\_  
Length: \_\_\_\_\_ No. of Con: \_\_\_\_\_

Instrument Settings  
Make / Model: Krautkramer USN 52R  
Serial No.: SAP 102282  
Delay: 0.000 Range: 2.0"  
M'tl Cal / Vel: 0.2306 Pulser: Dual  
Damping: 1000 Reject: 0%  
Rep. Rate: High Freq: 2-8  
Filter: Fixed Mode: Fullwave  
Reference Sensitivity (Sens.)  
Axial: 58.5 dB Circ: N/A  
SDH Sensitivity: Near SDH 3.0 @ 80% @ 43.5dB  
Zero: 5.069

Instrument Settings  
Make / Model: \_\_\_\_\_  
Serial No.: \_\_\_\_\_  
Delay: \_\_\_\_\_ Range: \_\_\_\_\_  
M'tl Cal / Vel: \_\_\_\_\_ Pulser: \_\_\_\_\_  
Damping: \_\_\_\_\_ Reject: \_\_\_\_\_  
Rep. Rate: \_\_\_\_\_ Freq: \_\_\_\_\_  
Filter: \_\_\_\_\_ Mode: \_\_\_\_\_  
Reference Sensitivity (Sens.)  
Axial: \_\_\_\_\_ Circ: \_\_\_\_\_  
SDH Sensitivity: \_\_\_\_\_  
Zero: \_\_\_\_\_

Examination Area / Weld	Access	Recordable Indications			Exam Sens.
		Yes	No	Geom	
<u>1RC-17-13</u>	<u>UPST</u>		<u>X</u>		<u>58.5 dB</u>
	<u>N/A</u>				

Remarks / Reason for Incomplete Scan(s) COMPONENT TEMP: 60°  
NRI. Scanned to maintain 5% - 20% ID roll or noise. No counterbore observed. 50% Coverage Achieved. Exam performed from pipe side only due to valve configuration.

Examiners: Jordan M. Anderson Level II Date 4/24/06  
[Signature] Level II Date 4/24/06

Reviewers: [Signature] Further Evaluation Required?  Yes  No

EXELON LEVEL II REVIEW / DATE

17 April 2006

ARB REVIEW / DATE

R White 4-24-06

Relief Request I2R-50  
Attachment 1 - 5  
Component: 1RC-17-13  
Sheet 6 of 7



NUCLEAR SERVICES  
INSPECTION SERVICES

A1R12-UT-046  
Page 4 of 4

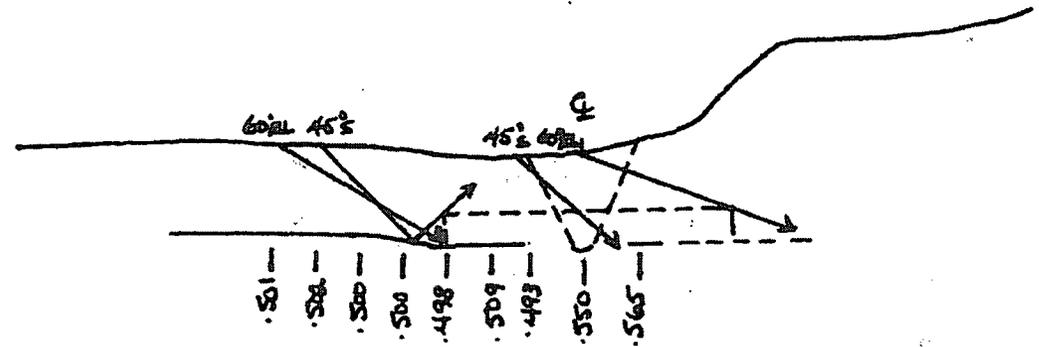
WELD PROFILE / DATA

PLANT BRAIDWOOD UNIT 1 SKETCH 1RC-17, Rev. F

SYST./COMP. RC PROCEDURE EXE-UT-350, Rev. 1

EXAMINER Todd M. Ginder and Martin Crate, Level II DATE 4/21/2006 IDENT. 1RC-17-13

PIPE FLOW → VALVE



Relief Request 12R-50  
 Attachment 1 - 5  
 Component: 1RC-17-13  
 Sheet 7 of 7

East Carbon, L011E

EXELON LEVEL III REVIEW / DATE

1-7-06 III 4-23-06

AND REVIEW / DATE

White 4-24-06

**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-6**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 1 of 9)

**1.0 Component**

Weld Number: 1SG-05-SGSE-02  
Code Category / Item: R-A / R1.20, Elements not Subject to a Damage Mechanism  
Configuration: Safe End-to-Nozzle Weld

**2.0 Applicable Code Edition and Addenda**

ASME Section XI 1989 Edition with no Addenda

**3.0 Applicable Code Requirement**

Table IWB-2500-1, Examination Category C-F-1, Figure IWC-2500-7 as supplemented by Figure 4-3 of EPRI TR-112657 Revision B-A (Reference 8.1).

Figure 4-3 of Reference 8.1 depicts the required examination volume (A-B-C-D), which includes the lower 1/3 thickness of the circumferential weld. There was no counterbore detected, so the volume 1/2" each side of the weld toes (shown in Figure 4-2 of Reference 8.1) was used to define the required examination volume.

As required by 10 CFR 50.55a, ASME Section XI 1995 Edition with 1996 Addenda Appendix VIII, Performance Demonstration for Ultrasonic Examination System was used for examination procedures, equipment, and personnel.

Code Case N-460, which accepts a reduction in examination coverage provided the reduction is less than 10%.

**4.0 Impracticality/Burden**

The auxiliary feedwater safe end-to-nozzle weld and associated adjacent base materials are approximately 1.1" thick. This full penetration weld is Inconel 690 material but is not in contact with reactor coolant. This weld was shop fabricated and installed during the Unit 1 steam generator replacement during the A1R07 refuel outage (fall 1998). Under the Braidwood Risk-Informed ISI Program, the welds associated with this particular segment are considered Category R-A, Item R1.20, which are not subject to any specific degradation mechanisms. Due to the physical configuration of the carbon steel nozzle, which includes an adjacent taper running away from the circumferential weld, limitations preventing scanning (limitation calculated to be 35.5% for nozzle side circumferential scans) to attain coverage of 90% exist. In accordance with PDI-UT-10 requirements, 35, 40, 45, and 60 degree shear and 45 and 60 degree refracted longitudinal wave (RL) scans of this weld were performed to the extent practical. The aggregate examination coverage achieved was 79%.

**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 1-6**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 2 of 9)

**5.0 Alternative Examinations or Testing**

These examinations were performed using examination procedures and personnel qualified under the Performance Demonstration Initiative (PDI) program administered through the EPRI NDE Center, specifically, PDI-UT-10 which is qualified for single or dual sided manual detection and circumferential length sizing for dissimilar metal welds. In addition to performing the required volumetric examination to the extent practical, numerous system leakage tests performed at system nominal operating pressure (1005 psig) and temperature (443°F) have been completed with no evidence of leakage associated with the auxiliary feedwater nozzle-to-safe end weld noted.

Radiography as an alternative is not feasible because access is not available for film placement. No alternative examinations are planned for the weld during the current inspection interval.

**6.0 Justification for Granting Relief**

No additional examinations were completed during the inspection interval; however, the examination coverage of 79% along with the results of the pressure tests assure boundary integrity has been maintained for this component.

**7.0 Precedents**

None.

**8.0 References**

- 8.1 EPRI TR-112657 Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure"



A Westinghouse NDE Company

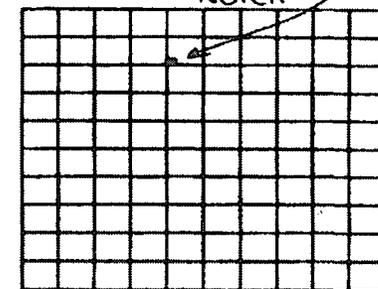
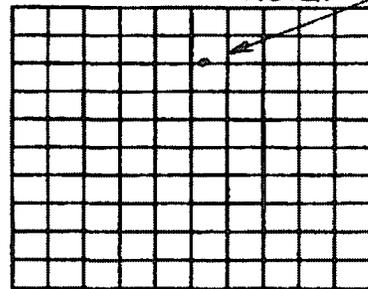
# Calibration Data Sheet

ID AX NOTCH

ID CIRC NOTCH

Plant / Unit BRAIDWOOD / 1  
 Company EXELON  
 Comp / System AUX FEEDWATER  
 Procedure No. EXE-PDI-UT-110  
 Rev / Chng. No. 0 / N/A  
 Cal. Block No. BWD-141  
 Cal. Block Temp. 74°F  
 Thermometer S/N: SAP 105133  
 Size 6.0" Sch. 1.06" "T"

Data Sheet # A1R13-UT-013  
 Page 1 of 7



Cal. Checks	Time
Initial Calib.	08:20 / 08:25
Initial Calib. Date	10/13/2007
Intermediate	N/A
Intermediate	N/A
Final Calib.	15:55 / 15:50
Final Calib. Date	10/13/2007

Ferritic  Austenitic  
 Each Major CRT Div. = 0.3" / 0.4"

Cal. Direction:  Axial  Circ.  Both

Scan Area: || to Weld   
|| to Weld

Code Category: R-A Code Item: R01.20 Type: ULTRAGEL II  
 Batch: 05325

**Search Unit #1**  
 Manufacture: KBA  
 Serial No.: 00X12M  
 No. of Elements: 1  
 Size: 0.25" Shape: Round  
 Freq: 2.25 MHz Style: Comp-G  
 Exam Angle: 35° Mode: Shear  
 Measured Angle: 35°  
 Wedge Style: MSWQC

**Search Unit #2**  
 Manufacture: KBA  
 Serial No.: 00YJYT  
 No. of Elements: 1  
 Size: 0.5" Shape: Round  
 Freq: 2.25 MHz Style: Comp-G  
 Exam Angle: 45° Mode: Shear  
 Measured Angle: 45°  
 Wedge Style: MSWQC

**Search Unit Cable**  
 Type: RG 174  
 Length: 6' No. of Con.: 0

**Search Unit Cable**  
 Type: RG 174  
 Length: 6' No. of Con.: 0

**Instrument Settings**  
 Make / Model: Krautkramer USN 58L SW  
 Serial No.: 104765  
 Probe Delay: 8.1622 Range: 3.0"  
 M'tl Cal / Vel: 0.1321 Pulser: Square  
 Damping: 500 Reject: 0%  
 PRF: Auto High Freq: 2.25 MHz  
 Filter: FIXED Mode: Shear  
 Rectify: Full Wave Voltage: 450  
 Pulse Width: 220  
 Reference Sensitivity (Sens.)  
 Axial: N/A Circ: 39.5 dB  
 SDH Sensitivity: N/A  
 Display Delay: 0

**Instrument Settings**  
 Make / Model: Krautkramer USN 58L SW  
 Serial No.: 104765  
 Probe Delay: 6.5253 Range: 4.0"  
 M'tl Cal / Vel: 0.1233 Pulser: Square  
 Damping: 500 Reject: 0%  
 PRF: Auto High Freq: 2.25 MHz  
 Filter: FIXED Mode: Shear  
 Rectify: Full Wave Voltage: 450  
 Pulse Width: 220  
 Reference Sensitivity (Sens.)  
 Axial: 18.5 dB Circ: N/A  
 SDH Sensitivity: N/A  
 Display Delay: 0

Examination Area / Weld	Access	Recordable Indications			Exam Sens.
		Yes	No	Geom	
1SG-05-SGSE-02 (35°)	*		X		45.5 dB
1SG-05-SGSE-02 (45°)	*		X		24.5 dB
	N/A				

Remarks / Reason for Incomplete Scan(s) COMPONENT TEMP: 86°F  
 Scanned with a 5-20% ID roll. Transducer 00X12M was used for Circ scan only.  
 Transducer 00YJYT was used for Ax scan only. Shear scan on upstream side only. No counterbores detected. \*NRI. \* See coverage plot for areas scanned.

Examiners: Douglas Gronewold Level II Date 10/13/2007  
Douglas Gronewold Level N/A Date N/A

Reviewers: Earl Peterson, Level III, 10-15-07 Further Evaluation Required?  Yes  No

EXELON LEVEL III REVIEW / DATE Chas H. McKee, Level III, 10-15-07

ASD REVIEW / DATE [Signature] 10/14/07

Attachment 1-6  
 Component: 1SG-05-SGSE-02  
 Sheet 3 of 9



A Westinghouse NDE Company

# Calibration Data Sheet

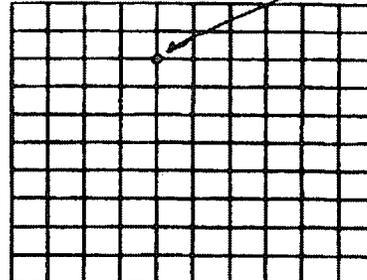
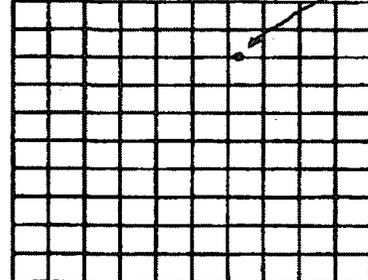
ID CIRC NOTCH

.8" DEEP SDH

Plant / Unit BRAIDWOOD / 1  
 Company EXELON  
 Comp / System AUX FEEDWATER  
 Procedure No. EXE-PDI-UT-110  
 Rev / Chng. No. 0 / N/A  
 Cal. Block No. BWD-141  
 Cal. Block Temp. 73°F  
 Thermometer S/N: SAP 105133  
 Size 6.0" Sch. 1.06" "T"

Data Sheet # A1R13-UT-013  
 Page 2 of 7

Cal. Checks	Time
Initial Calib.	13:35 / 13:40
Initial Calib. Date	10/13/2007
Intermediate	N/A
Intermediate	N/A
Final Calib.	14:55 / 15:00
Final Calib. Date	10/13/2007



Ferritic  Austenitic  
 Each Major CRT Div. = 0.2" / 0.2"

Cal. Direction:  Axial  Circ.  Both

Scan Area: || to Weld  to Weld

Code Category: R-A Code Item: R01.20 Type: ULTRAGEL II  
 Batch: 05325

### Couplant

### Search Unit #1

Manufacture: RTD  
 Serial No.: 06-871  
 No. of Elements: 2  
 Size: 2(10x18)mm Shape: Rect  
 Freq: 2.0 MHz Style: TRL 2  
 Exam Angle: 45° Mode: RL  
 Measured Angle: 45°  
 Wedge Style: Integral

### Search Unit #2

Manufacture: RTD  
 Serial No.: 06-895  
 No. of Elements: 2  
 Size: 2(15x25)mm Shape: Rect  
 Freq: 2.0 MHz Style: TRL 2  
 Exam Angle: 60° Mode: RL  
 Measured Angle: 60°  
 Wedge Style: Integral

### Search Unit Cable

Type: RG 174  
 Length: 6' No. of Con.: 0

### Search Unit Cable

Type: RG 174  
 Length: 6' No. of Con.: 0

### Instrument Settings

Make / Model: Krautkramer USN 58L SW  
 Serial No.: 104765  
 Probe Delay: 9.902 Range: 2.0"  
 M'tl Cal / Vel: 0.245 Pulser: Square  
 Damping: 500 Reject: 0%  
 PRF: Auto High Freq: 2.0 MHz  
 Filter: FIXED Mode: RL  
 Rectify: Full Wave Voltage: 450  
 Pulse Width: 250  
 Reference Sensitivity (Sens.)  
 Axial: 48.0 dB Circ: N/A  
 SDH Sensitivity: N/A  
 Display Delay: 0

### Instrument Settings

Make / Model: Krautkramer USN 58L SW  
 Serial No.: 104765  
 Probe Delay: 12.064 Range: 2.0"  
 M'tl Cal / Vel: 0.1370 Pulser: Square  
 Damping: 500 Reject: 0%  
 PRF: Auto High Freq: 2.0 MHz  
 Filter: FIXED Mode: RL  
 Rectify: Full Wave Voltage: 450  
 Pulse Width: 250  
 Reference Sensitivity (Sens.)  
 Axial: 44.0 dB Circ: N/A  
 SDH Sensitivity: N/A  
 Display Delay: 0

Examination Area / Weld	Access	Recordable Indications			Exam Sens.
		Yes	No	Geom	
1SG-05-SGSE-02 (45°)	*		X		54.0 dB
1SG-05-SGSE-02 (60°)	*		X		50.0 dB
	N/A				

Remarks / Reason for Incomplete Scan(s) COMPONENT TEMP: 86°F  
 \* See coverage plot for areas examined. Scanned with a 5-20% ID roll. No counterbore detected. No examination looking upstream due to configuration of nozzle. NRA

Examiners: Douglas Groves Level II Date 10/13/2007  
N/A Level N/A Date N/A

Reviewers: Choi H. McKean Further Evaluation Required?  Yes  No

EXELON LEVEL II REVIEW / DATE Choi H. McKean 10-18-07

LEVEL II REVIEW / DATE Choi H. McKean 10/14/07

Helier Request I2R-50  
 Attachment 1 - 6  
 Component: 1SG-05-SGSE-02  
 Sheet 4 of 9



A Westinghouse NDE Company

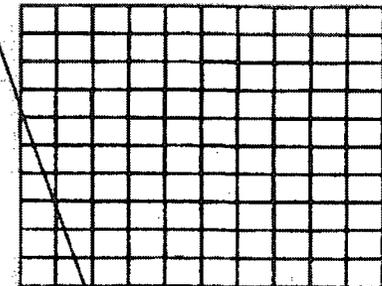
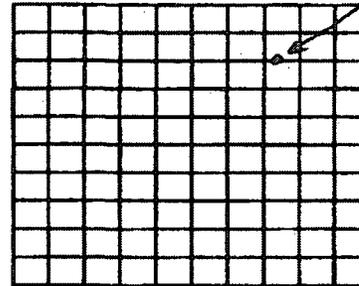
# Calibration Data Sheet

ID Ax  
NOTCH

Plant / Unit BRAIDWOOD / 1  
 Company EXELON  
 Comp / System REACTOR COOLANT  
 Procedure No. EXE-PDI-UT-110  
 Rev / Chng. No. 0 / N/A  
 Cal. Block No. BWD-141  
 Cal. Block Temp. 73°F  
 Thermometer S/N: SAP 105133  
 Size 6.0" Sch. 1.06" "T"

Data Sheet # A1R13-UT-013  
 Page 3 of 7

Cal. Checks	Time
Initial Calib.	13:45
Initial Calib. Date	10/13/2007
Intermediate	N/A
Intermediate	N/A
Final Calib.	15:05
Final Calib. Date	10/13/2007



Ferritic  Austenitic  
 Each Major CRT Div. = 0.2"

Cal. Direction:  Axial  Circ.  Both

Scan Area: || to Weld  to Weld

Code Category: R-A Code Item: R01.20 Type: ULTRAGEL II  
 Batch: 05325

### Couplant

Search Unit #1  
 Manufacture: Megasonics  
 Serial No.: U1057  
 No. of Elements: 2  
 Size: 2(15x25)mm Shape: Rect  
 Freq. 1.5 MHz Style: CSS  
 Exam Angle: 40° Mode: RL  
 Measured Angle: 40°  
 Wedge Style: Integral

Search Unit #2  
 Manufacture: \_\_\_\_\_  
 Serial No.: \_\_\_\_\_  
 No. of Elements: \_\_\_\_\_  
 Size: \_\_\_\_\_ Shape: \_\_\_\_\_  
 Freq. \_\_\_\_\_ Style: \_\_\_\_\_  
 Exam Angle: \_\_\_\_\_ Mode: \_\_\_\_\_  
 Measured Angle: \_\_\_\_\_  
 Wedge Style: \_\_\_\_\_

### Search Unit Cable

Type: RG 174  
 Length: 6' No. of Con.: 0

Type: \_\_\_\_\_  
 Length: \_\_\_\_\_ No. of Con.: \_\_\_\_\_

### Instrument Settings

Make / Model: Krautkramer USN 58L SW  
 Serial No.: 104765  
 Probe Delay: 8.1622 Range: 2.0"  
 M'tl Cal / Vel: 0.2271 Pulser: Square  
 Damping: 500 Reject: 0%  
 PRF: Auto High Freq: 2.0MHz  
 Filter: FIXED Mode: RL  
 Rectify: Full Wave Voltage: 450  
 Pulse Width: 330  
 Reference Sensitivity (Sens.)  
 Axial: N/A Circ: 51.5 dB  
 SDH Sensitivity: N/A  
 Display Delay: 0

Make / Model: \_\_\_\_\_  
 Serial No.: \_\_\_\_\_  
 Probe Delay: \_\_\_\_\_ Range: \_\_\_\_\_  
 M'tl Cal / Vel: \_\_\_\_\_ Pulser: \_\_\_\_\_  
 Damping: \_\_\_\_\_ Reject: \_\_\_\_\_  
 PRF: \_\_\_\_\_ Freq: \_\_\_\_\_  
 Filter: \_\_\_\_\_ Mode: \_\_\_\_\_  
 Rectify: \_\_\_\_\_ Voltage: \_\_\_\_\_  
 Pulse Width: \_\_\_\_\_  
 Reference Sensitivity (Sens.)  
 Axial: \_\_\_\_\_ Circ: \_\_\_\_\_  
 SDH Sensitivity: \_\_\_\_\_  
 Display Delay: \_\_\_\_\_

Examination Area / Weld	Access	Recordable Indications			Exam Sens.
		Yes	No	Geom	
<u>1SG-05-SGSE-02</u>			<u>X</u>		<u>55.5 dB</u>
<u>N/A</u>					

Remarks / Reason for Incomplete Scan(s) COMPONENT TEMP: 88°F  
\*See coverage plot for areas scanned. Scanned with a 5-20% ID roll. No counterbore detected. Used to perform Circ scans only. NRI.

Examiners: Doug Greenwald Level II Date 10/13/2007  
N/A Level N/A Date N/A

Reviewers: Toni Carter, Level III, 10-15-07 Further Evaluation Required?  Yes  No

EXELON LEVEL III REVIEW / DATE

Chris H. McKean Chris H. McKean 10-15-07

ARR REVIEW / DATE

L. H. ... 10/14/07

Relief Request 12R-50  
 Attachment 1 - 6  
 Component: 1SG-05-SGSE-02  
 Sheet 5 of 9



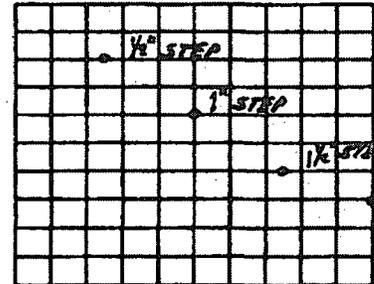
A Westinghouse NDE Company

# Calibration Data Sheet

Plant / Unit BRAIDWOOD / 1  
 Company EXELON  
 Comp / System REACTOR COOLANT  
 Procedure No. EXE-UT-350  
 Rev / Chng. No. 1 / N/A  
 Cal. Block No. 4654  
 Cal. Block Temp. 77°F  
 Thermometer S/N: SAP 105133  
 Size 6.0" Sch. 1.06" T

Data Sheet # A1R13-UT-013  
 Page 4 of 7

Cal. Checks	Time
Initial Calib.	13:07
Initial Calib. Date	10/7/2007
Intermediate	N/A
Intermediate	N/A
Final Calib.	15:26
Final Calib. Date	10/7/2007



Ferritic  Austenitic  
 Each Major CRT Div. = 0.2"

Cal. Direction:  Axial  Circ.  Both

Scan Area: || to Weld  || to Weld

Code Category: R-A Code Item: R01.20 Type: ULTRAGEL II  
 Couplant ULTRAGEL II  
 Batch: 05325

Search Unit #1  
 Manufacture: KBA  
 Serial No.: 57462976.8  
 No. of Elements: 2  
 Size: (3.5x10)mm Shape: Rect  
 Freq: 4.0 MHz Style: MSEB4E  
 Exam Angle: 0° Mode: LONG  
 Measured Angle: 0°  
 Wedge Style: Integral

Search Unit #2  
 Manufacture: \_\_\_\_\_  
 Serial No.: \_\_\_\_\_  
 No. of Elements: \_\_\_\_\_  
 Size: \_\_\_\_\_ Shape: \_\_\_\_\_  
 Freq: \_\_\_\_\_ Style: \_\_\_\_\_  
 Exam Angle: \_\_\_\_\_ Mode: \_\_\_\_\_  
 Measured Angle: \_\_\_\_\_  
 Wedge Style: \_\_\_\_\_

Search Unit Cable  
 Type: RG 174  
 Length: 6' No. of Con.: 0

Search Unit Cab  
 Type: \_\_\_\_\_  
 Length: \_\_\_\_\_ No. of Con: \_\_\_\_\_

Instrument Settings  
 Make / Model: Krautkramer USN 58L SW  
 Serial No.: 104765  
 Probe Delay: 9.2203 Range: 2.0"  
 M'ti Cal / Vel: 0.227 Pulser: Square  
 Damping: 500 Reject: 0%  
 PRF: Auto High Freq: 4.0 MHz  
 Filter: FIXED Mode: Long  
 Rectify: Full Wave Voltage: 450  
 Pulse Width: 130  
 Reference Sensitivity (Sens.)  
 Axial: 28.5 dB Circ: 28.5 dB  
 SDH Sensitivity: N/A  
 Display Delay: 0

Instrument Settings  
 Make / Model: \_\_\_\_\_  
 Serial No.: \_\_\_\_\_  
 Probe Delay: \_\_\_\_\_ Range: \_\_\_\_\_  
 M'ti Cal / Vel: \_\_\_\_\_ Pulser: \_\_\_\_\_  
 Damping: \_\_\_\_\_ Reject: \_\_\_\_\_  
 PRF: \_\_\_\_\_ Freq: \_\_\_\_\_  
 Filter: \_\_\_\_\_ Mode: \_\_\_\_\_  
 Rectify: \_\_\_\_\_ Voltage: \_\_\_\_\_  
 Pulse Width: \_\_\_\_\_  
 Reference Sensitivity (Sens.)  
 Axial: \_\_\_\_\_ Circ: \_\_\_\_\_  
 SDH Sensitivity: \_\_\_\_\_  
 Display Delay: \_\_\_\_\_

Relief Request I2R-50  
 Attachment 1 - 6  
 Component: 1SG-05-SGSE-02  
 Sheet 6 of 9

Examination Area / Weld	Access	Recordable Indications			Exam Sens.
		Yes	No	Geom	
1SG-05-SGSE-02	Single Sided			N/A	
	N/A				

Remarks / Reason for Incomplete Scan(s) COMPONENT TEMP: 84°F  
0° cal for thickness and contour only. No counterbore detected.

Examiners: Tommy E. Jackson Level II Date 10/07/2007  
Tommy E. Jackson  
Douglas Grohewold Level II Date 10/07/2007  
Douglas Grohewold

Reviewers: Chris H. McKeon Further Evaluation Required?  Yes  No

EXELON LEVEL II REVIEW / DATE: Chris H. McKeon 10-15-07

AND REVIEW / DATE: [Signature] 10/14/07



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LIMITATION TO EXAMINATION

A1R13-UT-013

Page 5 of 7

PLANT BRAIDWOOD UNIT 1 PROCEDURE EXE-PDI-UT-110 REV. 0

SKETCH See pages 5 and 6 of report WELD # 1SG-05-SGSE-02 WELD TYPE Safe End - Aux Feedwater

EXAMINER *Douglas Grnewold* DATE 10/15/2007  
Douglas Grnewold, Level II

The above referenced Dissimilar Metal Weld was examined in both the Axial and Circumferential directions. The Axial scans were performed utilizing 45° Shear, 45° and 60° RL search units. Due to the ID/OD ratio of the component, the Circ scans were performed with 35° Shear and 40° RL search units. No exam was performed looking upstream due to the nozzle configuration. The 35° Shear wave exam was performed on the nozzle side as a supplemental exam and no credit for coverage was taken on the nozzle side with this search unit.

Below is the coverage calculation:

Axial Scans 93%  
Circ Scans 65%

$158 / 2 = 79\%$

NOTE: See pages 6 of 7 of report for areas examined.

Relief Request 12R-50  
Attachment 1 - 6  
Component: 1SG-05-SGSE-02  
Sheet 7 of 9

Exelon *Choi H. McLean* LV III 10-15-07  
*Choi's H. McLean*

Reviewed BY: *Paul Carter*, Level III, 10-15-07

AMERICAN REVIEW  
10/16/07



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NUCLEAR SERVICES  
INSPECTION SERVICES

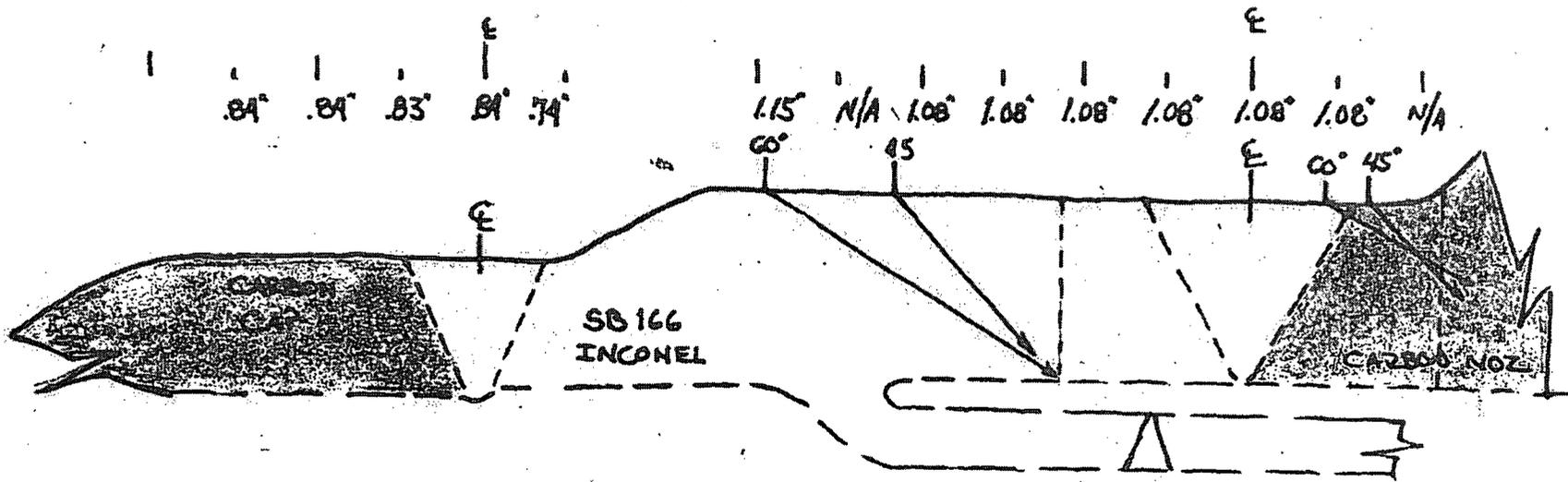
A1R13-UT-013  
Page 6 of 7

WELD PROFILE / DATA

PLANT BRAIDWOOD UNIT 1 SKETCH 1SG-05, Rev. 0

SYST./COMP. RC / 1SG-05-SGSE-02 PROCEDURE EXE-UT-350, Rev. 1 / EXE-PDI-UT-110, Rev. 0

EXAMINER Douglas Grozewold, Level II DATE 10/7/2007 IDENT. 1SG-05-SGSE-02



100% EXAM VOLUME

$$2.25 \times 1.1 = 2.475 \text{ sq. in.}$$

7.1% EXAM VOLUME NOT COVERED

$$\frac{.7 \times .5}{2} = 0.175 \text{ sq. in.}$$

APPROX COVERAGE  
ACHIEVED

93%

Reviewed by: Grant Catano, Level III, 10-15-07

EXELOW LEVEL TO REVIEW / DATE

Chris H. McKee

Chris H. McKee

10-15-07

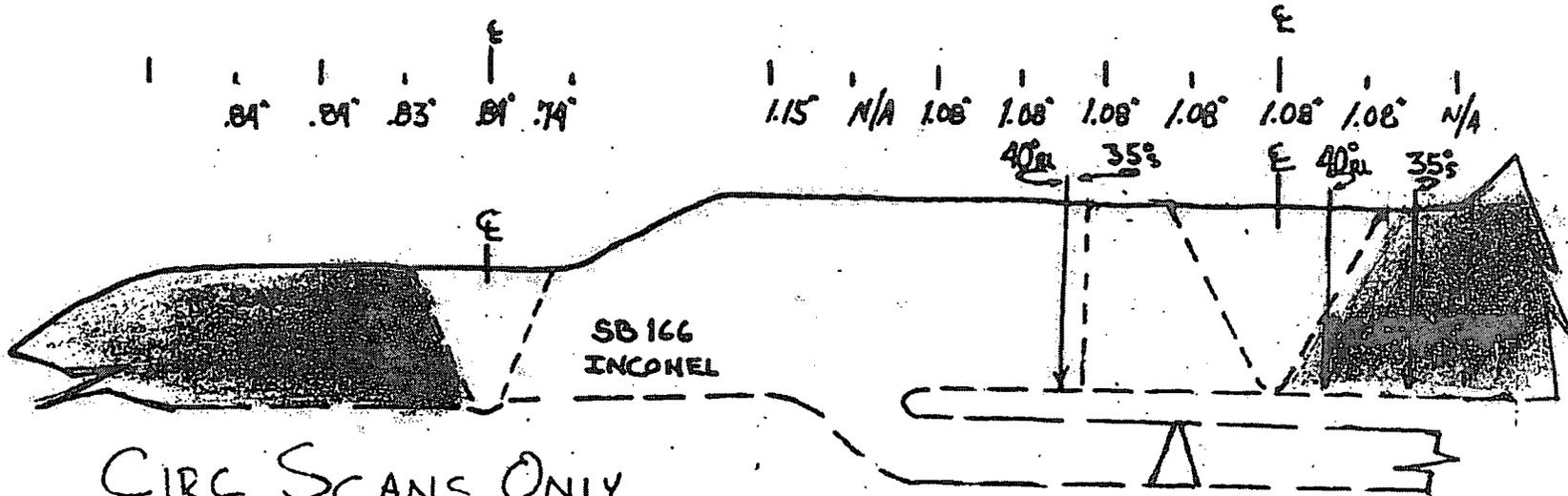
AND REVIEW / DATE

10/10/07

Relief Request 12R-50  
Attachment 1 - 6  
Component: 1SG-05-SGSE-02  
Sheet 8 of 9

WELD PROFILE / DATA

PLANT BRAIDWOOD UNIT 1 SKETCH 1SG-05, Rev. 0  
 SYST./COMP. RC / 1SG-05-SGSE-02 PROCEDURE EXE-UT-350, Rev. 1 / EXE-PDI-UT-110, Rev. 0  
 EXAMINER Douglas Gronewold DATE 10/7/2007 IDENT. 1SG-05-SGSE-02  
Douglas Gronewold, Level II



CIRC SCANS ONLY  
 35° SHEAR + 40° RL W/ CONTOURED WEDGE

EXAM VOLUME  
 2.25" x 1.1"  
 = 2.475 sq in.

EXAM VOLUME NOT COVERED  
 .8" x 1.1" = .88 sq in  
 OR  
 35.5%

65% COVERAGE ACHIEVED  
 FOR CIRC SCANS

Relief Request I2R-50  
 Attachment 1 - 6  
 Component: 1SG-05-SGSE-02  
 Sheet 9 of 9

Reviewed By: Chit Chit, Level III 10-15-07

EXE/OS LEVEL II REVIEW / DATE

Chris H. ...

AND REVIEW / DATE

Chit H. ... 10-15-07

I ... 10/14/07

**ATTACHMENT 2**

**Braidwood Station Unit 2 Limited Examinations**

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 2-1**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 1 of 1)

<b>Component ID Code Category Code Item</b>	<b>Outage Examined</b>	<b>Cumulative Examination Coverage Achieved</b>	<b>Reference Sketch/Coverage Plot</b>	<b>Remarks</b>
2RV-03-001 Category B-A Item B1.40	A2R07 (4/1999)	87.64%	Attachment 2-2	Reactor Vessel Upper Head-to-Flange weld. Examination coverage for surface examination (magnetic particle) was 100% with no recordable indications, no recordable indications noted in any of the ultrasonic scans.
2PZR-01-N2 Category B-D Item B3.110	A2R07 (4/1999)	83.64%	Attachment 2-3	Pressurizer Spray Nozzle-to-Shell Weld. No recordable indications noted in any of the ultrasonic scans performed.
2PZR-01-N3 Category B-D Item B3.110	A2R07 (4/1999)	80.9%	Attachment 2-4	Pressurizer Relief Nozzle-to-Shell Weld. No recordable indications noted in any of the ultrasonic scans performed.
2SG-01-SGC-02 Category C-A Item C1.30	A2R13 (4/2008)	88.4%	Attachment 2-5	Steam Generator Tube Sheet-to-Stub Barrel weld; scanning limitations due to adjacent plug/branch connections, weld pads and identification plate. No recordable indications noted in any of the ultrasonic scans performed.

---

**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 2-2**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 1 of 13)

**1.0 Component**

Weld Number: 2RV-03-001  
Code Category / Item: B-A / B1.40  
Configuration: Reactor Vessel Head-to-Flange Weld

**2.0 Applicable Code Edition and Addenda**

ASME Section XI 1989 Edition with no Addenda (including Mandatory Appendices)

**3.0 Applicable Code Requirement**

Table IWB-2500-1, Examination Category B-A, requires volumetric examination of Item B1.40 (Head-to-Flange welds). Table IWB-2500-1 Note (2) states essentially 100% of the weld length shall be examined.

Figure IWB-2500-5 depicts the required examination volume (A-B-C-D), which includes the circumferential weld and the adjacent base metal on either side of the weld extending to a distance of one-half the thickness of the wall from the extremities of the weld crown.

ASME Section XI Mandatory Appendix I requires ultrasonic examination of vessel welds greater than 2" thick to be conducted in accordance with ASME Section V, Article 4.

ASME Section V, Article 4 requires:

T-441.3.2.4 Extent of Scanning: Wherever feasible, the scanning of the examination volume shall be carried out from both sides of the weld on the same surface. Where the configuration or adjacent parts of the component are such that scanning from both sides is not feasible, this fact shall be included in the report of the examination.

T-441.3.2.5 Angle Beam Scanning: Wherever feasible, each examination shall be performed in two directions, i.e., approaching the weld from the opposite directions and parallel to the weld from opposite directions.

T-441.3.2.6 Scanning for Reflectors Oriented Parallel to the Weld: The angle beam search units shall be aimed at right angles to the weld axis, with the search unit manipulated so that the ultrasonic beams pass through the entire volume of weld metal. The adjacent base metal in the examination volume must be completely scanned by two angle beams, but need not be scanned by both angle beams from both directions.

Code Case N-460, which accepts a reduction in examination coverage provided the reduction is less than 10%.

**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 2-2**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
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**4.0 Impracticality/Burden**

The reactor vessel head-to-flange weld has a nominal thickness of 7.0" and is clad with stainless steel on the inside diameter surface. The surface geometry of the flange obstructs the ultrasonic transducer movement that is needed to examine the Code required volume from the flange side. The propagation for the ultrasonic beam was in the shear mode. Normally this mode would allow the ultrasonic beam to reflect off the inside surfaces and create a two-beam axis at right angles to each other; however, the presence of the stainless steel cladding precludes the ultrasound beams from reflecting at the inside diameter from the shell/cladding interface. In addition to the examination limitations encountered due to the flange configuration and inside diameter cladding, additional examination restrictions are caused by the presence of three lifting lugs located on the reactor vessel head. These limitations preclude complete coverage of the full volume for the required scanning directions mandated by ASME Section V and Section XI. These limitations are inherent to the original design of the reactor vessel head. Conformance with the ASME Section XI requirements for essentially 100% of the volumetric coverage would require extensive structural modifications to the reactor vessel head.

**5.0 Alternative Examinations or Testing**

In addition to performing the 0, 45, and 60 degree ultrasonic scans required by Appendix I, additional 30 and 40 degree ultrasonic scans were performed in lieu of the 70 degree scan as permitted by Section V, Article 4, T-441.3.2.1 to supplement coverage. The calculated volumetric coverage achieved for all combined scans was documented as 87.64%.

The Code required surface examination area (B-E as depicted in Figure IWB-2500-5) was fully achieved (100% coverage) utilizing the magnetic particle method. In addition to the required surface examination, numerous system leakage tests (ASME Section XI Category B-P and Generic Letter 88-05) at nominal system operating pressure (2235 psig) and temperature (557°F) as well as bare metal visual examinations of the upper reactor head associated with the First Revised Order EA-03-009 have been completed with no evidence of leakage associated with the reactor vessel head-to-flange weld noted during the course of the interval.

Radiography (RT) is not a desired option because RT is limited in the ability to detect expected degradation mechanisms such as service induced cracking. Additionally, RT has not been qualified through performance demonstration.

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 2-2**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 3 of 13)

**6.0 Justification for Granting Relief**

No additional examinations were completed during the inspection interval; however, the aggregate examination coverage achieved 87.64% along with the results of the completed surface examination, system pressure tests, and bare metal visual inspections performed throughout the inspection interval provide reasonable assurance that pressure boundary integrity has been maintained for this component. There were no indications noted during any of the examinations (surface, volumetric, and visual) performed during the course of the interval.

**7.0 Precedents**

Similar examination limitations for reactor head-to-flange welds were encountered and similar examination coverage was accepted for the following units:

Byron Station Units 1 and 2:

Letter from R. Gibbs (U. S. NRC) to C. G. Pardee (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2 – Inservice Inspection Program Second Interval Relief Requests I2R-22, I2R-23, I2R-25, and I2R-53 (TAC Nos. MD4099, MD4100, MD4101, MD4102, MD4103, MD4104, MD4105, and MD4106)," dated January 15, 2008

**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit: 2 Procedure/ Rev.: NDT-C-30 / 7 Date: 4-30-99 Page 1 of 1  
 Calibration Report No.: Axial: 99BR2-UTC-053 Circ.: N/A Exam. Report No.: 99BR2-UTD-048  
 System: REACTOR VESSEL Component #: 2RV-03-001 Weld Type: REACTOR HEAD - FLANGE  
 Component Size: 48' Schedule / Thickness: N/A / 7.0" Material: CS / SS CLAD  
 Component Temp. / I.D. # 71°F / 193748 Couplant: ULTRAGEL II Batch #: 99125  
 Scan Gain: 45.2 dB Axial: N/A Circ.: N/A  
 Lo Reference Point: 0.0" Wo Reference Point: WELD CENTERLINE

	Performed		Indications		
	YES	NO	NO	YES	
1. Angle Beam - Normal - Against Flow 	N/A	X	N/A	N/A	
2. Angle Beam - Normal - With Flow	N/A	X	N/A	N/A	
3. Angle Beam - Along Weld - CW	N/A	X	N/A	N/A	
4. Angle Beam - Along Weld - CCW	N/A	X	N/A	N/A	
5. Thickness Across Weld and Base Metal	X	N/A	7.00"	7.00"	7.00"
			UP STRM	WELD	DN STRM

Comments:

- 0° EXAMINATION.
- NO RECORDABLE INDICATIONS.
- \* REFERENCE 99BR2-UTD-051 FOR THICKNESS AND COVERAGE INFORMATION.
- WELD AND BASE METAL STRAIGHT BEAM WAS PERFORMED.
- GAIN ADJUSTED TO MAINTAIN 80% BACK WALL.
- 45° INFORMATION REFERENCE 99BR2-UTD-051.
- 60° INFORMATION REFERENCE 99BR2-UTD-052.

Examiner: *Richard B. Sain* Level: II Date: 4-30-99  
 Reviewer: *Michael Robbins* Level: III Date: 5/6/99  
 Reviewer: *J. Meen* Level: III Date: 5-13-99  
 Others: *D. J. Chapman* Date: 5/13/99  
 ANII: *L. H. ...* Date: 5-13-99

**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit: 2 Procedure/ Rev.: NDT-C-30 Date: 4-30-99 Page 1 of 1

Calibration Report No.: Axial: 99BR2-UTC-054 Circ.: N/A Exam. Report No.: 99-BR2-UTD-049

System: REACTOR HEAD Component #: 2RV-03-001 Weld Type: REACTOR HEAD TO FLANGE

Component Size: 48' Schedule / Thickness: N/A / 7.0" Material: CS

Component Temp. / I.D. # 71° / 193748 Couplant: ULTRAGEL II Batch #: 99125

Scan Gain: 65dB Axial: X Circ.: NA

Lo Reference Point: 0° Wo Reference Point: WELD CL

	Performed		Indications		
	YES	NO	NO	YES	
1. Angle Beam - Normal - Against Flow 	X	N/A	X	N/A	
2. Angle Beam - Normal - With Flow	X	N/A	X	N/A	
3. Angle Beam - Along Weld - CW	N/A	X	N/A	N/A	
4. Angle Beam - Along Weld - CCW	N/A	X	N/A	N/A	
5. Thickness Across Weld and Base Metal	*	X	N/A	*	*
			UP STRM	WELD	DN STRM

Comments:  
 .NO RECORDABLE INDICATIONS - NRI  
 \*REF 99BR2-UTD-051 FOR THICKNESS AND COVERAGE DATA.  
 MAINTAIN A 10% ID ROLL  
 LIMITED EXAM PERFORMED AGAINST FLOW DO TO FLANGE  
 0° INFORMATION REFERENCE 99BR2-UTD-048  
 45° INFORMATION REFERENCE 99BR2-UTD-051  
 60° INFORMATION REFERENCE 99BR2-UTD-052  
 40° INFORMATION REFERENCE 99BR2-UTD-050

30° / 2.25MHz

Examiner: JOSPH SERTH  Level: II Date: 4-30-99  
 Reviewer: Michael Robbins Level: III Date: 5/7/99  
 Reviewer: W. H. H. Level: III Date: 5-12-99  
 Others: D. J. Chykowski Date: 5/13/99  
 ANII: L. H. H. Date: 5-13-99

**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit: 2 Procedure/ Rev.: NDT-C-30 Date: 4-30-99 Page 1 of 1  
 Calibration Report No.: Axial: 99BR2-UTC-055 Circ.: N/A Exam. Report No.: 99-BR2-UTD-050  
 System: REACTOR HEAD Component #: 2RV-03-001 Weld Type: REACTOR HEAD TO FLANGE  
 Component Size: 48' Schedule / Thickness: N/A / 7.0' Material: CS  
 Component Temp. / I.D. # 71° / 193748 Couplant: ULTRAGEL II Batch #: 99125  
 Scan Gain: 65dB Axial: X Circ.: NA  
 Lo Reference Point: 0° Wo Reference Point: WELD CL

	Performed		Indications		
	YES	NO	NO	YES	
1. Angle Beam - Normal - Against Flow 	X	N/A	X	N/A	
2. Angle Beam - Normal - With Flow	X	N/A	X	N/A	
3. Angle Beam - Along Weld - CW	N/A	X	N/A	N/A	
4. Angle Beam - Along Weld - CCW	N/A	X	N/A	N/A	
5. Thickness Across Weld and Base Metal	.	X	N/A	.	.
			UP STRM	WELD	DN STRM

Comments:  
 .NO RECORDABLE INDICATIONS - NRI  
 \*REF 99BR2-UTD-051 FOR THICKNESS AND COVERAGE DATA.  
 MAINTAIN A 10% ID ROLL  
 LIMITED EXAM PERFORMED AGAINST FLOW DO TO FLANGE  
 0° INFORMATION REFERENCE 99BR2-UTD-048  
 45° INFORMATION REFERENCE 99BR2-UTD-051  
 60° INFORMATION REFERENCE 99BR2-UTD-052  
 30° INFORMATION REFERENCE 99BR2-UTD-049

40° / 2.25MHz

Examiner: JOSPH SERTH  Level: II Date: 4-30-99  
 Reviewer: Michael Robbins Level: III Date: 5/7/99  
 Reviewer: J. Green Level: III Date: 5-12-99  
 Others: D. J. Chapman Date: 5/13/99  
 ANII: L. Green Date: 5-13-99

**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit: 2 Procedure/ Rev.: NDT-C-30/7 Date: 4-30-99 Page 1 of 12  
 Calibration Report No.: Axial: 99BR2-UTC-056 Circ.: 99BR2-UTC-056 Exam. Report No.: 99BR2-UTD-051  
 System: REACTOR VESSEL Component #: 2RV-03-001 Weld Type: REACTOR HEAD - FLANGE  
 Component Size: 48" Schedule / Thickness: N/A / 7.0" Material: CS/SS CLAD  
 Component Temp. / I.D. #: 71°F / 193748 Couplant: ULTRAGEL II Batch #: 99125  
 Scan Gain: N/A Axial: 59.4 dB Circ.: 59.4 dB  
 L<sub>0</sub> Reference Point: 0° W<sub>0</sub> Reference Point: WELD CENTERLINE

45° SHEAR	Performed		Indications		
	YES	NO	NO	YES	
1. Angle Beam - Normal - Against Flow 	X	N/A	X	N/A	
2. Angle Beam - Normal - With Flow	X	N/A	X	N/A	
3. Angle Beam - Along Weld - CW	X	N/A	X	N/A	
4. Angle Beam - Along Weld - CCW	X	N/A	X	N/A	
5. Thickness Across Weld and Base Metal	N/A	X	N/A	N/A	N/A
			UP STRM	WELD	DN STRM

COMMENTS:

1. THERE WERE NO RECORDABLE INDICATIONS.
2. EXAM WAS LIMITED AGAINST FLOW DUE TO FLANGE.
3. REFER TO ATTACHED SHEETS FOR THICKNESS AND COVERAGE INFORMATION.
4. THE ABOVE SCAN GAIN WAS USED TO MAINTAIN A 10% ID ROLL.
5. FOR 0° INFORMATION REFER TO 99BR2-UTD-048.
6. FOR 60° INFORMATION REFER TO 99BR2-UTD-052.

Examiner: RONALD P. NIZIOL *Ronald P. Niziol* Level: II Date: 4-30-99  
 Reviewer: Michael Robbins Level: III Date: 5/7/99  
 Reviewer: W. Green Level: III Date: 5-12-99  
 Others: D. J. Chapman Date: 5/13/99  
 ANII: L. Green Date: 5-13-99

**EXAMINATION COVERAGE**

Station: BRAIDWOOD Unit: 2 Date: 5-3-99 Page 2 of 12

System: REACTOR VESSEL Comp. ID: 2RV-03-001 Exam. No.: 99BR2-UTD-051

Config: REACTOR HEAD to FLANGE Procedure/ Rev.: NDT-C-30 /7 & NDT-Z-1 /1

Examiner: RICH SCERINE Level: II

Examiner: RON NIZIOL Level: II

Notes: LIMITATION DUE TO 3 TENSIONING LUGS AND FLANGE

NDE Method: UT X MT N/A PT N/A

Comments: **SEE ATTACHMENT 1 COVERAGE SUMMARY FOR EXAMINATION PERCENTAGE BREAK DOWN.**

ASME Section XI Examination Volume Achieved: 87.64%

Attachments: Yes / No YES

REVIEWER: Michael Robbins LEVEL: III DATE: 5/12/99

OTHERS: Zyreen DSC 5/13/99 LEVEL: III DATE: 5-12-99

ANII: L. Inman DATE: 5-13-99

Site: Braidwood Unit: 2  
System: Reactor Vessel  
Weld ID: 2RV-03-001  
Config: REACTOR HEAD / FLANGE

Examiner: Richard Scerine LEVEL: II  
Examiner: Ron Nizio LEVEL: II

Procedure # NDT-Z-1 / 1

Calibration Sheet # 99BR2-UTC-53,54,55,56,57

NDE METHOD X UT      PT      MT

Notes: Supplemental Exams 30° & 40°

**VESSEL COVERAGE SUMMARY**

W = 9.40" ( 2.40" WELD CROWN AND 3.50" ( T ) SIDE 3.50" ( B ) SIDE T = 7.00" WELD LENGTH = 525.15"

Total Weld Metal Volume = 5881.68 cu. in. Total Base Metal Volume = 29019.80 cu.in.

Obstruction: #1 TENSION LUGS (3 EA.) 3" X 6" WIDE FOR A TOTAL OBSTRUCTION OF 0.11% (18.0")  
#2 FLANGE (SEE BELOW FOR PERCENTAGES)

WELD METAL EXAMINATION			BASE METAL EXAMINATION		
SCAN	EXAM VOLUME / TOTAL VOLUME =	% EXAM	SCAN	EXAM VOLUME / TOTAL VOLUME	% EXAM
0°	5881.68 cu.in / 5881.68 cu.in.	100.00%	0°	23159.12 cu.in. / 29019.80 cu.in.	79.80%
30° ( B )	4180.19 cu.in / 5881.68 cu.in.	71.07%	45°	28263.58 cu.in. / 29019.80 cu.in.	97.40%
30° ( T )	5881.68 cu.in / 5881.68 cu.in.	100.00%	60°	28557.66 cu.in. / 29019.80 cu.in.	98.41%
40° ( T )	2457.70 cu.in / 5881.68 cu.in.	41.79%	45° CW	23159.12 cu.in. / 29019.80 cu.in.	79.80%
40° ( B )	5875.24 cu.in / 5881.68 cu.in.	99.89%	45° CCW	23159.12 cu.in. / 29019.80 cu.in.	79.80%
45° CW	5881.68 cu.in / 5881.68 cu.in.	100.00%	60° CW	23159.12 cu.in. / 29019.80 cu.in.	79.80%
45° CCW	5881.68 cu.in / 5881.68 cu.in.	100.00%	60° CCW	23159.12 cu.in. / 29019.80 cu.in.	79.80%
60° CW	5881.68 cu.in / 5881.68 cu.in.	100.00%	<b>TOTAL 594.81% + 7 = 84.97% BMV EXAMINED</b>		
60° CCW	5881.68 cu.in / 5881.68 cu.in.	100.00%			

TOTAL 812.75% + 9 = 90.31%

TOTAL ( 90.31% + 84.97% ) + 2 = 87.64% EXAMINATION COVERAGE

PREPARED BY: *Roby H. II* DATE: 5-11-99  
 REVIEWED BY: *Michael Robbins LVIII* DATE: 5/12/99  
 REVIEWED BY: *W. Green DSC 5/13/99* DATE: 5-13-99  
 ANII: *L. Green* DATE: 5-13-99

<u>WELD MATERIAL</u>	<u>PERCENT CALCULATED</u>	<u>COMMENTS</u>
0°	100.00%	
30° B	71.07%	30° USED TO SUPPLEMENT 45°, % COVERAGE BASED ON 30°
30° T	100.00%	30° USED TO SUPPLEMENT 45°, % COVERAGE BASED ON 30°
40° B	41.79%	40° USED TO SUPPLEMENT 60°, % COVERAGE BASED ON 40°
40° T	99.89%	40° USED TO SUPPLEMENT 60°, % COVERAGE BASED ON 40°
45° CW	100.00%	
45° CCW	100.00%	
60° CW	100.00% AVERAGE	
60° CCW	100.00% 90.31%	

<u>BASE MATERIAL</u>	<u>PERCENT CALCULATED</u>
0°	79.80%
45°	97.40%
60°	98.41%
45°CW	79.80%
45°CCW	79.80%
60°CW	79.80% AVERAGE
60°CCW	79.80% 84.97%

TOTAL WELD METAL 90.31%  
 TOTAL BASE MATERIAL 84.97%  
 TOTAL EXAMINATION COVERAGE 87.64%

"B" FLANGE SIDE OF WELD  
 "T" HEAD SIDE OR WELD

Relief Request IZR-50  
 Attachment 2 - 2  
 Component: 2RV-03-001  
 Sheet 10 of 13

REFERENCE EXAMINATION VOLUME COVERAGE PLOT, PAGE 7 OF 12, FOR ALL ANGLES PERFORMED. THE ABOVE ANGLES WERE UTILIZED FOR TOTAL EXAMINATION COVERAGE CALCULATIONS.

PREPARED BY: *[Signature]* DATE: 5-11-99

REVIEWED BY: *Michael Robbins LV III* DATE: 5/12/99

REVIEWED BY: *[Signature] DJC 5/13/99* DATE: 5-13-99

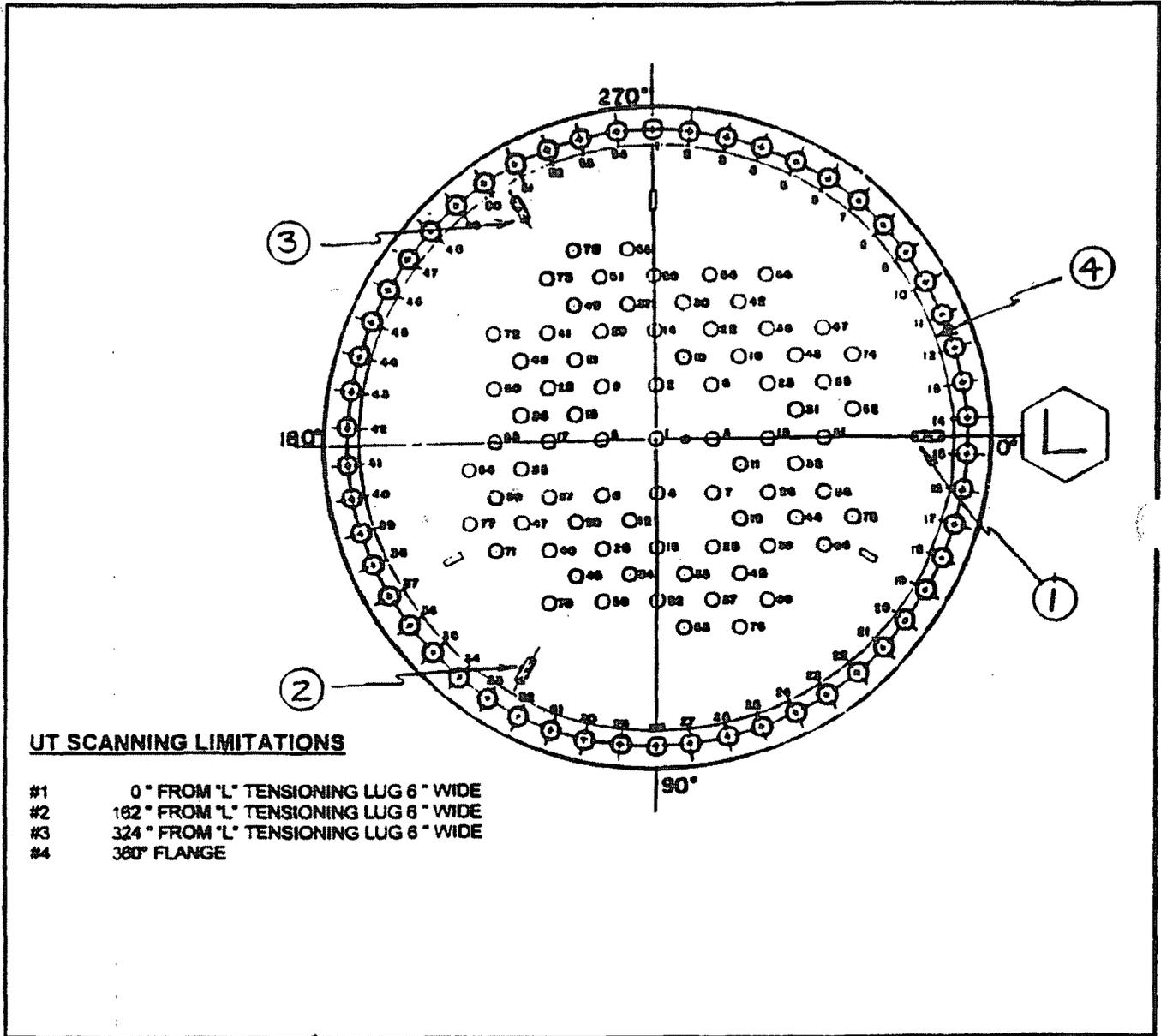
ANII: *[Signature]* DATE: 5-13-99

STATION: BRAIDWOOD UNIT: 2

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PROCEDURE/ REV.: NDT-C-30 Rev. 7 & NDT-Z-1 Rev. 1 REPORT NO.: 99BR2-UTD-051

SYSTEM: REACTOR VESSEL COMPONENT: 2RV-03-001



**UT SCANNING LIMITATIONS**

- #1 0" FROM "L" TENSIONING LUG 6" WIDE
- #2 162" FROM "L" TENSIONING LUG 6" WIDE
- #3 324" FROM "L" TENSIONING LUG 6" WIDE
- #4 360° FLANGE

EXAMINER:	<u><i>Richard S. [Signature]</i></u>	LEVEL:	<u>II</u>	DATE:	<u>4-30-99</u>
REVIEWER:	<u><i>Michael Robbins</i></u>	LEVEL:	<u>III</u>	DATE:	<u>5/12/99</u>
REVIEWER:	<u><i>J. Meyer</i></u>	LEVEL:	<u>III</u>	DATE:	<u>5-12-99</u>
OTHER:	<u><i>D. J. Chykowski</i></u>			DATE:	<u>5/13/99</u>
ANI:	<u><i>L. [Signature]</i></u>			DATE:	<u>5-13-99</u>

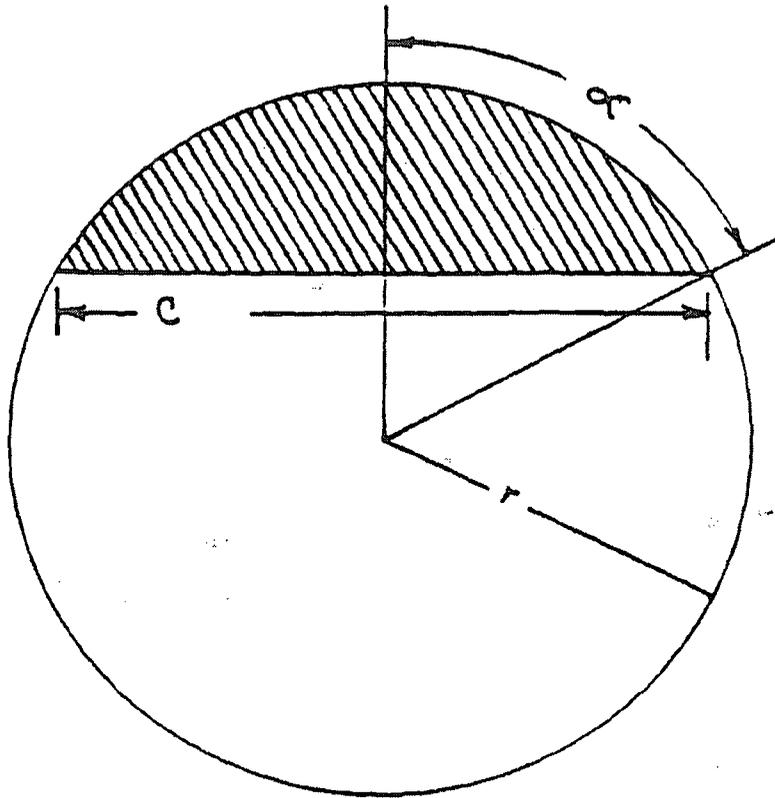
STATION: BRAIDWOOD UNIT: 2

PAGE 6 OF 12

PROCEDURE/ REV.: NDT-C-30 Rev. 7 & NDT-Z-1 Rev. 1 REPORT NO.: 99BR2-UTD-051

SYSTEM: REACTOR VESSEL COMPONENT: 2RV-03-001

NOTE:  
Pages 7 of 12 through  
12 of 12 are 1:1 scale drawings  
and are not included



$95.12''$  ( OUTSIDE RADIUS ) -  $87.85''$  ( INSIDE RADIUS ) =  $7.27''$   
 $7.27'' + 2 = 3.636''$  or  $3.64''$        $3.64'' + 87.85'' = 91.49''$   
 $C = (2r) (\sin \alpha)$   
 $C = (2) (91.49'') (\sin 68^\circ)$   
 $C = (2) (91.49'') (0.9135)$   
 $C = 167.166''$   
 CIRCUMFERENCE =  $\pi d = \pi C = \pi ( 167.16'' ) = 525.15''$

EXAMINER:	<u>Rich J. S.</u>	LEVEL:	<u>II</u>	DATE:	<u>4-30-99</u>
REVIEWER:	<u>Michael Robbins</u>	LEVEL:	<u>III</u>	DATE:	<u>5/12/99</u>
REVIEWER:	<u>Tyler</u>	LEVEL:	<u>II</u>	DATE:	<u>5-12-99</u>
OTHER:	<u>D. J. Chykowski</u>			DATE:	<u>5/13/99</u>
ANII:	<u>L. Hume</u>			DATE:	<u>5-13-99</u>

**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit: 2 Procedure/ Rev.: NDT-C-30/7 Date: 4-30-99 Page 1 of 1

Calibration Report No.: Axial: 99BR2-UTC-057 Circ.: 99BR2-UTC-057 Exam. Report No.: 99BR2-UTD-052

System: REACTOR VESSEL Component #: 2RV-03-001 Weld Type: REACTOR HEAD - FLANGE

Component Size: 48' Schedule / Thickness: N/A / 7.0" Material: CS / SS CLAD

Component Temp. / I.D. # 71°F / 193748 Couplant: ULTRAGEL II Batch #: 99125

Scan Gain: N/A Axial: 63.0 dB Circ.: 63.0 dB

Lo Reference Point: 0.0" Wo Reference Point: WELD CENTERLINE

	Performed		Indications		
	YES	NO	NO	YES	
1. Angle Beam - Normal - Against Flow 	X	N/A	X	N/A	
2. Angle Beam - Normal - With Flow	X	N/A	X	N/A	
3. Angle Beam - Along Weld - CW	X	N/A	X	N/A	
4. Angle Beam - Along Weld - CCW	X	N/A	X	N/A	
5. Thickness Across Weld and Base Metal	.	N/A	.	.	.
			UP STRM	WELD	DN STRM

Comments:

- 60° EXAMINATION.
- NO RECORDABLE INDICATIONS.
- \* REFERENCE 99BR2-UTD-051 FOR THICKNESS AND COVERAGE INFORMATION.
- LIMITED SCAN AGAINST DUE TO FLANGE.
- THE ABOVE SCAN GAIN WAS USED TO MAINTAIN A 10% ID ROLL.
- 0° INFORMATION REFERENCE 99BR2-UTD-048.
- 45° INFORMATION REFERENCE 99BR2-UTD-051.

Examiner: *Richard B. Sen* Level: II Date: 4-30-99

Reviewer: *Michael Robbins* Level: III Date: 5/6/99

Reviewer: *W. Miller* Level: III Date: 5-13-99

Others: *D. J. Chapman* Date: 5/13/99

ANII: *L. Miller* Date: 5-13-99

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 2-3**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 1 of 24)

**1.0 Component**

Weld Number: 2PZR-01-N2  
Code Category / Item: B-D / B3.110  
Configuration: Pressurizer Spray Nozzle-to-Vessel Weld

**2.0 Applicable Code Edition and Addenda**

ASME Section XI 1989 Edition with no Addenda (including Mandatory Appendices)

**3.0 Applicable Code Requirement**

Table IWB-2500-1, Examination Category B-D requires volumetric examination of Item B3.110 (Pressurizer Nozzle-to-Vessel welds).

Figure IWB-2500-7(b) depicts the required examination volume (A-B-C-D-E-F-G-H), which includes the actual circumferential weld and adjacent base metal on either side of the weld extending to a distance of one-half the thickness of the wall from the extremities of the weld crown.

ASME Section XI Mandatory Appendix I requires ultrasonic examination of vessel welds greater than 2" thick to be conducted in accordance with ASME Section V, Article 4.

ASME Section V, Article 4 requires:

T-441.3.2.4 Extent of Scanning: Wherever feasible, the scanning of the examination volume shall be carried out from both sides of the weld on the same surface. Where the configuration or adjacent parts of the component are such that scanning from both sides is not feasible, this fact shall be included in the report of the examination.

T-441.3.2.5 Angle Beam Scanning: Wherever feasible, each examination shall be performed in two directions, i.e., approaching the weld from the opposite directions and parallel to the weld from opposite directions.

T-441.3.2.6 Scanning for Reflectors Oriented Parallel to the Weld: The angle beam search units shall be aimed at right angles to the weld axis, with the search unit manipulated so that the ultrasonic beams pass through the entire volume of weld metal. The adjacent base metal in the examination volume must be completely scanned by two angle beams, but need not be scanned by both angle beams from both directions.

T-441.3.2.7 Scanning for Reflectors Oriented Transverse to the Weld: The angle beam search units shall be aimed parallel to the axis of the longitudinal and circumferential welds. The search unit shall be manipulated so that the ultrasonic beams pass through of the examination volume. Scanning shall be done in two directions 180 degrees to

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
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each other to the extent possible. Areas blocked by geometric conditions shall be examined from at least one direction.

Code Case N-460, which accepts a reduction in examination coverage provided the reduction is less than 10%.

#### **4.0 Impracticality/Burden**

The pressurizer vessel spray nozzle-to-vessel weld is approximately 2.7" thick. The pressurizer nozzle and vessel are clad with stainless steel on the inside diameter surface. The geometry of the nozzle along with the presence of the cladding on the inside diameter of the pressurizer result in limited access to the entire examination volume. The propagation for the ultrasonic beam was in the shear mode. Normally this mode would allow the ultrasonic beam to reflect off the inside surfaces and create a two-beam axis at right angles to each other; however, the presence of the stainless steel cladding precludes the ultrasound beams from reflecting at the inside diameter from the shell/cladding interface. The nozzle geometry tapers away from the weld resulting in limited scanning surfaces available for transducer coupling on the nozzle side of the weld resulting in additional examination limitations. These factors result in limited examination coverage from the scan directions required by ASME Section V and Section XI. These limitations are inherent to the original design of the pressurizer vessel. Conformance with the ASME Section XI requirements for essentially 100% of the volumetric coverage would require extensive structural modifications to the pressurizer vessel.

#### **5.0 Alternative Examinations or Testing**

In addition to performing the 0, 45 (recorded as 46 degrees in coverage calculation data), 60, and 70 degree scans to the extent practical as required by Appendix I, additional 30 and 40 degree scans were performed to supplement coverage. The aggregate examination coverage achieved was 83.64%.

In addition to completing the required volumetric examination to the extent practical, numerous system leakage tests (ASME Section XI Category B-P and Generic Letter 88-05) at nominal system operating pressure (2235 psig) and temperature (557°F) as well as the bare metal visual examinations associated with NRC Bulletin 2004-01 of the upper pressurizer vessel head were completed with no evidence of leakage associated with the pressurizer spray nozzle-to-vessel weld noted during the course of the interval.

Radiography as an alternative is not feasible because access is not available for film placement.

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
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**6.0 Justification for Granting Relief**

No additional examinations were completed during the inspection interval; however, the examination coverage of 83.64% along with the results of the pressure test and bare metal visual inspections provide reasonable assurance that pressure boundary integrity has been maintained for this component throughout the interval.

**7.0 Precedents**

Similar examination limitations for pressurizer spray nozzle -to-shell welds were encountered and similar examination coverage was accepted for the following units:

Byron Station Units 1 and 2:

Letter from R. Gibbs (U. S. NRC) to C. G. Pardee (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2 – Inservice Inspection Program Second Interval Relief Requests I2R-22, I2R-23, I2R-25, and I2R-53 (TAC Nos. MD4099, MD4100, MD4101, MD4102, MD4103, MD4104, MD4105, and MD4106)," dated January 15, 2008

Callaway Unit 1:

Letter from D. Terao (U. S. NRC) to C. D. Naslund (Union Electric Company), "Callaway Plant, Unit 1 - Relief Request ISI-41 for the Second 10-Year Inservice Inspection Interval (TAC No. MD3437)," dated January 18, 2007

Wolf Creek Unit 1:

Letter from D. Terao (U. S. NRC) to R. A. Muench (Wolf Creek Nuclear Operating Corporation), "Wolf Creek Generating Station – Relief Request I2R-34 for the Second Ten-Year Interval Inservice Inspection (TAC No. MD0288)," dated November 20, 2006

Catawba Unit 1:

Letter from E. C. Marinos (U. S. NRC) to D. Jamil (Catawba Nuclear Station), "Catawba Nuclear Station, Unit 1, Request for Relief 05-CN-004, Limited Weld Examinations During End-of-Cycle 15 Refueling Outage (TAC Nos. MC8337, MC9171, MC9172, MC9199, MC9173, MC9202, MC9174, MC9175, MC9176, MC9177, MC9178 and MC9179)," dated September 25, 2006

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 2-3**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
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Catawba Unit 2:

Letter from E. C. Marinos (U. S. NRC) to D. Jamil (Catawba Nuclear Station), "Catawba Nuclear Station, Unit 2, Request for Relief from the Requirements of the ASME Code (TAC Nos. MC7004, MC9197, MC9198, MC9199, MC9200, MC9202, MC9203, MC9204, MC9205, MC9206 and MC9207)," dated April 3, 2006

**EXAMINATION COVERAGE**

Station: BRAIDWOOD Unit: 02 Date: 04/27/99 Page 1 of 20

System: PRESSURIZER Comp. ID: 2PZR-01-N2 Exam. No.: 99BR2-UTD-025

Config: SPRAY NOZZLE to PRESSURIZER Procedure/ Rev.: NDT-C-5, REV. 4  
NDT-Z-1, REV. 1

Examiner: MIKE KICKBUSCH Level: II

Examiner: TIMOTHY GAHAN Level: II

Notes: LIMITATION DUE TO NOZZLE CONFIGURATION

NDE Method: UT X MT N/A PT N/A

Comments:

Total weld metal examination volume (WMV) achieved : **90.41%**

Total base metal examination volume (BMV) achieved : **76.86%**

Total examination volume achieved : **83.64%** ( 90.41 + 76.86 = 167.27 / 2 = 83.64 )

Reference attached examination coverage calculation sheet for details.

ASME Section XI Examination Volume Achieved: 83.64%

Attachments: Yes / No YES

REVIEWER: *Mike Kickbusch* LEVEL: III DATE: 5-9-99

OTHERS: *Timothy Gahan* *DJK* 5/11/99 LEVEL: III DATE: 5-11-99

ANII: *L...* DATE: 5-12-99

WELD MATERIAL (WMV)	PERCENT ACHIEVED	PERCENT UTILIZED	COMMENTS
0°	100.00%	100.00%	
30° X	72.79%	72.79%	30° (X) USED TO SUPPLEMENT 46°, % COVERAGE BASED ON 30°
30° Y	100.00%	100.00%	30° (Y) USED TO SUPPLEMENT 46°, % COVERAGE BASED ON 30°
40° X	40.88%	40.88%	40° (X) USED TO SUPPLEMENT 60°, % COVERAGE BASED ON 40°
40° Y	100.00%		
46° X	28.96%		
46° Y	100.00%	100.00%	
60° X	12.80%		
60° Y	99.78%		
70° Y	99.49%		
46° CW	100.00%	100.00%	
46° CCW	100.00%	100.00%	
60° CW	100.00%	100.00%	
60° CCW	100.00%	100.00%	
	<b>813.67%</b>	<b>TOTAL</b>	<b>813.67 / 9 = 90.41% WMV ACHIEVED</b>

BASE MATERIAL (BMV)	PERCENT ACHIEVED	PERCENT UTILIZED	COMMENTS
0°	80.00%	79.96%	
30° X	48.09%		
30° Y	77.43%		
40° X	43.58%		
40° Y	84.13%		
46° X	36.40%		
46° Y	86.26%		
60° X	19.81%		
60° Y	88.70%	88.70%	
70° Y	90.87%	90.87%	70° (Y) USED TO SUPPLEMENT 46°, % COVERAGE BASED ON 70°
46° CW	69.62%	69.62%	
46° CCW	69.62%	69.62%	
60° CW	69.62%	69.62%	
60° CCW	69.62%	69.62%	
	<b>638.01%</b>	<b>TOTAL</b>	<b>638.01 / 7 = (76.858571) 76.86% BMV ACHIEVED</b>

TOTAL WELD METAL 90.41%  
 TOTAL BASE MATERIAL 76.86%

TOTAL EXAMINATION COVERAGE 83.64%

EXAMINER:

*meywood II 5/8/99*

PREPARED BY:

*K. J. ... 5-8-99*

REVIEWED BY:

*K. J. ... 5-8-99*  
*J. ... 5-11-99*

ANII:

*L. ... 5-11-99*

*J. ... 5/11/99*

Relief Request IZR-50  
 Attachment 2 - 3  
 Component: 2PZR-01-N2  
 Sheet 6 of 24

**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit: 2 Procedure/ Rev.: NDT-C-5 / REV 4 Date: 4-27-99 Page 3 of 20  
 Calibration Report No.: WHAZ 99BR2-UTC-028 BM 99BR2-UTC-028 Exam. Report No.: 99BR2-UTD-025  
 System: PRESSURIZER Component #: 2PZR-01-N2 Weld Type: SPRAY NOZZLE / PRESSURIZER  
 Component Size: N/A Schedule / Thickness: N/A / 2.0625" Material: CARBON STEEL  
 Component Temp. / I.D. # 90° F / 159175 Couplant: ULTRAGEL II Batch #: 99125  
 Scan Gain: N/A WHAZ 25.6 dB BM \*  
 Lo Reference Point: STAMPED ZERO Wo Reference Point: WELD CENTERLINE

	Performed		Indications		
	YES	NO	NO	YES	
1. L-Wave - Base Metal & Weld	X	N/A	X	N/A	
2. Angle Beam - Perpendicular to Weld Clockwise "X" Side	N/A	X	N/A	N/A	
3. Angle Beam - Perpendicular to Weld Clockwise "Y" Side	N/A	X	N/A	N/A	
4. Angle Beam - Parallel to Weld Clockwise	N/A	X	N/A	N/A	
5. Angle Beam - Parallel to Weld Counterclockwise	N/A	X	N/A	N/A	
6. L-Wave Average Thickness	X	N/A	2.71"	2.67"	2.72"
			"X" Side	WELD	"Y" Side

Comments: 0° SCAN \*GAIN ADJUSTED TO MAINTAIN 80% BACKWALL  
NO RECORDABLE INDICATIONS  
TOTAL EXAM COVERAGE 83.64%  
REFERENCE COVERAGE SHEET FOR THE PERCENT OF COVERAGE FOR THIS ANGLE.

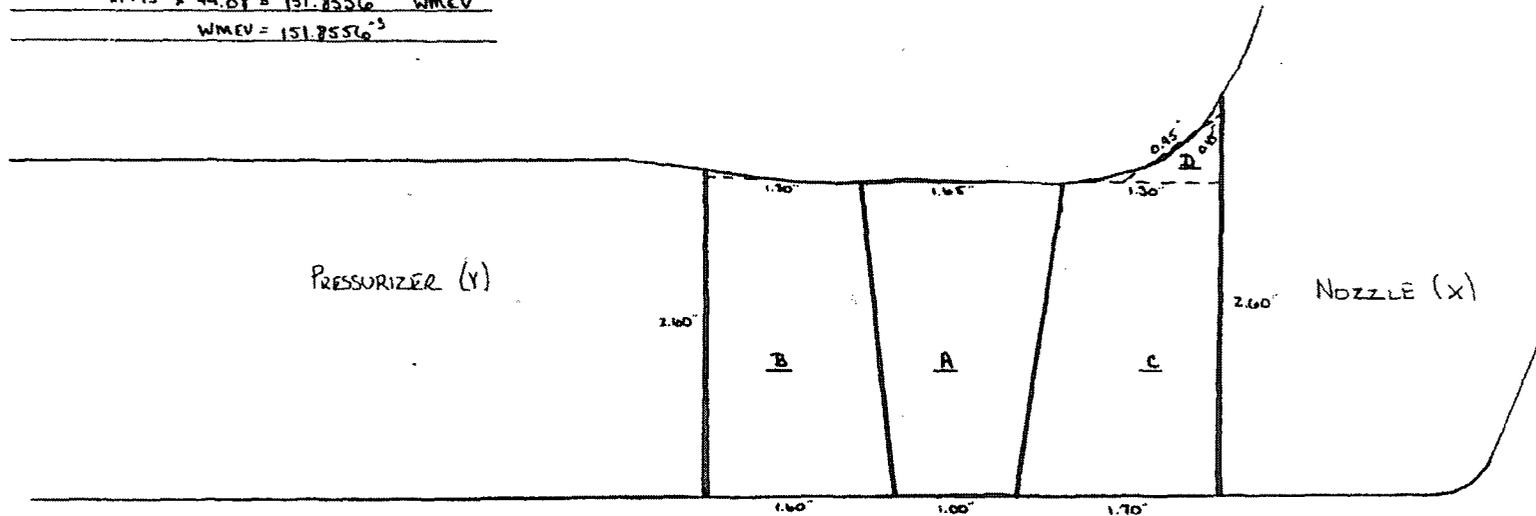
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Examiner: Maureen & Timothy Kahan Level: II/II Date: 5/8/99  
 Reviewer: John L. Bell Level: III Date: 5/9/99  
 Reviewer: W. Green Level: III Date: 5-11-99  
 Others: D. J. Chapman Date: 5/12/99  
 ANII: L. L... Date: 5-12-99

PRESSURIZER NOZZLE COVERAGE PLOT  
N-2 NOZZLE

PAGE 4 (C)  
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98R2-010-1

AREA A  
 $WMV = \frac{1}{2}(1.45 + 1.60) 2.40$   
 $0.50(2.45 \times 2.40) = 0.50(6.89)$   
 $0.50 \times 6.89 = 3.445 \text{ CSV}$   
 $3.445 \times 44.07 = 151.8556 \text{ WMEV}$   
 $WMEV = 151.8556 \text{ WMEV}$



Relief Request 12R-50  
Attachment 2 - 3  
Component: 2PZR-01-N2  
Sheet 8 of 24

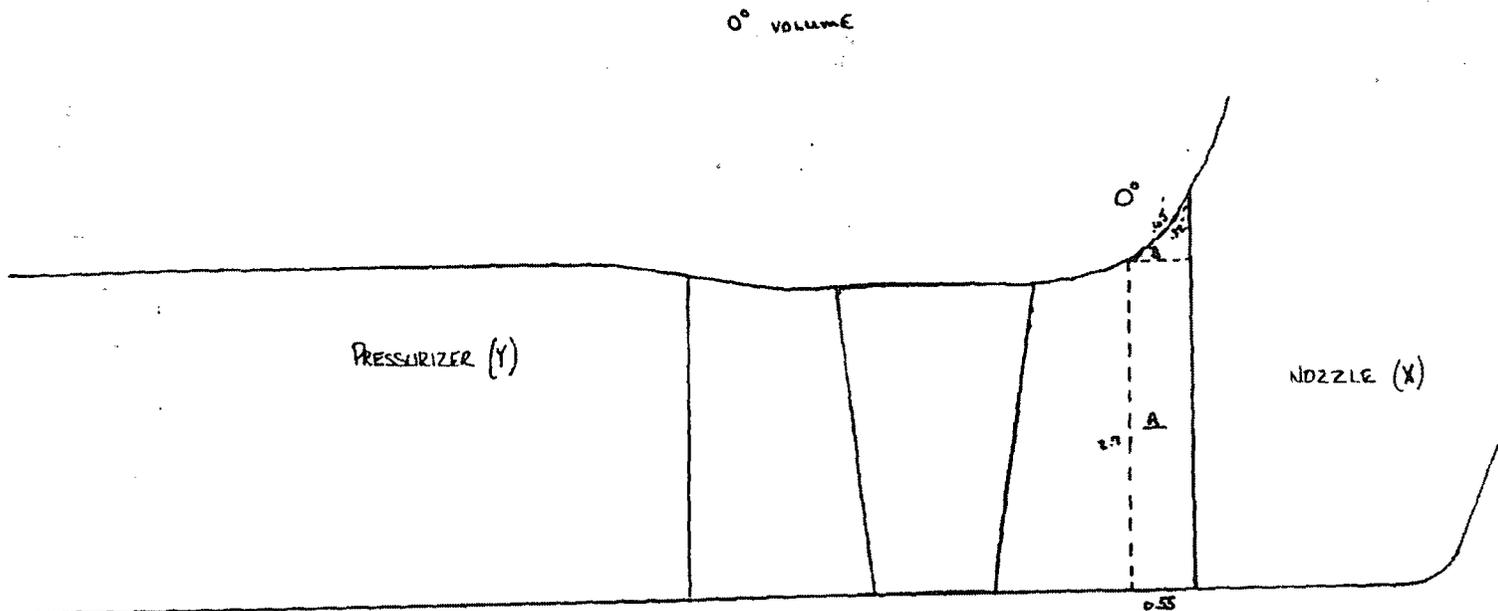
BMV = AREA B  $\frac{1}{2}(1.50 + 1.60) 2.40$   
 $0.70(2.90) 2.40$   
 $0.50 \times 7.54 = 3.77 \text{ CSV}$   
 AREA C  $\frac{1}{2}(1.30 + 1.70) 2.40$   
 $0.50(3.00) 2.40$   
 $0.50 \times 7.80 = 3.90 \text{ CSV}$   
 AREA D  $\frac{1}{2}(0.95 \times 0.45)$   
 $\frac{1}{2} \times 0.4275 = 0.21375 \text{ CSV}$   
 TOTAL CSV =  $3.77 + 3.90 + 0.21375$   
 TOTAL CSV = 7.88375  
 $EV = 7.88375 \times 44.07 = 347.5157$   
 BM EV = 347.5157

WELD LENGTH = 44.07  
 MESH NO. XX (1.115127) = 44.07  
 PER DESIGN DRUG:  
 CODE 379445B

D. J. [Signature] 5/11/99  
 M. J. [Signature] 5/10/99  
 J. [Signature] III 5/6/99  
 M. J. [Signature] II 5/8/99  
 M. J. [Signature] II 5-8-99

APPROVAL REVIEW

# PRESSURIZER NOZZLE COVERAGE PLOT



Relief Request IZR-50  
Attachment 2 - 3  
Component: 2PZR-01-N2  
Sheet 9 of 24

WELD METAL VOLUME ACHIEVED = 100%

N-2 NOZZLE

BASE METAL ACHIEVED = 79.96%

BASE METAL RESTRICTIONS:

$$\text{AREA A} = \text{RECTANGLE} = 2.70 \times 0.65 = 1.755$$

$$\text{AREA B} = \text{TRIANGLE} = \frac{0.65 \times 0.65}{2} = 0.104$$

$$1.48 \times 0.104 + 1.58(2.24) \times 44.08(6) = 16.65$$

$$16.65 + 347.5157 = 364.1657 \times 100 = 20.89226\%$$

$$100 - 20.89226 = 79.95774\%$$

*O. J. Chapman* 5/11/99  
see K200 II 5/11/99  
then of base steel

*J. Meyer* 5-11-99  
7-11-99

AN/ANII REVIEW  
*[Signature]*

**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit: 2 Procedure/ Rev.: NDT-C-5 / REV 4 Date: 4-27-99 Page 6 of 20

Calibration Report No.: Axial: 99BR2-UTC-029 Circ.: N/A Exam. Report No.: 99BR2-UTD-025

System: PRESSURIZER Component #: 2PZR-01-N2 Weld Type: SPRAY NOZZLE / PRESSURIZER

Component Size: N/A Schedule / Thickness: N/A / 2.0625" Material: CARBON STEEL

Component Temp. / I.D. #: 90° / 159175 Couplant: ULTRAGEL II Batch #: 99125

Scan Gain: N/A Axial: 50.6dB Circ.: N/A

Lo Reference Point: STAMPED ZERO Wo Reference Point: WELD CENTERLINE

	Performed		Indications		
	YES	NO	NO	YES	
1. L-Wave - Base Metal & Weld	N/A	X	N/A	N/A	
2. Angle Beam - Perpendicular to Weld Clockwise "X" Side	X	N/A	X	N/A	
3. Angle Beam - Perpendicular to Weld Clockwise "Y" Side	X	N/A	X	N/A	
4. Angle Beam - Parallel to Weld Clockwise	N/A	X	N/A	N/A	
5. Angle Beam - Parallel to Weld Counterclockwise	N/A	X	N/A	N/A	
6. L-Wave Average Thickness	X	N/A	2.71"	2.67"	2.72"
			"X" Side	WELD	"Y" Side

Comments:

30° SHEAR NO RECORDABLE INDICATIONS  
 10% ID ROLL MAINTAINED DURING SCAN  
 30° SUPPLEMENTS THE 45° FOR ADDITIONAL COVERAGE  
 TOTAL EXAM COVERAGE 83.64%  
 REFERENCE COVERAGE SHEET FOR THE PERCENT OF COVERAGE FOR THIS ANGLE.

Examiner: moe j. k. oel Jonathan Kahn Level: II / II Date: 5/8/99

Reviewer: Tom P. Abel Level: III Date: 5/8/99

Reviewer: J. Miller Level: III Date: 5-11-99

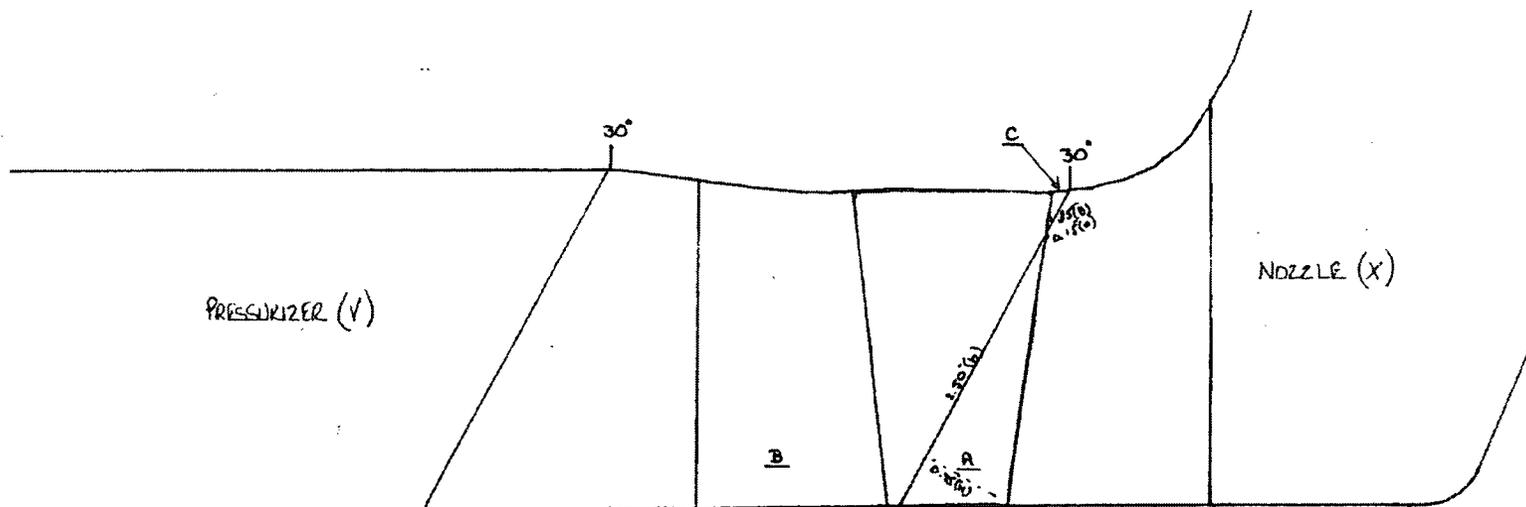
Others: D. J. Chapman Date: 5/11/99

ANII: J. Miller Date: 5-12-99

PRESSURIZER NOZZLE COVERAGE PLOT  
SHEAR TRANSDUCER

PAGE 1 OF:  
REPORT  
PRRZ-UTD-02E

30° (X) VOLUME



Relief Request I2R-50  
Attachment 2 - 3  
Component: 2PZR-01-N2  
Sheet 11 of 24

Not Examined  
W.M.V. Examined  
A:  $\frac{0.35(h) \times 0.75(h)}{2} = \frac{1.875}{2} = 0.9375$   
 $0.9375 \times 44.08 = 41.325$   
 $151.8556 - 41.325 = 110.5306$   
 $110.5306 \div 151.8556 = 0.72787$   
 $0.72787 \times 100 = 72.79\%$   
 Not Examined: 27.21%  
 Examined: 72.79%

N-2 NOZZLE

B.M.V. Examined  
 B: 3.77 (REF. TO THE VOLUME CAUSING THE PRESSURE AT A)  $\frac{0.35 \times 0.12}{2} = \frac{0.042}{2} = 0.021$   
 $3.77 + 0.021 = 3.791 \times 44.08 = 167.10728$   
 $167.10728 \div 347.5157 = 0.4809$   
 $0.4809 \times 100 = 48.09\%$   
 Not Examined: 51.91%  
 Examined: 48.09%

*D. J. Campbell*  
5-11-99

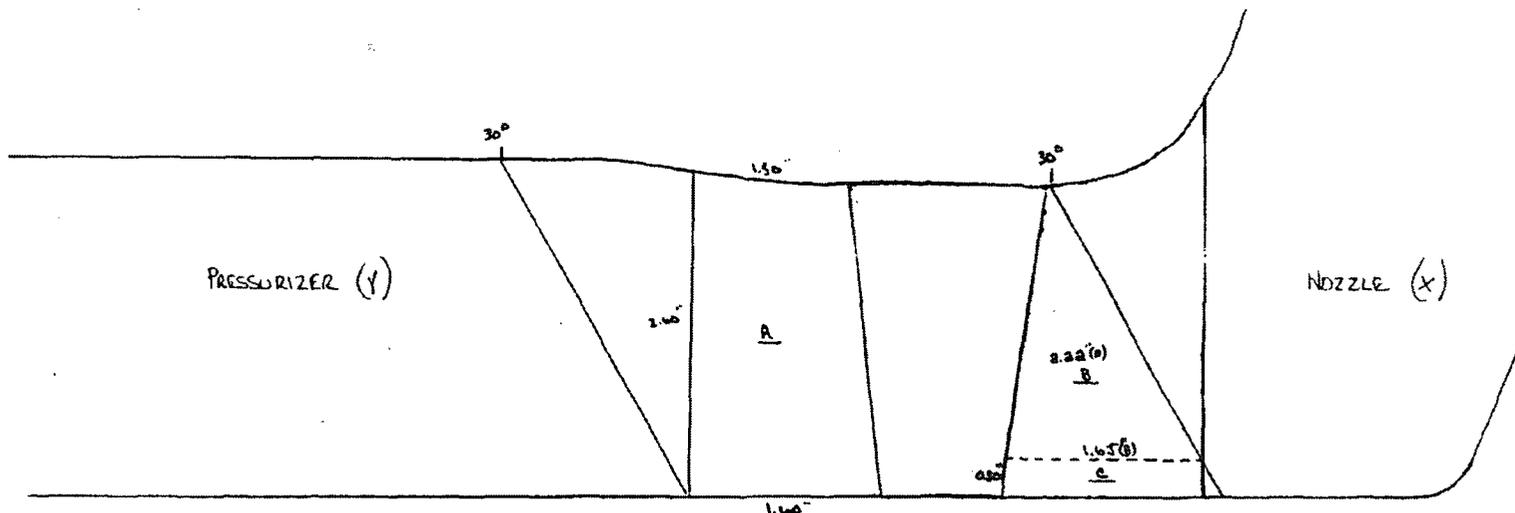
*M. Lee III* 07/99  
*meel keel* 5/10/99  
*Timothy J. Lee* 5-10-99

APPROVED FOR RELEASE  
DATE 5-10-99

PRESSURIZER NOZZLE COVERAGE PLOT  
SHEAR TRANSDUCER

PAGE 8 OF  
REPORT  
PRR2-010-01

30° (Y) VOLUME



Relief Request 12R-50  
Attachment 2 - 3  
Component: 2PZR-01-N2  
Sheet 12 of 24

WMV ACHIEVED = 100%

N-2 NOZZLE

BMV ACHIEVED = 77.43%

AREA A: (SEE AREA B TOTAL VOLUME 0.00) 3.77

AREA B:  $\frac{1.65 \times 2.02}{2} = \frac{3.345}{2} = 1.6725$

AREA C:  $\frac{1}{2} (1.65 + 1.70) 0.30 = \frac{1}{2} (3.35 \times 0.30)$

$= \frac{1}{2} (1.005) = 0.5025$

TOTAL AREA =  $3.77 + 1.6725 + 0.5025 = 5.945$

$\frac{4.60124407}{5.945} = 0.774322 = 77.4322\%$

$0.774322 \times 100 = 77.4322\% = 77.43\%$

AN/ANII REVIEW  
5/11/99

D.J. Chapman 5/11/99  
J. Miller 5-11-99  
K. Wood III 5/10/99  
Mee J. Kopp II 5/10/99  
Timothy Hall 5-10-99

**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit: 2 Procedure/ Rev.: NDT-C-5 / REV 4 Date: 4-27-99 Page 9 of 20

Calibration Report No.: Axial: 99BR2-UTC-030 Circ.: N/A Exam. Report No.: 99BR2-UTD-025

System: PRESSURIZER Component #: 2PZR-01-N2 Weld Type: SPRAY NOZZLE / PRESSURIZER

Component Size: N/A Schedule / Thickness: N/A / 2.0625" Material: CARBON STEEL

Component Temp. / I.D. # 90° / 159175 Couplant: ULTRAGEL II Batch #: 99125

Scan Gain: N/A Axial: 43.6dB Circ.: N/A

Lo Reference Point: STAMPED ZERO Wo Reference Point: WELD CENTERLINE

	Performed		Indications		
	YES	NO	NO	YES	
1. L-Wave - Base Metal & Weld	N/A	X	N/A	N/A	
2. Angle Beam - Perpendicular to Weld Clockwise "X" Side	X	N/A	X	N/A	
3. Angle Beam - Perpendicular to Weld Clockwise "Y" Side	X	N/A	X	N/A	
4. Angle Beam - Parallel to Weld Clockwise	N/A	X	N/A	N/A	
5. Angle Beam - Parallel to Weld Counterclockwise	N/A	X	N/A	N/A	
6. L-Wave Average Thickness	X	N/A	2.71"	2.87"	2.72"
			"X" Side	WELD	"Y" Side

Comments:

40° SHEAR NO RECORDABLE INDICATIONS  
 10% ID ROLL MAINTAINED DURING SCAN  
 40° SUPPLEMENTS THE 60° FOR ADDITIONAL COVERAGE  
 TOTAL EXAM COVERAGE 83.64%  
 REFERENCE COVERAGE SHEET FOR THE PERCENT OF COVERAGE FOR THIS ANGLE.

Examiner: neej. keel Jonathan Kaban Level: II/II Date: 5/8/99

Reviewer: Tom J. Deed Level: III Date: 5/6/99

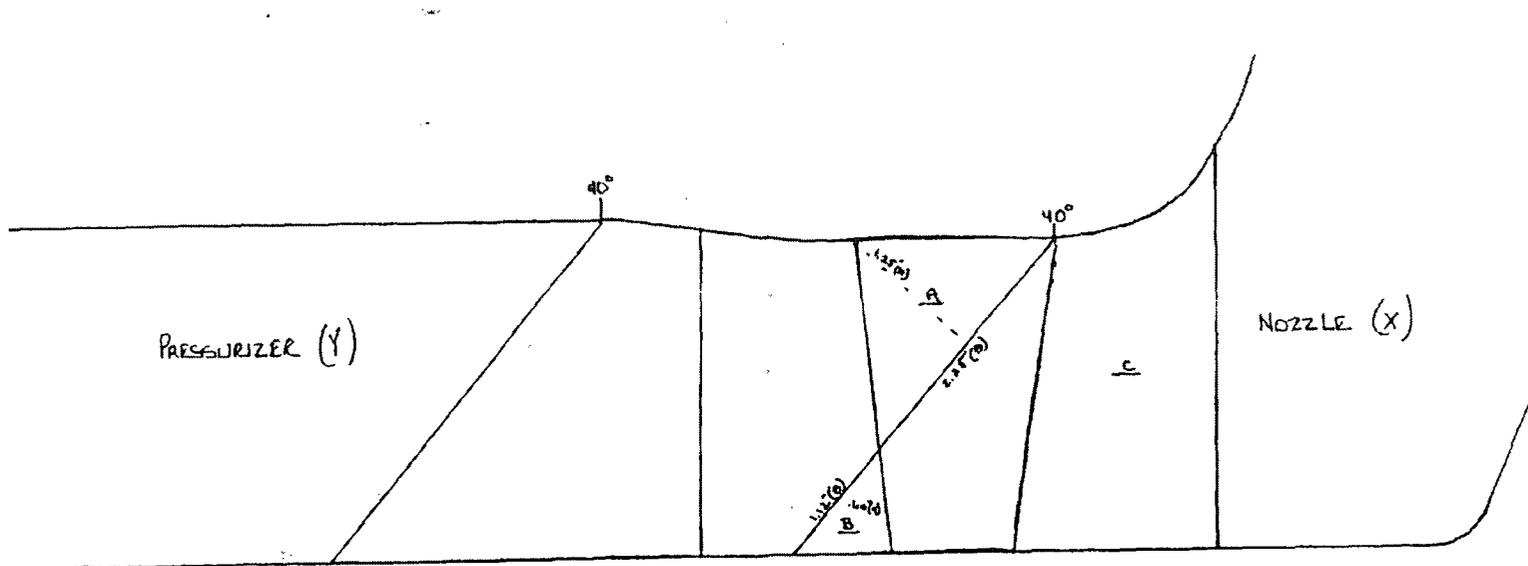
Reviewer: J. M. Muen Level: III Date: 5-11-99

Others: D. J. Chapman Date: 5/11/99

ANII: L. Muen Date: 5-12-99

PRESSURIZER NOZZLE COVERAGE PLOT  
SHEAR TRANSUCER

40° (X) VOLUME



Relief Request 12R-50  
Attachment 2 - 3  
Component: 2PZR-01-N2  
Sheet 14 of 24

WMV Examined  
 $A = \frac{2.25(h)}{2} \times 1.25(w) = \frac{2.8125}{2} = 1.40625$   
 $1.40625 \times 44.08 = 61.9875$   
 $61.9875 \div 151.64 = 0.4087807$   
 $0.4087807 \times 100 = 40.88\%$

N-2 NOZZLE

BMV Examined  
 $B = \frac{1.12 \times 0.4}{2} = \frac{0.452}{2} = 0.226$   
 $C = 4.11 \div 0.226 = 18.1858$  (Ref. that valve coverage sheet)  
 $4.446 \times 44.08 = 195.97968$   
 $347.3504 \div 195.97968 = 1.772$   
 $1.772 \div 4.0358 = 0.4358$   
 $0.4358 \times 100 = 43.58\%$

O. J. Campbell 5/11/99  
 M. J. Hall 5-11-99  
 M. J. Hall III 5/10/99  
 mee J. K. Hall II 5/10/99  
 D. M. Hall 5-10-99

AN/ANII REVIEW  
 5-11-99



**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit: 2 Procedure/ Rev.: NDT-C-5 / REV 4 Date: 4-27-99 Page 12 of 20

Calibration Report No.: Axial: 99BR2-UTC-031 Circ.: 99BR2-UTC-031 Exam. Report No.: 99BR2-UTD-025

System: PRESSURIZER Component #: 2PZR-01-N2 Weld Type: SPRAY NOZZLE / PRESSURIZER

Component Size: N/A Schedule / Thickness: N/A / 2.0625" Material: CARBON STEEL

Component Temp. / I.D. # 80° / 159175 Couplant: ULTRAGEL II Batch #: 99125

Scan Gain: N/A Axial: 48.6dB Circ.: 48.6dB

Lo Reference Point: STAMPED ZERO Wo Reference Point: WELD CENTERLINE

	Performed		Indications		
	YES	NO	NO	YES	
1. L-Wave - Base Metal & Weld	N/A	X	N/A	N/A	
2. Angle Beam - Perpendicular to Weld Clockwise "X" Side	X	N/A	X	N/A	
3. Angle Beam - Perpendicular to Weld Clockwise "Y" Side	X	N/A	X	N/A	
4. Angle Beam - Parallel to Weld Clockwise	X	N/A	X	N/A	
5. Angle Beam - Parallel to Weld Counterclockwise	X	N/A	X	N/A	
6. L-Wave Average Thickness	X	N/A	2.71"	2.67"	2.72"
			"X" Side	WELD	"Y" Side

Comments:

45° SHEAR NO RECORDABLE INDICATIONS  
 10% ID ROLL MAINTAINED DURING SCAN  
 ADDITIONAL COVERAGE ACHIEVED WITH THE 30°  
 TOTAL EXAM COVERAGE 83.64%  
 REFERENCE COVERAGE SHEET FOR THE PERCENT OF COVERAGE FOR THIS ANGLE.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Examiner: nee J. Keel Jonathan Hagan Level: II/II Date: 5/8/99

Reviewer: Tom L. Hoel Level: III Date: 5/10/99

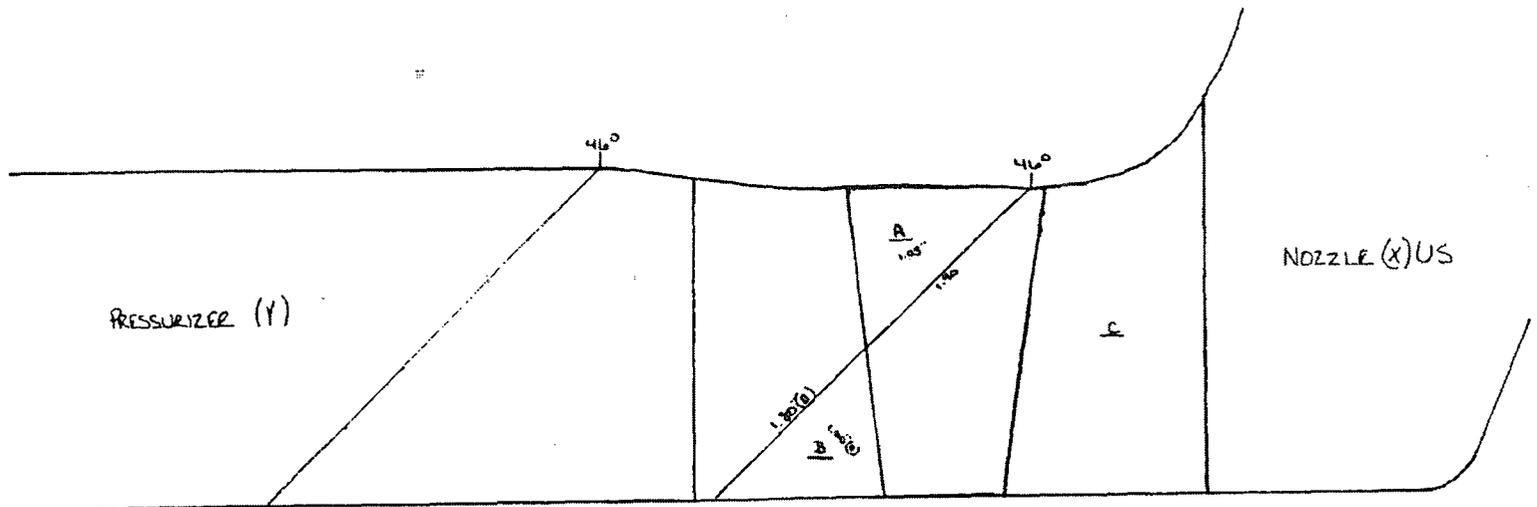
Reviewer: W. Green Level: III Date: 5-11-99

Others: D. J. O'Connell Date: 5/11/99

ANII: L. Hagan Date: 5/12/99

PRESSURIZER NOZZLE COVERAGE PLOT  
SHEAR TRANSDUCER

46° (X) VOLUME



Relief Request IZR-50  
Attachment 2 - 3  
Component: 2PZR-01-N2  
Sheet 17 of 24

WMV ACHIEVED = 28.96%

$$\text{AREA A} = \frac{1.40 \times 1.05}{2} = \frac{1.47}{2} = 0.735$$

$$0.735 \times 44.08 = 32.4098 \div 151.9536 = 0.2133701$$

$$0.2133701 \times 100 = 21.33701$$

N-2 NOZZLE

BMV ACHIEVED = 36.40%

RESTRICTED AREA

$$\text{AREA B} = \frac{1.80 \times 1.00}{2} = \frac{1.80}{2} = 0.90$$

$$\text{AREA C} = (\text{SEE AREA D OF SAME PLOT}) = 4.11775$$

$$0.90 + 4.11775 = 5.01775 \times 44.08 = 221.0041$$

$$221.0041 \div 607.157 = 0.36396 \times 100 = 36.39604$$

$$100 - 63.59604 = 36.40396$$

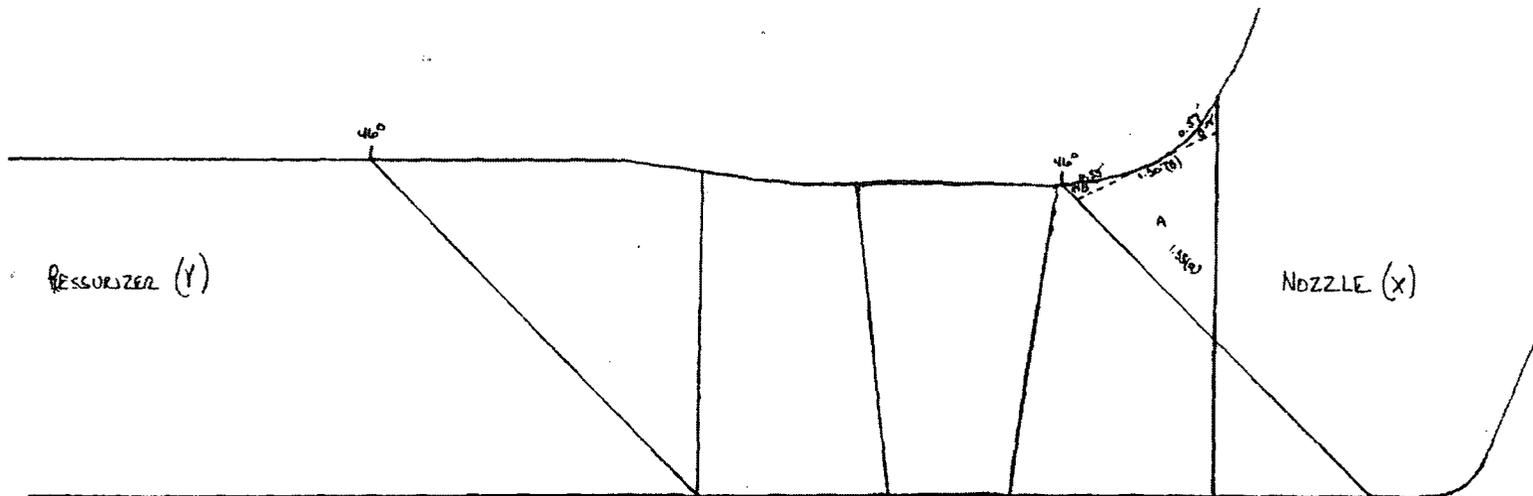
AN/ANII REVIEW  
3/2/99

SJC 5/11/99  
M... 5-11-99  
Jim... III 5/6/99  
me J. KEEP II 5/10/99  
Timothy... II 5-10-99

PRESSURIZER NOZZLE COVERAGE PLOT  
SHEAR TRANSDUCER

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99822-010-01

46° (y) VOLUME



Relief Request 12R-50  
Attachment 2 - 3  
Component: 2PZR-01-N2  
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WMV ACHIEVED = 100%

BMV ACHIEVED = 86.26%

N-2 NOZZLE

RESTRICTED AREA:

$$\text{AREA A} = \frac{1.20 \times 1.57}{2} = \frac{1.884}{2} = 0.942 \text{ in}^2$$

$$\text{AREA B} = \frac{0.55 \times 0.12}{2} = \frac{0.066}{2} = 0.033 \text{ in}^2$$

$$\text{AREA C} = \frac{0.07 \times 0.14}{2} = \frac{0.0098}{2} = 0.0049 \text{ in}^2$$

$$\text{TOTAL RESTRICTED} = 0.942 + 0.033 + 0.0049 = 0.98 \text{ in}^2$$

$$0.98 \text{ in}^2 \times 44.08 = 43.1984 \text{ in}^3$$

$$43.1984 \text{ in}^3 \times 100 = 4319.84 \text{ in}^3$$

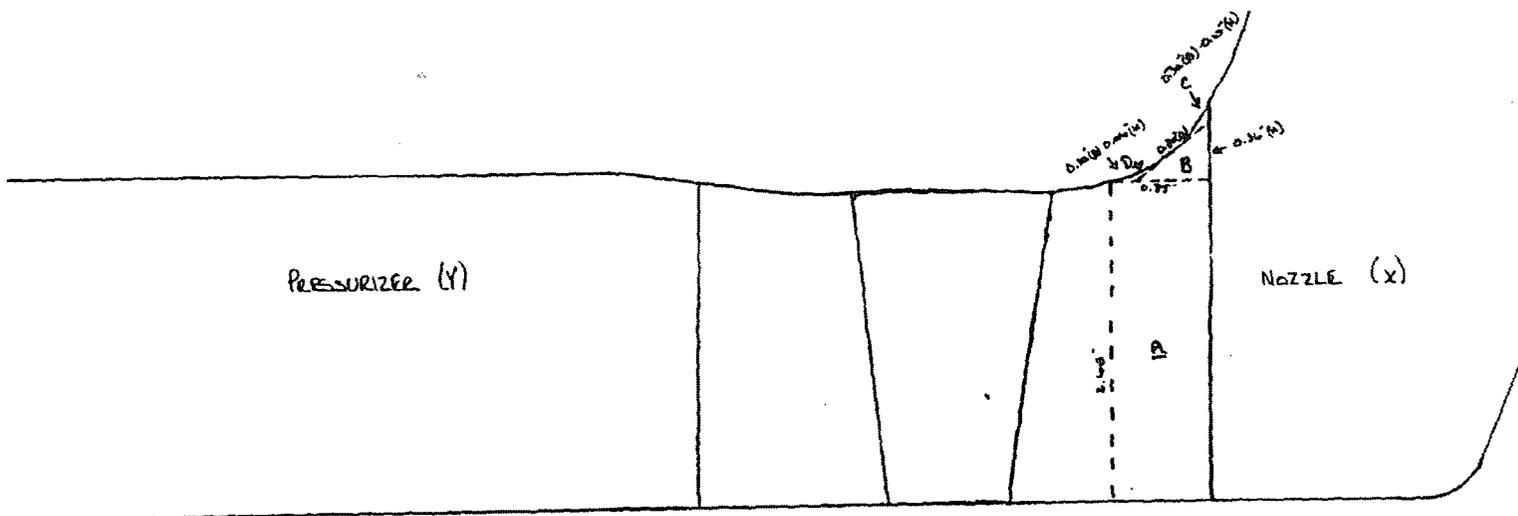
*D. Chapman* 5/11/79  
*W. Miller III* 5-10-79  
*Tom L. Carl III* 5/6/79  
*mel J. KROD II* 5/10/79  
*Timothy A. II* 5-10-79

AN/ANII REVIEW

PRESSURIZER NOZZLE COVERAGE PLOT  
SHEAR TRANSDUCER

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98R2-070-02

45° and 60° CW and CCW SEAM VOLUME



Relief Request 12R-50  
Attachment 2 - 3  
Component: 2PZR-01-N2  
Sheet 19 of 24

WMV ACHIEVED  
CW WMV = 100%  
CCW WMV = 100%

N-2 NOZZLE

*D. J. ... 5/11/99*

BMV ACHIEVED  
CW BMV = 69.62%    CCW BMV = 69.62%

RESTRICTED AREA FOR CW & CCW:  
AREA A  
 $\frac{3.61 \times 0.25}{2} = 2.227$   
AREA B  
 $\frac{0.20 \times 0.36}{2} = 0.036$   
AREA C  
 $\frac{0.30 \times 0.10}{2} = 0.015$   
AREA D  
 $\frac{0.30 \times 0.01}{2} = 0.0015$

TOTAL RESTRICTED AREA = 2.227 + 0.036 + 0.015 + 0.0015 = 2.2795  
2.2795 x 44.08 = 100.5716  
0.3027894 x 100 = 30.27894%    100 - 30.27894 = 69.72106%

*Jim J. ... 5/10/99*  
*meel J. Kelly 5/10/99*  
*Donnelly Huber 5-10-99*

ANVANI REVIEW  
5/12/99

**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit: 2 Procedure/ Rev.: NDT-C-5 / REV 4 Date: 4-27-99 Page 14 of 20

Calibration Report No.: Axial: 99BR2-UTC-032 Circ.: 99BR2-UTC-032 Exam. Report No.: 99BR2-UTD-025

System: PRESSURIZER Component #: 2PZR-01-N2 Weld Type: SPRAY NOZZLE / PRESSURIZER

Component Size: N/A Schedule / Thickness: N/A / 2.0625" Material: CARBON STEEL

Component Temp. / I.D. # 90° / 159175 Couplant: ULTRAGEL II Batch #: 99125

Scan Gain: N/A Axial: 56.0dB Circ.: 56.0dB

Lo Reference Point: STAMPED ZERO Wo Reference Point: WELD CENTERLINE

	Performed		Indications		
	YES	NO	NO	YES	
1. L-Wave - Base Metal & Weld	N/A	X	N/A	N/A	
2. Angle Beam - Perpendicular to Weld Clockwise "X" Side	X	N/A	X	N/A	
3. Angle Beam - Perpendicular to Weld Clockwise "Y" Side	X	N/A	X	N/A	
4. Angle Beam - Parallel to Weld Clockwise	X	N/A	X	N/A	
5. Angle Beam - Parallel to Weld Counterclockwise	X	N/A	X	N/A	
6. L-Wave Average Thickness	X	N/A	2.71"	2.67"	2.72"
			"X" Side	WELD	"Y" Side

Comments:

60° SHEAR NO RECORDABLE INDICATIONS  
 10% ID ROLL MAINTAINED DURING SCAN  
 ADDITIONAL COVERAGE ACHIEVED WITH THE 40° AND 70°.  
 TOTAL EXAM COVERAGE 83.64%  
 REFERENCE COVERAGE SHEET FOR THE PERCENT OF COVERAGE FOR THIS ANGLE.

Examiner: meely keel Jonathan Galan Level: II/II Date: 5/8/99

Reviewer: Ken Steel Level: III Date: 5/10/99

Reviewer: J. Keen Level: III Date: 5-11-99

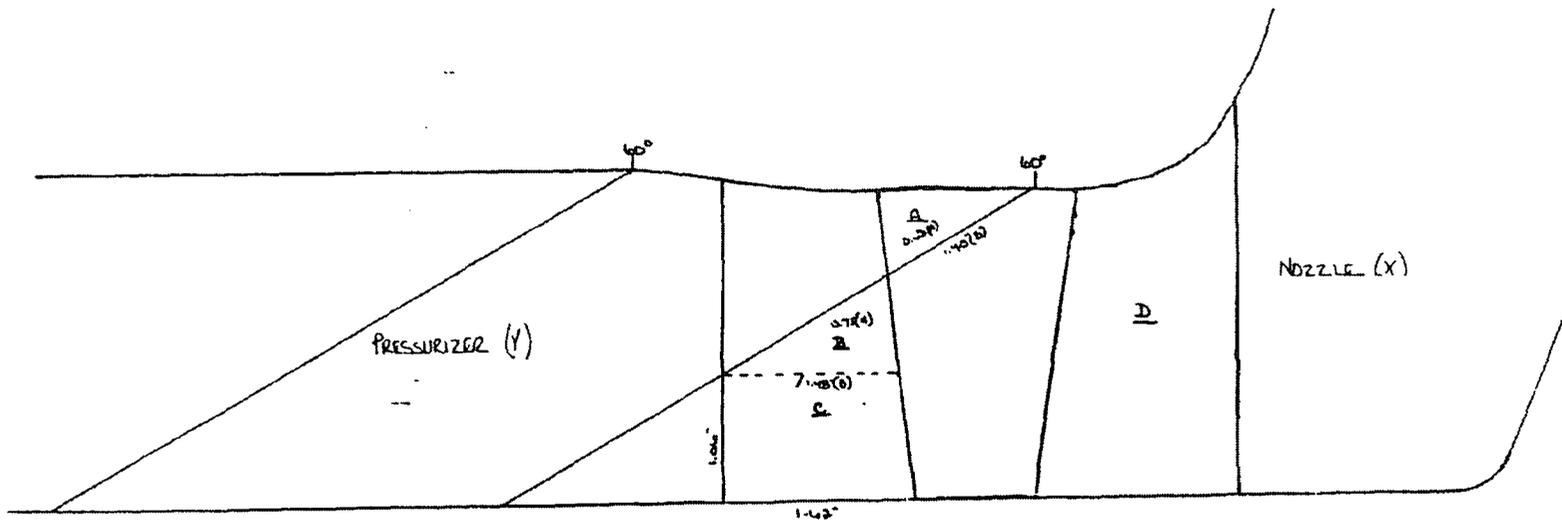
Others: D. Chapman Date: 5/11/99

ANII: L. Keen Date: 5-12-99

PRESSURIZER NOZZLE COVERAGE PLOT  
SHEAR TRANSDUCER

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REPORT  
PBRZ-UTD

60° (X) VOLUME



Relief Request 12R-50  
Attachment 2 - 3  
Component: 2PZR-01-N2  
Sheet 21 of 24

WMV ACHIEVED: 12.80%

---

AREA A -  $\frac{1.43 \times 0.63}{2} = 0.452$

---

$0.441 \times 44.08 = 19.4398$

---

$19.4398 \times 1.5 = 29.1597$

---

$0.1280116 \times 100 = 12.80116\%$

N-2 NOZZLE

WMV ACHIEVED = 19.81%

---

RESTRICTED AREA B -  $\frac{1.43 \times 0.75}{2} = 0.536$

---

AREA C -  $\frac{1}{2} (1.5 + 1.62) \times 1.06 = 0.50 (3.12 \times 1.06) =$

---

$0.50 \times 3.3072 = 1.6536$

---

AREA D: C FROM TOTAL COVERAGE PLOT  $3.90 \times 0.21375 =$

---

TOTAL RESTRICTED AREA:  $0.555 + 1.6536 + 3.90 = 0.21375$

---

$= 16.32235 \times 44.08 = 719.68917 = 347.5157$

---

$0.801747 \times 100 = 80.1747\%$ ,  $100 - 80.1747\% = 19.8252\%$

D.J. Chappard 5/11/99

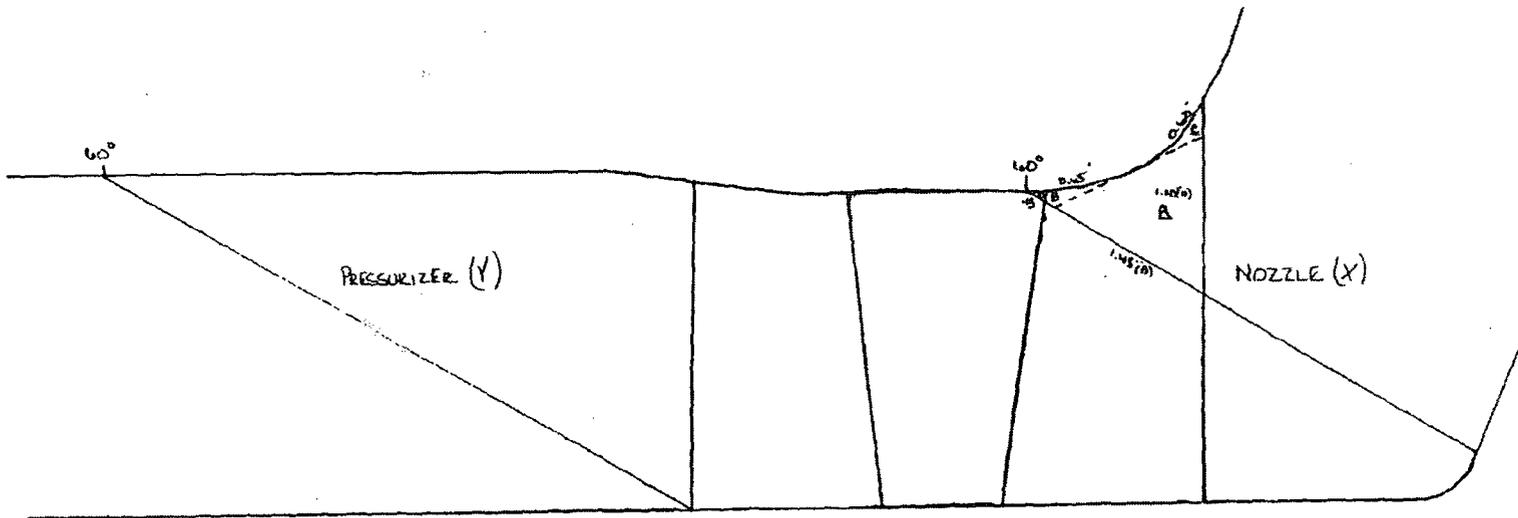
Thom 5-11-99  
John F. Reed III 5/11/99  
nee J. Reed II 5/10/99  
Timothy J. Reed II 5-10-99

ANNUAL REVIEW  
5/2/99

PRESSURIZER NOZZLE COVERAGE PLOT  
SHEAR TRANSDUCER

PAGE 18 OF 39  
REPORT  
99BRZ-010-025

60° (Y) VOLUME



Relief Request 12R-50  
Attachment 2 - 3  
Component: 2PZR-01-N2  
Sheet 22 of 24

WMV ACHIEVED = 99.78%

RESTRICTED AREA  
 $\frac{0.15 \times 0.10}{2} = \frac{0.015}{2} = 0.0075$

$0.0075 \times 44.08^2 = 0.3306 \div 151.8656 = 0.0021711$

$0.0021711 \times 100 = 0.217068$   $100 - 0.217068 = 99.78293\%$

N-2 NOZZLE

BMV ACHIEVED = 88.70%

RESTRICTED AREA: AREA A -  $\frac{1.05 \times 1.10}{2} = \frac{1.395}{2} = 0.6975$

AREA B -  $\frac{0.05 \times 0.15}{2} = \frac{0.0075}{2} = 0.04875$

AREA C -  $\frac{0.04 \times 0.15}{2} = \frac{0.009}{2} = 0.045$

TOTAL RESTRICTED AREA =  $0.6975 + 0.04875 + 0.045 = 0.79125$

$0.79125 \times 551.517 = 309.1297 = 347.9157 = 0.8870\%$

$0.79125 \times 44.08^2 = 39.2863 \div 347.5157 = 0.113049 \times 100 = 11.3049\%$

$100 - 11.3049 = 88.6951\%$

ANALYSIS REVIEW  
5-11-99

D. J. ... 5/11/99

5/11/99  
5/10/99  
5-10-99

**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit 2 Procedure/ Rev.: NDT-C-5 / REV 4 Date: 4-27-99 Page 19 of 20  
 Calibration Report No.: Axial: 99BR2-UTC-033 Circ.: N/A Exam. Report No.: 99BR2-UTD-025  
 System: PRESSURIZER Component #: 2PZR-01-N2 Weld Type: SPRAY NOZZLE / PRESSURIZER  
 Component Size: N/A Schedule / Thickness: N/A / 2.0625" Material: CARBON STEEL  
 Component Temp. / I.D. # 90° / 159175 Couplant: ULTRAGEL II Batch #: 99125  
 Scan Gain: N/A Axial: 68.4dB Circ.: N/A  
 Lo Reference Point: STAMPED ZERO Ho Reference Point: WELD CENTERLINE

	Performed		Indications		
	YES	NO	NO	YES	
1. L-Wave - Base Metal & Weld	N/A	X	N/A	N/A	
2. Angle Beam - Perpendicular to Weld Clockwise "X" Side	N/A	N/A	X	N/A	
3. Angle Beam - Perpendicular to Weld Clockwise "Y" Side	X	X	N/A	N/A	
4. Angle Beam - Parallel to Weld Clockwise	N/A	X	N/A	N/A	
5. Angle Beam - Parallel to Weld Counterclockwise	N/A	X	N/A	N/A	
6. L-Wave Average Thickness	X	N/A	2.71"	2.67"	2.72"
			"X" Side	WELD	"Y" Side

Comments:

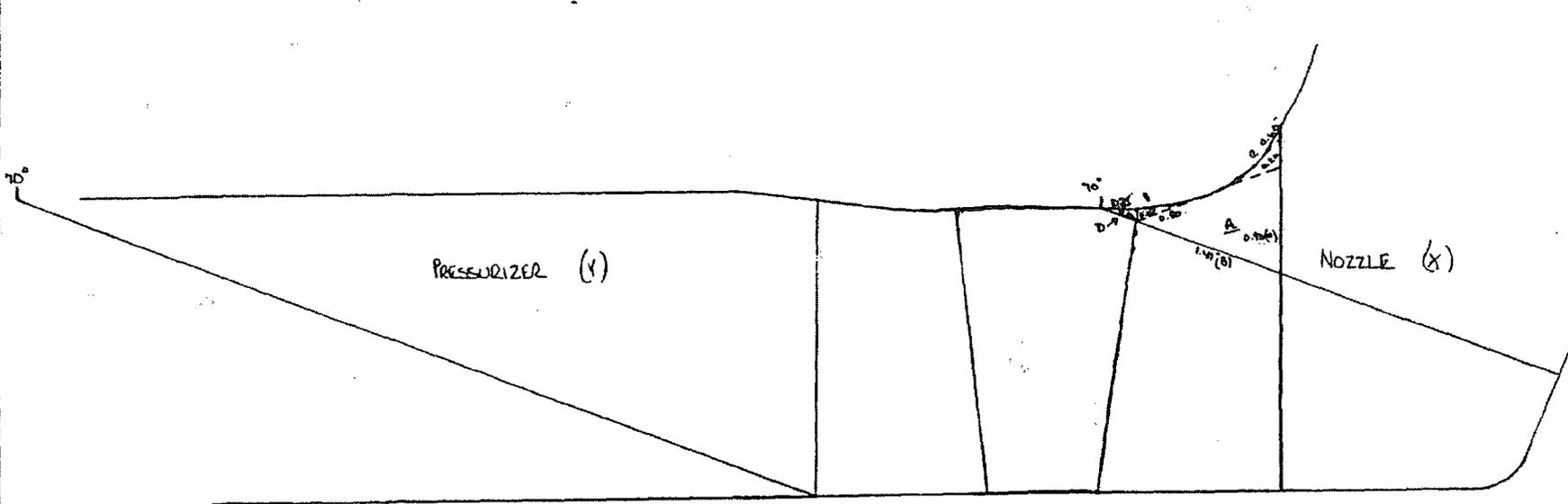
70° SHEAR NO RECORDABLE INDICATIONS  
 10% ID ROLL MAINTAINED DURING SCAN  
 70° SUPPLEMENTS THE 60° FOR ADDITIONAL COVERAGE  
 TOTAL EXAM COVERAGE 83.64%  
 REFERENCE COVERAGE SHEET FOR THE PERCENT OF COVERAGE FOR THIS ANGLE.

Examiner: meely kell Timothy Kahan Level: II/II Date: 5/10/99  
 Reviewer: Tom L. Lee Level: III Date: 5/10/99  
 Reviewer: W. K. Lee Level: III Date: 5-10-99  
 Others: D. J. Chapman Date: 5/11/99  
 ANII: L. Lee Date: 5-12-99

PRESSURIZER NOZZLE COVERAGE PLOT  
SHEAR TRANSDUCER

PAGE 10 OF  
REPORT  
98R2-010-025

70° (y) VOLUME



Relief Request 12R-50  
Attachment 2 - 3  
Component: 2PZR-01-N2  
Sheet 24 of 24

$$\frac{WMV \text{ ACHIEVED}}{\text{RESTRICTED AREA}} = 99.4990$$

$$\frac{\text{AREA D}}{\text{AREA B}} = \frac{0.015 \times 0.10}{2} = 0.0175$$

$$0.0175 \times 44.08 = 0.7714, 0.7714 \div 131.8516 = 0.0058778$$

$$0.0058778 \times 100 = 0.5877826, 100 - 0.5877826 = 99.4122174$$

N-2 NOZZLE

$$\text{BMV ACHIEVED} = 90.87\%$$

$$\text{RESTRICTED AREA: AREA A} = \frac{1.41 \times 0.10}{2} = \frac{1.248}{2} = 0.6245 \text{ in}^2$$

$$\text{AREA B} = \frac{0.10 \times 0.10}{2} = \frac{0.05}{2} = 0.025 \text{ in}^2$$

$$\text{AREA C} = \frac{0.40 \times 0.10}{2} = \frac{0.17}{2} = 0.085 \text{ in}^2$$

$$\text{TOTAL RESTRICTED AREA} = 0.6245 + 0.025 + 0.085 = 0.7345 \text{ in}^2$$

$$0.7345 \times 44.08 = 32.5756 \text{ in}^2 \div 359.5157 = 0.0911637 \text{ in}^2$$

$$0.0911637 \times 100 = 9.11637\%, 100 - 9.11637\% = 90.88363\%$$

D. J. [Signature] 5/11/99

J. Green III 5-10-99  
 John V. [Signature] III 5/9/99  
 M. J. Keel 5/10/99  
 [Signature] 5-10-99

ANI/ANH REVIEW  
 5/10/99

**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 2-4**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 1 of 29)

**1.0 Component**

Weld Number: 2PZR-01-N3  
Code Category / Item: B-D / B3.110  
Configuration: Pressurizer Relief Nozzle-to-Vessel Weld

**2.0 Applicable Code Edition and Addenda**

ASME Section XI 1989 Edition with no Addenda (including Mandatory Appendices)

**3.0 Applicable Code Requirement**

Table IWB-2500-1, Examination Category B-D requires volumetric examination of Item B3.110 (Pressurizer Nozzle-to-Vessel welds).

Figure IWB-2500-7(b) depicts the required examination volume (A-B-C-D-E-F-G-H), which includes the actual circumferential weld and adjacent base metal on either side of the weld extending to a distance of one-half the thickness of the wall from the extremities of the weld crown.

ASME Section XI Mandatory Appendix I requires ultrasonic examination of vessel welds greater than 2" thick to be conducted in accordance with ASME Section V, Article 4.

ASME Section V, Article 4 requires:

T-441.3.2.4 Extent of Scanning: Wherever feasible, the scanning of the examination volume shall be carried out from both sides of the weld on the same surface. Where the configuration or adjacent parts of the component are such that scanning from both sides is not feasible, this fact shall be included in the report of the examination.

T-441.3.2.5 Angle Beam Scanning: Wherever feasible, each examination shall be performed in two directions, i.e., approaching the weld from the opposite directions and parallel to the weld from opposite directions.

T-441.3.2.6 Scanning for Reflectors Oriented Parallel to the Weld: The angle beam search units shall be aimed at right angles to the weld axis, with the search unit manipulated so that the ultrasonic beams pass through the entire volume of weld metal. The adjacent base metal in the examination volume must be completely scanned by two angle beams, but need not be scanned by both angle beams from both directions.

T-441.3.2.7 Scanning for Reflectors Oriented Transverse to the Weld: The angle beam search units shall be aimed parallel to the axis of the longitudinal and circumferential welds. The search unit shall be manipulated so that the ultrasonic beams pass through of the examination volume. Scanning shall be done in two directions 180 degrees to

**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 2-4**  
**Braidwood Station Unit 1 Limited Examinations**  
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(Page 2 of 29)

each other to the extent possible. Areas blocked by geometric conditions shall be examined from at least one direction.

Code Case N-460, which accepts a reduction in examination coverage provided the reduction is less than 10%.

#### **4.0 Impracticality/Burden**

The pressurizer vessel relief nozzle-to-vessel weld is approximately 2.8" thick. The pressurizer nozzle and vessel are clad with stainless steel on the inside diameter surface. The geometry of the nozzle along with the presence of the cladding on the inside diameter of the pressurizer result in limited access to the entire examination volume. The propagation for the ultrasonic beam was in the shear mode. Normally this mode would allow the ultrasonic beam to reflect off the inside surfaces and create a two-beam axis at right angles to each other; however, the presence of the stainless steel cladding precludes the ultrasound beams from reflecting at the inside diameter from the shell/cladding interface. The nozzle geometry tapers away from the weld resulting in limited scanning surfaces available for transducer coupling on the nozzle side of the weld resulting in additional examination limitations. These factors result in limited examination coverage from the scan directions required by ASME Section V and Section XI. These limitations are inherent to the original design of the pressurizer vessel. Conformance with the ASME Section XI requirements for essentially 100% of the volumetric coverage would require extensive structural modifications to the pressurizer vessel.

#### **5.0 Alternative Examinations or Testing**

In addition to performing the 0, 45 (recorded as 46 degrees in coverage calculation data), 60, and 70 degree scans to the extent practical as required by Appendix I, additional 30 and 40 degree scans were performed to supplement coverage. The aggregate examination coverage achieved was 80.9%.

In addition to completing the required volumetric examination to the extent practical, numerous system leakage tests (ASME Section XI Category B-P and Generic Letter 88-05) at nominal system operating pressure (2235 psig) and temperature (557°F) as well as the bare metal visual examinations associated with NRC Bulletin 2004-01 of the upper pressurizer vessel head were completed with no evidence of leakage associated with the pressurizer relief nozzle-to-vessel weld noted during the course of the interval.

Radiography as an alternative is not feasible because access is not available for film placement.

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 2-4**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 3 of 29)

**6.0 Justification for Granting Relief**

No additional examinations were completed during the inspection interval; however, the examination coverage of 80.9% along with the results of the pressure test and bare metal visual inspections provide reasonable assurance that pressure boundary integrity has been maintained for this component throughout the interval.

**7.0 Precedents**

Similar examination limitations for pressurizer relief nozzle-to-shell welds were encountered and similar examination coverage was accepted for the following units:

Byron Station Units 1 and 2:

Letter from R. Gibbs (U. S. NRC) to C. G. Pardee (Exelon Generation Company, LLC), "Byron Station, Unit Nos. 1 and 2 – Inservice Inspection Program Second Interval Relief Requests I2R-22, I2R-23, I2R-25, and I2R-53 (TAC Nos. MD4099, MD4100, MD4101, MD4102, MD4103, MD4104, MD4105, and MD4106)," dated January 15, 2008

Callaway Unit 1:

Letter from D. Terao (U. S. NRC) to C. D. Naslund (Union Electric Company), "Callaway Plant, Unit 1 - Relief Request ISI-41 for the Second 10-Year Inservice Inspection Interval (TAC No. MD3437)," dated January 18, 2007

Wolf Creek Unit 1:

Letter from D. Terao (U. S. NRC) to R. A. Muench (Wolf Creek Nuclear Operating Corporation), "Wolf Creek Generating Station – Relief Request I2R-34 for the Second Ten-Year Interval Inservice Inspection (TAC No. MD0288)," dated November 20, 2006

Catawba Unit 1:

Letter from E. C. Marinos (U. S. NRC) to D. Jamil (Catawba Nuclear Station), "Catawba Nuclear Station, Unit 1, Request for Relief 05-CN-004, Limited Weld Examinations During End-of-Cycle 15 Refueling Outage (TAC Nos. MC8337, MC9171, MC9172, MC9199, MC9173, MC9202, MC9174, MC9175, MC9176, MC9177, MC9178 and MC9179)," dated September 25, 2006

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 2-4**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
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Catawba Unit 2:

Letter from E. C. Marinos (U. S. NRC) to D. Jamil (Catawba Nuclear Station), "Catawba Nuclear Station, Unit 2, Request for Relief from the Requirements of the ASME Code (TAC Nos. MC7004, MC9197, MC9198, MC9199, MC9200, MC9202, MC9203, MC9204, MC9205, MC9206 and MC9207)," dated April 3, 2006

**8.0 References**

- 8.1 EPRI TR-112657 Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure"

**EXAMINATION COVERAGE**

Station: BRAIDWOOD Unit: 02 Date: 04/27/99 Page 1 of 25

System: PRESSURIZER Comp. ID: 2PZR-01-N3 Exam. No.: 99BR2-UTD-026

Config: PERESSURIZER to RELIEF NOZZLE Procedure/ Rev.: NDT-C-5, REV. 4  
NDT-Z-1, REV. 1

Examiner: MIKE KICKBUSCH Level: II

Examiner: TIMOTHY GAHAN Level: II

Notes: LIMITATION DUE TO NOZZLE CONFIGURATION

NDE Method: UT X MT N/A PT N/A

Comments:

Total weld metal examination volume (WMV) achieved : **88.13%**

Total base metal examination volume (BMV) achieved : **73.67%**

Total examination volume achieved : **80.90%** ( 88.13 + 73.67 = 161.80 / 2 = 80.90 )

Reference attached examination coverage calculation sheet for details.

ASME Section XI Examination Volume Achieved: 80.90%

Attachments: Yes / No YES

REVIEWER: [Signature] LEVEL: III DATE: 5/10/99

OTHERS: [Signature] DJC 5/11/99 LEVEL: III DATE: 5-11-99

ANII: [Signature] DATE: 5-12-99

WELD MATERIAL (WMV)	PERCENT ACHIEVED	PERCENT UTILIZED	COMMENTS
0°	100.00%	100.00%	
30° (X)	57.30%	57.30%	30°(X) USED TO SUPPLEMENT 46°(X), % COVERAGE BASED ON 30°
30° (Y)	100.00%		
40° (X)	35.90%	35.90%	40°(X) USED TO SUPPLEMENT 60°(X), % COVERAGE BASED ON 40°
40° (Y)	100.00%		
46° (X)	30.70%		
46° (Y)	100.00%	100.00%	
60° (X)	8.50%		
60° (Y)	100.00%	100.00%	
70° (Y)	99.70%		
46° (CW)	100.00%	100.00%	
46° (CCW)	100.00%	100.00%	
60° (CW)	100.00%	100.00%	
60° (CCW)	100.00%	100.00%	
	<b>793.20%</b>	<b>TOTAL</b>	<b>793.20 / 9 = 88.13% WMV ACHIEVED</b>

BASE MATERIAL (BMV)	PERCENT ACHIEVED	PERCENT UTILIZED	COMMENTS
0°	73.30%	73.30%	
30° (X)	47.80%		
30° (Y)	78.20%		
40° (X)	42.20%		
40° (Y)	84.50%		
46° (X)	36.80%		
46° (Y)	87.90%	87.90%	
60° (X)	13.50%		
60° (Y)	90.90%	90.90%	
70° (Y)	90.70%		
46° (CW)	65.90%	65.90%	
46° (CCW)	65.90%	65.90%	
60° (CW)	65.90%	65.90%	
60° (CCW)	65.90%	65.90%	
	<b>515.70%</b>	<b>TOTAL</b>	<b>515.70 / 7 = 73.67% BMV ACHIEVED</b>

TOTAL WELD METAL 88.13%  
 TOTAL BASE MATERIAL 73.67%

TOTAL EXAMINATION COVERAGE IS 80.90%

EXAMINER: meel keel Donnelly Galan  
 REVIEWED BY: Kevin Stolar 5-11-99  
 PREPARED BY: Kevin Stolar 5-11-99  
 ANII: L. Hume 5-12-99

Attachment 2 - 4  
 Component: 2PZR-01-N3  
 Sheet 6 of 29

**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit: 2 Procedure/ Rev.: NDT-C-5 / REV 4 Date: 4-27-99 Page 3 of 25  
 Calibration Report No.: WHAZ 99BR2-UTC-028 BM 99BR2-UTC-028 Exam. Report No.: 99BR2-UTD-026  
 System: PRESSURIZER Component #: 2PZR-01-N3 Weld Type: PRESSURIZER / RELIEF NOZZLE  
 Component Size: N/A Schedule / Thickness: N/A / 2.065" Material: CARBON STEEL  
 Component Temp. / I.D. # 90° F / 159175 Couplant: ULTRAGEL II Batch #: 99125  
 Scan Gain: N/A WHAZ 25.6dB BM \*  
 Lo Reference Point: STAMPED ZERO Wo Reference Point: WELD CENTERLINE

	Performed		Indications		
	YES	NO	NO	YES	
1. L-Wave - Base Metal & Weld	X	N/A	X	N/A	
2. Angle Beam - Perpendicular to Weld Clockwise "X" Side	N/A	X	N/A	N/A	
3. Angle Beam - Perpendicular to Weld Clockwise "Y" Side	N/A	X	N/A	N/A	
4. Angle Beam - Parallel to Weld Clockwise	N/A	X	N/A	N/A	
5. Angle Beam - Parallel to Weld Counterclockwise	N/A	X	N/A	N/A	
6. L-Wave Average Thickness	X	N/A	2.72"	2.81"	2.79"
			"X" Side	WELD	"Y" Side

Comments: 0° SCAN \*GAIN ADJUSTED TO MAINTAIN 80% BACKWALL  
NO RECORDABLE INDICATIONS  
TOTAL EXAM COVERAGE 80.90%  
REFERENCE EXAM COVERAGE SHEET FOR THE PERCENT OF COVERAGE FOR THIS ANGLE.

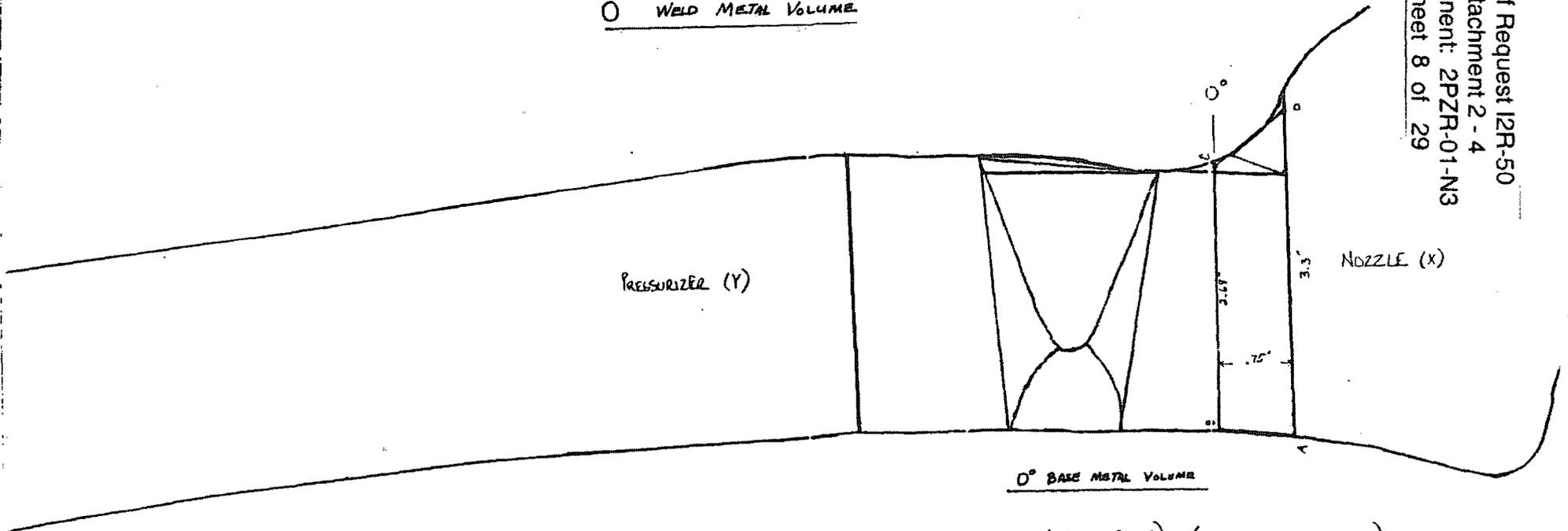
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Examiner: mel j kool Timothy Kahan Level: II / II Date: 5/10/99  
 Reviewer: [Signature] Level: III Date: 5/10/99  
 Reviewer: [Signature] Level: III Date: 5-11-99  
 Others: D. J. Chycauli Date: 5/11/99  
 ANII: [Signature] Date: 5-12-99

PRESSURIZER NOZZLE COVERAGE PLOT  
0° TRANSDUCER

Relief Request 12R-50  
Attachment 2 - 4  
Component: 2PZR-01-N3  
Sheet 8 of 29

0° BASE METAL VOLUME  
0° WELD METAL VOLUME



0° WELD METAL VOLUME

EXAM COVERAGE = EC = TOTAL WMV

$$\% EC = EC/EV = \frac{423.53 \text{ m}^3}{423.53 \text{ m}^3}$$

% EC = 100% ACHIEVED

N-3 NOZZLE

*D. J. Chapman*  
5/11/99

EXAM COVERAGE = (TOTAL BMV) - (VOLUME NOT COVERED)

VOLUME NOT COVERED = (AREA OF TRAPEZOID A-B-C-D) X L

AREA OF TRAPEZOID A-B-C-D =  $\frac{1}{2} A(a+b) = \frac{1}{2} (.75)(2.69 + 3.30) = 2.2425 \text{ m}^2$

VOLUME NOT COVERED =  $(2.2425 \text{ m}^2) \times (50.36) = 112.93 \text{ m}^3$

% EC =  $EC/EV = \frac{423.53 \text{ m}^3 - 112.93 \text{ m}^3}{423.53 \text{ m}^3} = 73.3\% \text{ ACHIEVED}$

MANII REVIEW  
5/12/99

*7/14/99*  
see also II 5/10/99  
mother also II 5-10-99

# PRESSURIZER NOZZLE COVERAGE PLOT

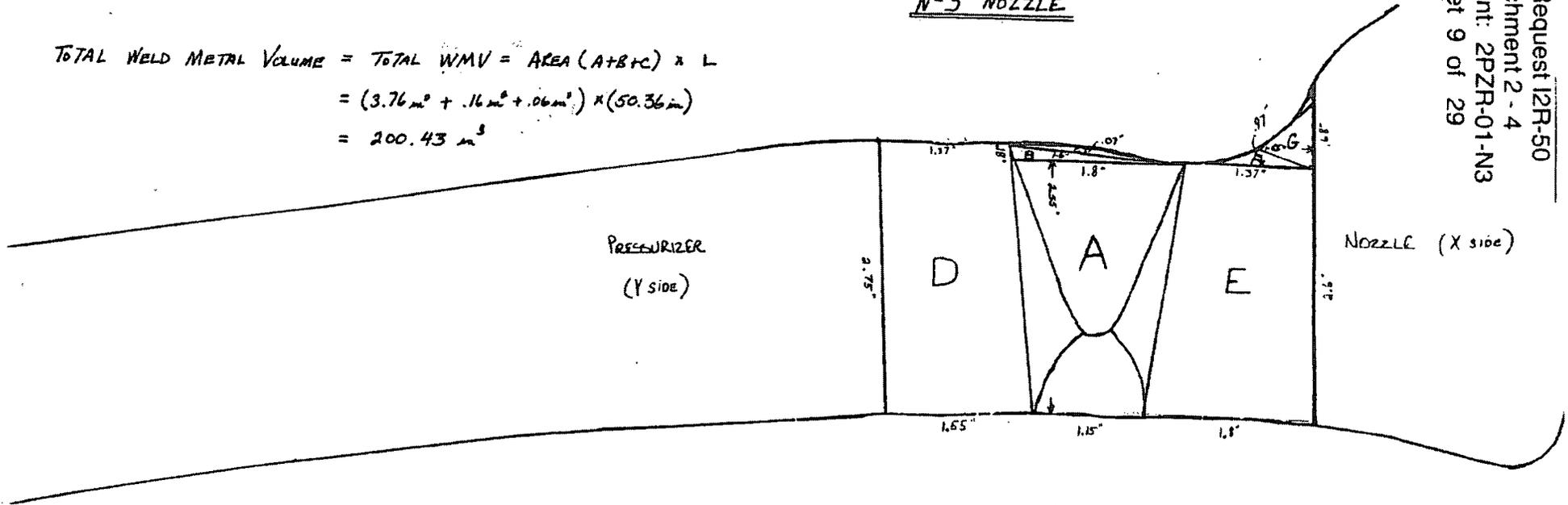
PAGE 5 OF 25  
REPORT 98R2-DTD-02

L = LENGTH OF WELD (BASED ON WESTINGHOUSE DWG. E08K379.557)  
= 50.36"

## MASTER REFERENCE SHEET

### N-3 NOZZLE

$$\begin{aligned} \text{TOTAL WELD METAL VOLUME} &= \text{TOTAL WMV} = \text{AREA (A+B+C)} \times L \\ &= (3.76 \text{ m}^2 + .16 \text{ m}^2 + .06 \text{ m}^2) \times (50.36 \text{ in}) \\ &= 200.43 \text{ m}^3 \end{aligned}$$



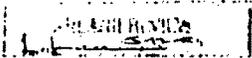
Relief Request 12R-50  
Attachment 2 - 4  
Component: 2PZR-01-N3  
Sheet 9 of 29

### GEOMETRIC AREA CALCULATIONS

$$\begin{aligned} \text{TOTAL BASE METAL VOLUME} &= \text{TOTAL BMV} = \text{AREA (D+E+F+G)} \times L \\ &= (4.02 \text{ m}^2 + 4.12 \text{ m}^2 + .09 \text{ m}^2 + .18 \text{ m}^2) \times (50.36 \text{ in}) \\ &= 423.53 \text{ m}^3 \end{aligned}$$

$$\begin{aligned} \text{AREA "A" (TRAPEZOID)} &= \frac{1}{2} h(a+b) = \frac{1}{2} (2.55") (1.15" + 1.8") = 3.76 \text{ m}^2 \\ \text{AREA "B" (TRIANGLE)} &= \frac{1}{2} b \cdot h = \frac{1}{2} (1.8") (1.8") = .16 \text{ m}^2 \\ \text{AREA "C" (TRIANGLE)} &= \frac{1}{2} b \cdot h = \frac{1}{2} (1.1") (1.07") = .06 \text{ m}^2 \\ \text{AREA "D" (TRAPEZOID)} &= \frac{1}{2} h(a+b) = \frac{1}{2} (2.75") (1.37" + 1.55") = 4.02 \text{ m}^2 \\ \text{AREA "E" (TRAPEZOID)} &= \frac{1}{2} h(a+b) = \frac{1}{2} (2.6") (1.37" + 1.8") = 4.12 \text{ m}^2 \\ \text{AREA "F" (TRIANGLE)} &= \frac{1}{2} b \cdot h = \frac{1}{2} (.97") (1.8") = .09 \text{ m}^2 \\ \text{AREA "G" (TRIANGLE)} &= \frac{1}{2} b \cdot h = \frac{1}{2} (.68") (.52") = .18 \text{ m}^2 \end{aligned}$$

*D. J. Thompson* 5/11/99  
*J. K. Koo III* 5/10/99  
*meo J. KOO II* 5/10/99  
*Matthew Adams II* 5-10-99



**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit: 2 Procedure/ Rev.: NDT-C-5 / REV 4 Date: 4-27-99 Page 6 of 25

Calibration Report No.: Axial: 99BR2-UTC-029 Circ.: N/A Exam. Report No.: 99BR2-UTD-026

System: PRESSURIZER Component #: 2PZR-01-N3 Weld Type: PRESSURIZER / RELIEF NOZZLE

Component Size: N/A Schedule / Thickness: N/A / 2.0625" Material: CARBON STEEL

Component Temp. / I.D. # 90° / 159175 Couplant: ULTRAGEL II Batch #: 99125

Scan Gain: N/A Axial: 50.6dB Circ.: N/A

Lo Reference Point: STAMPED ZERO Wo Reference Point: WELD CENTERLINE

	Performed		Indications		
	YES	NO	NO	YES	
1. L-Wave - Base Metal & Weld	N/A	X	N/A	N/A	
2. Angle Beam - Perpendicular to Weld Clockwise "X" Side	X	N/A	X	N/A	
3. Angle Beam - Perpendicular to Weld Clockwise "Y" Side	X	N/A	X	N/A	
4. Angle Beam - Parallel to Weld Clockwise	N/A	X	N/A	N/A	
5. Angle Beam - Parallel to Weld Counterclockwise	N/A	X	N/A	N/A	
6. L-Wave Average Thickness	X	N/A	2.72"	2.81"	2.79"
			"X" Side	WELD	"Y" Side

Comments:

30° SHEAR NO RECORDABLE INDICATIONS  
 10% ID ROLL MAINTAINED DURING SCAN  
 30° SUPPLEMENTS THE 45° FOR ADDITIONAL COVERAGE  
 TOTAL EXAM COVERAGE 80.90%  
 REFERENCE EXAM COVERAGE SHEET FOR THE PERCENT OF COVERAGE FOR THIS ANGLE.

Examiner: meel J. Keel Jonathan Kahan Level: II / II Date: 5/10/99

Reviewer: [Signature] Level: III Date: 5/10/98

Reviewer: [Signature] Level: TII Date: 5-11-99

Others: D. Chyand Date: 5/11/99

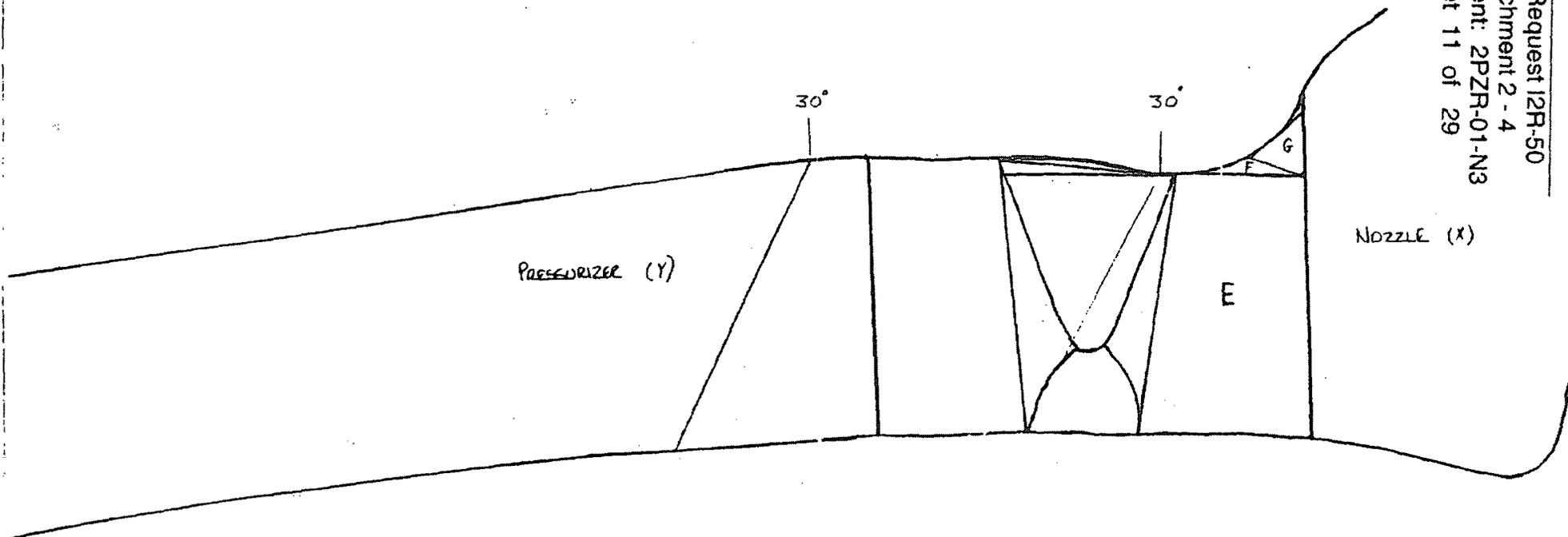
ANII: [Signature] Date: 5-12-99

PRESSURIZER NOZZLE COVERAGE PLOT  
30° SHEAR TRANSDUCER

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REPORT 99882-010-024

30° (X) BASE METAL VOLUME

Relief Request 12R-50  
Attachment 2 - 4  
Component: 2PZR-01-N3  
Sheet 11 of 29



N-3 NOZZLE

$$\text{EXAM COVERAGE} = EC = (\text{TOTAL BMV}) - (\text{VOLUME NOT COVERED})$$

$$\text{VOLUME NOT COVERED} = \text{AREA } (E + F + G) \times L$$

$$\bullet \text{ AREA "E" (TRAPAZOID)} = \frac{1}{2} A (a+b) = \frac{1}{2} (2.6') (1.37' + 1.80') = 4.12 \text{ m}^2$$

$$\bullet \text{ AREA "F" (TRIANG)} = \frac{1}{2} b \cdot h = \frac{1}{2} (.97') (.18') = .09 \text{ m}^2$$

$$\bullet \text{ AREA "G" (TRIANG)} = \frac{1}{2} b \cdot h = \frac{1}{2} (.68') (.52') = .18 \text{ m}^2$$

$$\text{VOLUME NOT COVERED} = (4.12 \text{ m}^2 + .09 \text{ m}^2 + .18 \text{ m}^2) \times (50.86'') = 221.08 \text{ m}^3$$

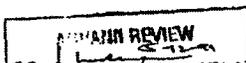
$$\% EC = \frac{EC}{EV} = \frac{423.53 \text{ m}^3 - 221.08 \text{ m}^3}{423.53 \text{ m}^3} = 47.80\% \text{ ACHIEVED}$$

D. J. O'Connell 5/11/99

M. J. Moran 5-11-99

See L. K. Lee III 4/1/99  
see J. K. Lee 2/9/99

Timothy J. Moran II 5-10-99



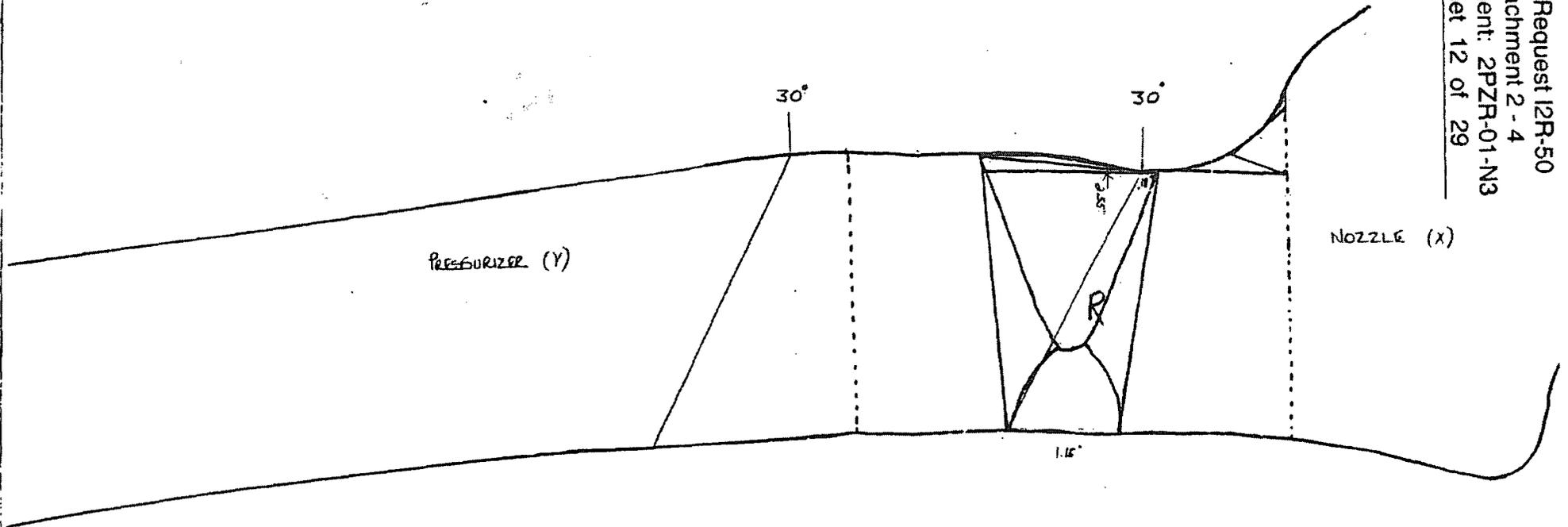
SEE MASTER REFERENCE SHEET,  
PAGE 5 OF 35

PRESSURIZER NOZZLE COVERAGE PLOT  
30° SHEAR TRANSDUCER

PAGE 1 OF 35  
REPORT 98R2-JTD-026

30° (X) WELD METAL VOLUME

Relief Request 12R-50  
Attachment 2 - 4  
Component: 2PZR-01-N3  
Sheet 12 of 29



N-3 NOZZLE

$$\text{EXAM COVERAGE} = \text{EC} = (\text{TOTAL WMV}) - (\text{VOLUME NOT COVERED})$$

$$\text{VOLUME NOT COVERED} = \text{AREA "R"} \times L$$

$$\text{AREA "R" (TRAPEZOID)} = \frac{1}{2} h (a+b) = \frac{1}{2} (2.53") (1.19" + 1.15") = 1.70 \text{ in}^2$$

$$\text{VOLUME NOT COVERED} = (1.70 \text{ in}^2) \times (50.36 \text{ in}) = 85.61 \text{ in}^3$$

$$\% \text{ EC} = \frac{\text{EC}}{\text{EV}} = \frac{200.43 \text{ in}^3 - 85.61 \text{ in}^3}{200.43 \text{ in}^3}$$

$$\% \text{ EC} = 57.3\% \text{ ACHIEVED}$$

D/C [Signature] 5/11/99

[Signature] 5-11-99

Ann L. Keel II 5/10/99  
Mar J. Keel II 5/10/99

Christy Padon II 5-10-99

AN/ANII REVIEW  
[Signature]

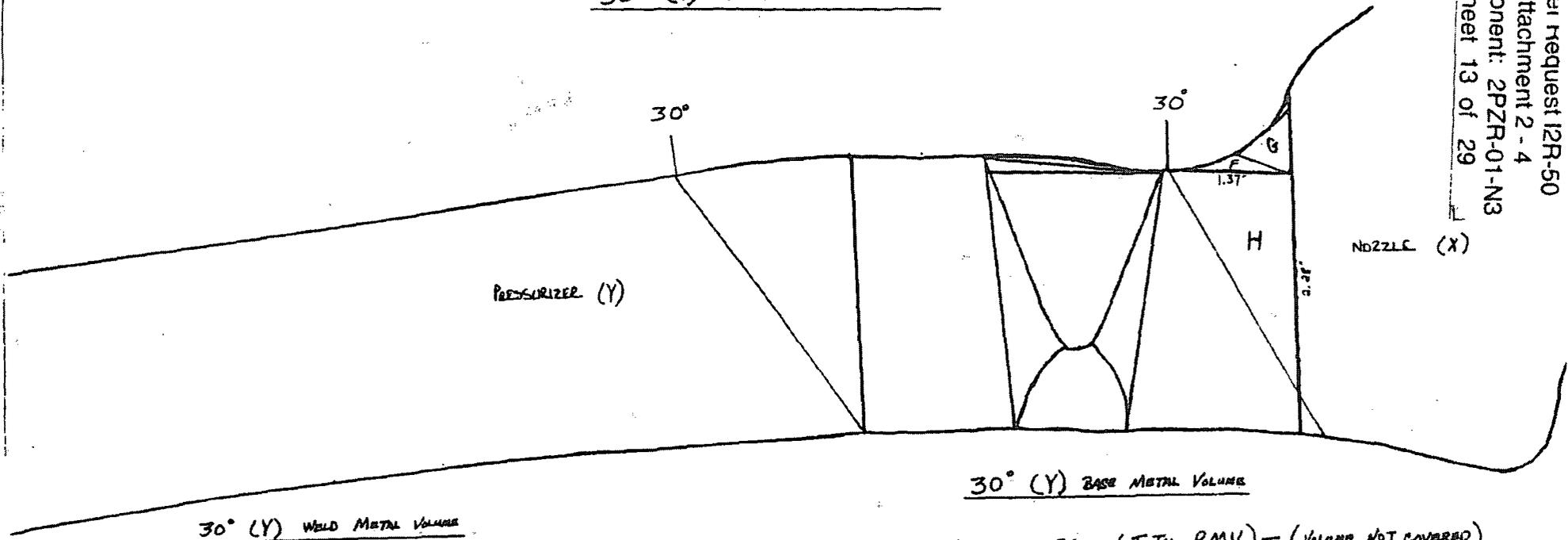
PRESSURIZER NOZZLE COVERAGE PLOT  
30° SHEAR TRANSDUCER

PAGE 9 OF 25  
REPORT 99R22-010-024

30° (Y) BASE METAL VOLUME

30° (Y) WELD METAL VOLUME

Review Request 12R-50  
Attachment 2 - 4  
Component: 2PZR-01-N3  
Sheet 13 of 29



EXAM COVERAGE = EC = TOTAL WMV

$$\% EC = EC/EV = \frac{200.43 \text{ m}^3}{200.43 \text{ m}^3}$$

% EC = 100% ACHIEVED

N-3 NOZZLE

ANVANI REVIEW  
INITIALS: L.S.

\* SEE MASTER REFERENCE DRAWING  
PAGE 5 OF 25

$$\text{EXAM COVERAGE} = EC = (\text{TOTAL BMV}) - (\text{VOLUME NOT COVERED})$$

$$\text{VOLUME NOT COVERED} = \text{AREA}(F+G+H) \times L$$

$$\ast \text{ AREA "F" (TRIANGLE)} = \frac{1}{2} b \times h = \frac{1}{2} (.97)(.19) = .09 \text{ m}^2$$

$$\ast \text{ AREA "G" (TRIANGLE)} = \frac{1}{2} b \times h = \frac{1}{2} (.68)(.52) = .18 \text{ m}^2$$

$$\text{ AREA "H" (TRIANGLE)} = \frac{1}{2} b \times h = \frac{1}{2} (2.28)(1.37) = 1.56 \text{ m}^2$$

$$\text{ VOLUME NOT COVERED} = (.09 \text{ m}^2 + .18 \text{ m}^2 + 1.56 \text{ m}^2) \times (50.36) = 92.16 \text{ m}^3$$

$$\% EC = EC/EV = \frac{400.43 \text{ m}^3 - 92.16 \text{ m}^3}{400.43 \text{ m}^3} = 78.2 \% \text{ ACHIEVED}$$

John Z. Beck III 5/1/99  
Freey K002 II 5/10/99

D. J. Chappell  
5/11/99

Donnelly, John II 5-10-99 1Y  
5/11/99

**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit: 2 Procedure/ Rev.: NDT-C-5 / REV 4 Date: 4-27-99 Page 10 of 20

Calibration Report No.: Axial: 99BR2-UTC-030 Circ.: N/A Exam. Report No.: 99BR2-UTD-026

System: PRESSURIZER Component #: 2PZR-01-N3 Weld Type: PRESSURIZER / RELIEF NOZZLE

Component Size: N/A Schedule / Thickness: N/A / 2.0625" Material: CARBON STEEL

Component Temp. / I.D. # 90° / 159175 Couplant: ULTRAGEL II Batch #: 99125

Scan Gain: N/A Axial: 43.6dB Circ.: N/A

Lo Reference Point: STAMPED ZERO Wo Reference Point: WELD CENTERLINE

	Performed		Indications		
	YES	NO	NO	YES	
1. L-Wave - Base Metal & Weld	N/A	X	N/A	N/A	
2. Angle Beam - Perpendicular to Weld Clockwise "X" Side	X	N/A	X	N/A	
3. Angle Beam - Perpendicular to Weld Clockwise "Y" Side	X	N/A	X	N/A	
4. Angle Beam - Parallel to Weld Clockwise	N/A	X	N/A	N/A	
5. Angle Beam - Parallel to Weld Counterclockwise	N/A	X	N/A	N/A	
6. L-Wave Average Thickness	X	N/A	2.72"	2.81"	2.79"
			"X" Side	WELD	"Y" Side

Comments:

40° SHEAR NO RECORDABLE INDICATIONS  
 10% ID ROLL MAINTAINED DURING SCAN  
 40° SUPPLEMENTS THE 60° FOR ADDITIONAL COVERAGE  
 TOTAL EXAM COVERAGE 80.90%  
 REFERENCE EXAM COVERAGE SHEET FOR THE PERCENT OF COVERAGE FOR THIS ANGLE.

Examiner: meo, keel Jonathan Gahan Level: II / II Date: 5/10/99

Reviewer: Ken Z. Deel Level: III Date: 5/10/99

Reviewer: Spencer Level: III Date: 5-11-99

Others: D. J. Chapman Date: 5/11/99

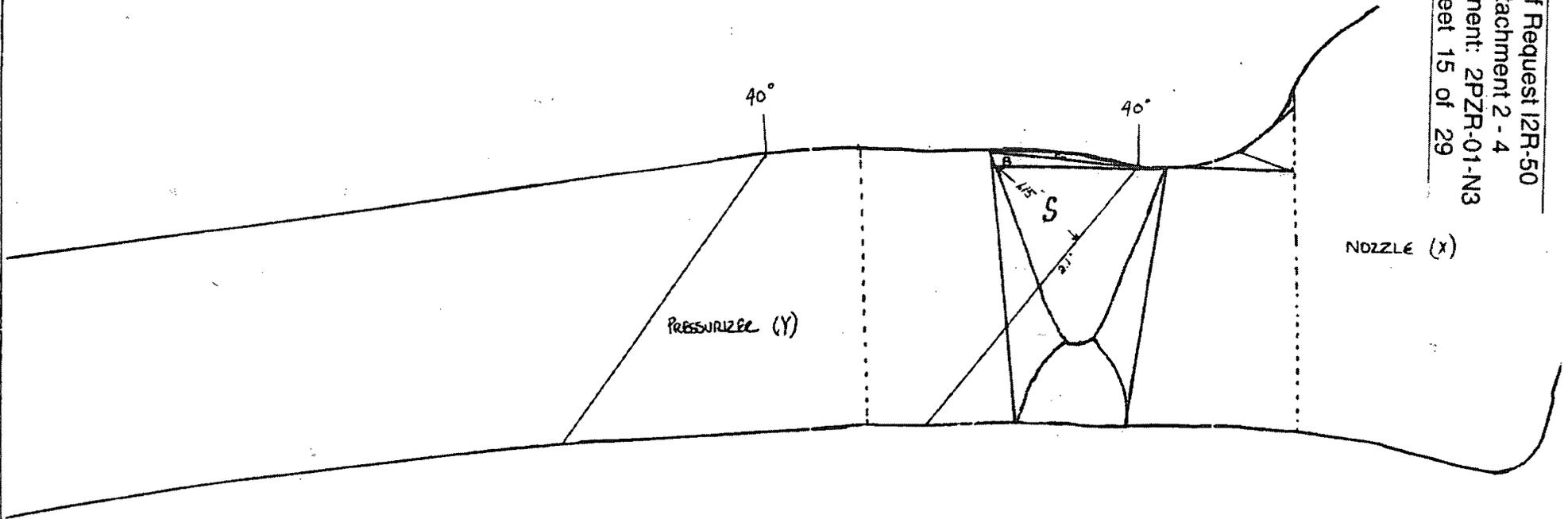
ANII: L. H. ... Date: 5-11-99

PRESSURIZER NOZZLE COVERAGE PLOT  
40° SHEAR TRANSDUCER

PAGE 11 OF 21  
REPORT 99R22-070-026

40° (X) WELD METAL VOLUME

Relief Request 12R-50  
Attachment 2 - 4  
Component: 2PZR-01-N3  
Sheet 15 of 29



N-3 NOZZLE

EXAM COVERAGE = EC = AREA (B+C+S) x L

- \* AREA "B" (TRIANGLE) =  $\frac{1}{2}bh = \frac{1}{2}(1.8)(.18) = .16 \text{ m}^2$
- \* AREA "C" (TRIANGLE) =  $\frac{1}{2}bh = \frac{1}{2}(1.6)(.07) = .06 \text{ in}^2$
- AREA "S" (TRIANGLE) =  $\frac{1}{2}bh = \frac{1}{2}(2.10)(1.15) = 1.21 \text{ m}^2$

EC =  $(.16 \text{ m}^2 + .06 \text{ m}^2 + 1.21 \text{ m}^2) \times (57.36 \text{ in}) = 72.01 \text{ m}^2$

% EC =  $\frac{EC}{EV} = \frac{72.01 \text{ m}^2}{200.43 \text{ m}^2} = 35.9\% \text{ ACHIEVED}$

D. J. Chapman  
5/11/99

ANIVANII REVIEW  
S. Man

Ken & Joel III 5/10/99  
meo J. KELL II 5/10/99  
Dorothy Kellan II 5-10-99

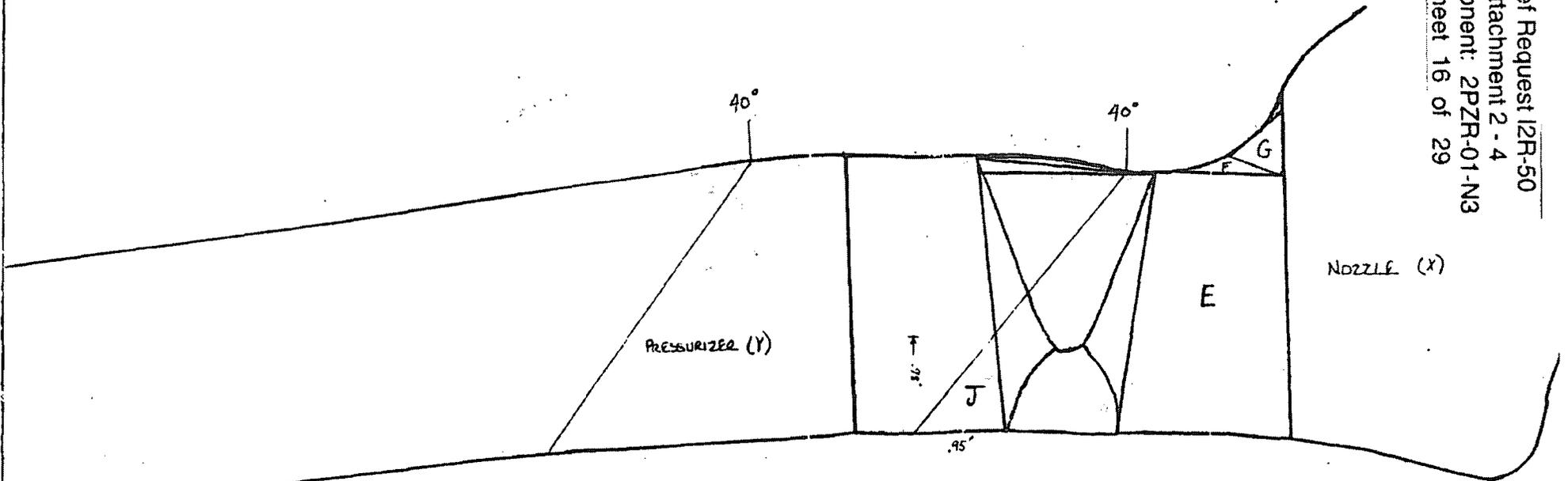
\* SEE MASTER REFERENCE SHEET,  
PAGE 5 OF 28  
5/11/99

PRESSURIZER NOZZLE COVERAGE PLOT  
40° SHEAR TRANSDUCER

PAGE 12 OF 21  
REPORT 99822-UTG-024

40° (X) BASE METAL VOLUME

Relief Request 12R-50  
Attachment 2 - 4  
Component: 2PZR-01-N3  
Sheet 16 of 29



N-3 NOZZLE

$$\text{EXAM COVERAGE} = EC = (\text{TOTAL BMV}) - (\text{VOLUME NOT COVERED})$$

$$\text{VOLUME NOT COVERED} = \text{AREA} (E + F + G + J) \times L$$

$$\bullet \text{ AREA "E" (TRAPEZOID)} = \frac{1}{2} b \cdot h (a+b) = \frac{1}{2} (2.6") (1.57" + 1.80") = 4.12 \text{ m}^2$$

$$\bullet \text{ AREA "F" (TRAPEZOID)} = \frac{1}{2} b \cdot h = \frac{1}{2} (.97") (.18") = .09 \text{ m}^2$$

$$\bullet \text{ AREA "G" (TRIANGLE)} = \frac{1}{2} b \cdot h = \frac{1}{2} (.68") (.52") = .18 \text{ m}^2$$

$$\text{AREA "J" (TRIANGLE)} = \frac{1}{2} b \cdot h = \frac{1}{2} (.95") (.98") = .47 \text{ m}^2$$

$$\text{VOLUME NOT COVERED} = (4.12 \text{ m}^2 + .09 \text{ m}^2 + .18 \text{ m}^2 + .47 \text{ m}^2) \times (50.96") = 244.75 \text{ m}^3$$

$$\% \text{ EC} = \frac{EC}{EV} = \frac{423.53 \text{ m}^3 - 244.75 \text{ m}^3}{423.53 \text{ m}^3} = 42.2 \% \text{ BMV}$$

*D. J. ...*  
3/11/99

*...*  
5/11/99

\* SEE MATING DIMENSION SHEET,  
PAGE 5 OF 25

ANVAMH REVIEW

5/10/99

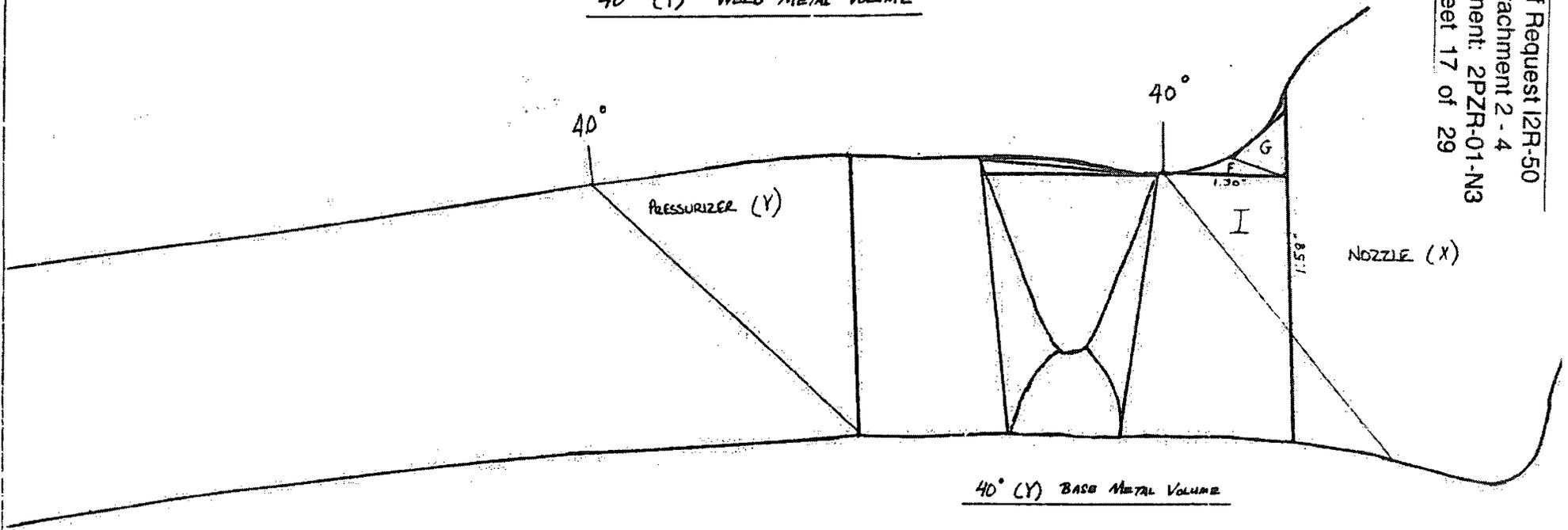
PRESSURIZER NOZZLE COVERAGE PLOT  
40° SHEAR TRANSDUCER

PAGE 13 OF 25  
REPORT 99B22-VTD-026

Relief Request I2R-50  
Attachment 2 - 4  
Component: 2PZR-01-N3  
Sheet 17 of 29

40° (Y) BASE METAL VOLUME

40° (Y) WELD METAL VOLUME



40° (Y) WELD METAL VOLUME

EXAM COVERAGE - EC = TOTAL WMV

$$\% EC = EC/EV = \frac{200.43 \text{ m}^3}{200.43 \text{ m}^3}$$

% EC = 100% ACHIEVED

N-3 NOZZLE

EXAM COVERAGE = (TOTAL BMV) - (VOLUME NOT COVERED)

VOLUME NOT COVERED = AREA (F+G+I) x L

\* AREA "F" (TRIANGLE) =  $\frac{1}{2} (.97") (.18") = .09 \text{ m}^2$

\* AREA "G" (TRIANGLE) =  $\frac{1}{2} (.68") (.52") = .18 \text{ m}^2$

AREA "I" (TRIANGLE) =  $\frac{1}{2} (1.58") (1.50") = 1.03 \text{ m}^2$

VOLUME NOT COVERED =  $(.09 \text{ m}^2 + .18 \text{ m}^2 + 1.03 \text{ m}^2) \times (50.86") = 65.47 \text{ m}^3$

% EC =  $\frac{EC}{EV} = \frac{423.53 \text{ m}^3 - 65.47 \text{ m}^3}{423.53 \text{ m}^3} = 84.5\% \text{ ACHIEVED}$

D.J. Amador 5/11/99  
See Laser 5/11/99  
see J. Kell II 6/10/99  
- Timothy Hall II 5-10-99  
ANVAH REVIEW PAGE 5 OF 25  
\* SEE MASTER REFERENCE SHEET

**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit: 2 Procedure/ Rev.: NDT-C-5/REV 4 Date: 4-27-99 Page 14 of 25

Calibration Report No.: Axial: 99BR2-UTC-031 Circ.: 99BR2-UTD-031 Exam. Report No.: 99BR2-UTD-026

System: PRESSURIZER Component #: 2PZR-01-N3 Weld Type: PRESSURIZER / RELIEF NOZZLE

Component Size: N/A Schedule / Thickness: N/A / 2.0625" Material: CARBON STEEL

Component Temp. / I.D. # 90° / 159175 Couplant: ULTRAGEL II Batch #: 99125

Scan Gain: N/A Axial: 48.6dB Circ.: 48.6dB

Lo Reference Point: STAMPED ZERO Wo Reference Point: WELD CENTERLINE

	Performed		Indications		
	YES	NO	NO	YES	
1. L-Wave - Base Metal & Weld	N/A	X	N/A	N/A	
2. Angle Beam - Perpendicular to Weld Clockwise "X" Side	X	N/A	X	N/A	
3. Angle Beam - Perpendicular to Weld Clockwise "Y" Side	X	N/A	X	N/A	
4. Angle Beam - Parallel to Weld Clockwise	X	N/A	X	N/A	
5. Angle Beam - Parallel to Weld Counterclockwise	X	N/A	X	N/A	
6. L-Wave Average Thickness	X	N/A	2.72"	2.81"	2.78"
			"X" Side	WELD	"Y" Side

Comments:

45° SHEAR NO RECORDABLE INDICATIONS  
 10% ID ROLL MAINTAINED DURING SCAN  
 ADDITIONAL COVERAGE ACHIEVED WITH THE 30°  
 TOTAL EXAM COVERAGE 80.90%.  
 REFERENCE EXAM COVERAGE SHEET FOR THE PERCENT OF COVERAGE FOR THIS  
 ANGLE.

Examiner: mel j. keel Timothy Galan Level: II/II Date: 5/10/99

Reviewer: Tom Steel Level: III Date: 5/10/99

Reviewer: Wheeler Level: III Date: 5-11-99

Others: D. J. Chyand Date: 5/11/99

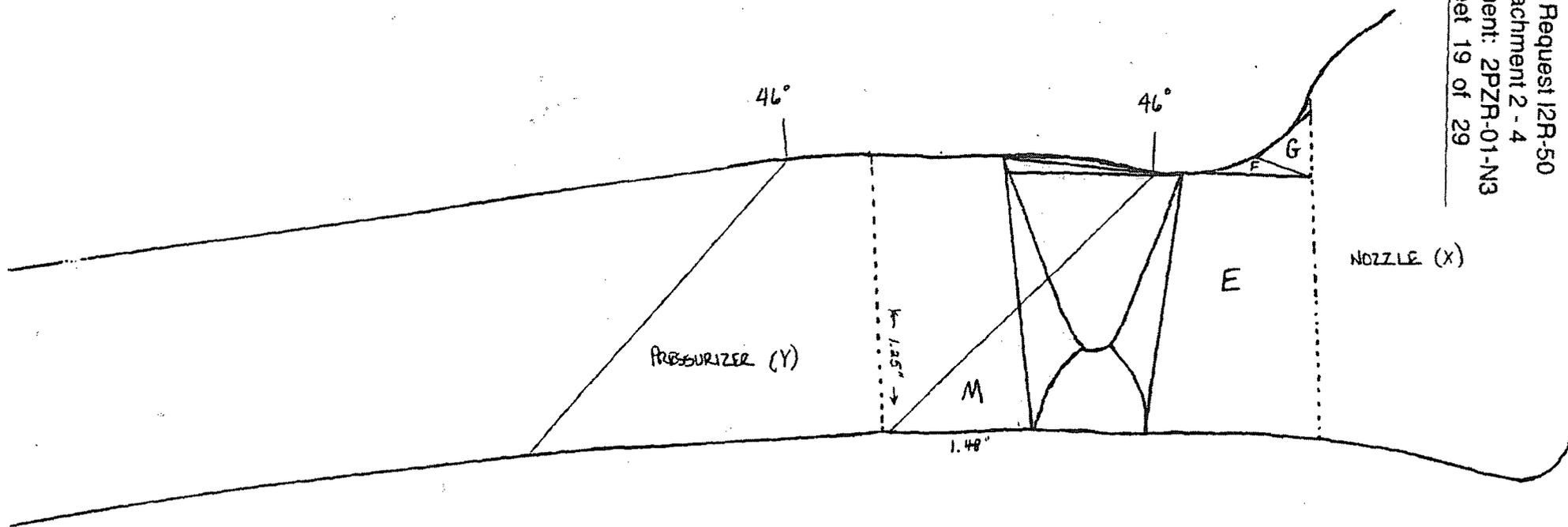
ANII: I. huan Date: 5-12-99

PRESSURIZER NOZZLE COVERAGE PLOT  
46° SHEAR TRANSDUCERS

PAGE 15 OF 25  
REPORT PBRZ-010-02

46° (X) BASE METAL VOLUME

Relief Request I2R-50  
Attachment 2 - 4  
Component: 2PZR-01-N3  
Sheet 19 of 29



N-3 NOZZLE

$$\text{EXAM COVERAGE} = EC = (\text{TOTAL BMV}) - (\text{VOLUME NOT COVERED})$$

$$\text{VOLUME NOT COVERED} = \text{AREA } (E+F+G+M) \times L$$

$$* \text{ AREA "E" (TRAPZOID) } = \frac{1}{2} h (a+b) = \frac{1}{2} (2.6") (1.37" + 1.90") = 4.12 \text{ in}^2$$

$$* \text{ AREA "F" (TRIANGLE) } = \frac{1}{2} b h = \frac{1}{2} (.97") (.18") = .09 \text{ in}^2$$

$$* \text{ AREA "G" (TRIANGLE) } = \frac{1}{2} b h = \frac{1}{2} (.68") (.52") = .18 \text{ in}^2$$

$$\text{AREA "M" (TRIANGLE) } = \frac{1}{2} b h = \frac{1}{2} (1.48") (1.25") = .925 \text{ in}^2$$

$$\text{VOLUME NOT COVERED} = (4.12 \text{ in}^2 + .09 \text{ in}^2 + .18 \text{ in}^2 + .925 \text{ in}^2) \times (.5036") = 267.66 \text{ in}^3$$

$$\% EC = \frac{EC}{EV} = \frac{483.53 \text{ in}^3 - 267.66 \text{ in}^3}{483.53 \text{ in}^3} = 36.8\% \text{ ACHIEVED}$$

D. J. [Signature]  
5/11/99

See [Signature] to [Signature]  
see [Signature] II 5/10/99

See [Signature] II 5-10-99

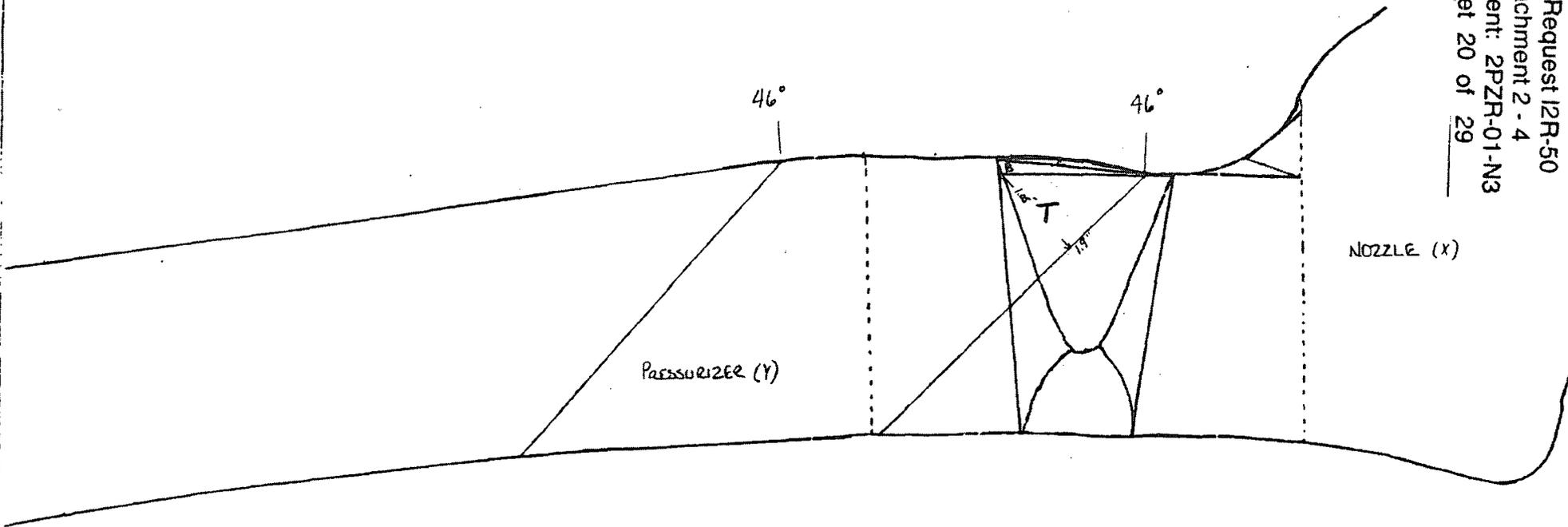
ANVANI REVIEW

\* SEE MASTER REFERENCE SHEET,  
PAGE 5 OF 25

PRESSURIZER NOZZLE COVERAGE PLOT  
46° SHEAR TRANSDUCER

46° (X) WELD METAL VOLUME

Relief Request 12R-50  
Attachment 2 - 4  
Component: 2PZR-01-N3  
Sheet 20 of 29



N-3 NOZZLE

EXAM COVERAGE = EC = AREA (B+C+T) x L

- \* AREA "B" (TRIANGLE) =  $\frac{1}{2} b \cdot h = \frac{1}{2} (1.8") (1.18") = .16 \text{ in}^2$
- \* AREA "C" (TRAPEZOID) =  $\frac{1}{2} b \cdot h = \frac{1}{2} (1.6") (.07") = .06 \text{ in}^2$
- AREA "T" (TRIANGLE) =  $\frac{1}{2} b \cdot h = \frac{1}{2} (1.9") (1.05") = 1.00 \text{ in}^2$

EC =  $(.16 \text{ in}^2 + .06 \text{ in}^2 + 1.00 \text{ in}^2) \times (50.36 \text{ in}) = 61.44 \text{ in}^3$

%EC =  $\frac{EC}{EV} = \frac{61.44 \text{ in}^3}{200.43 \text{ in}^3} = 30.7\% \text{ ACHIEVED}$

*D. J. [Signature]*  
5/11/99

*[Signature]*  
mees 22 II 5/10/99

CIVIL REVIEW

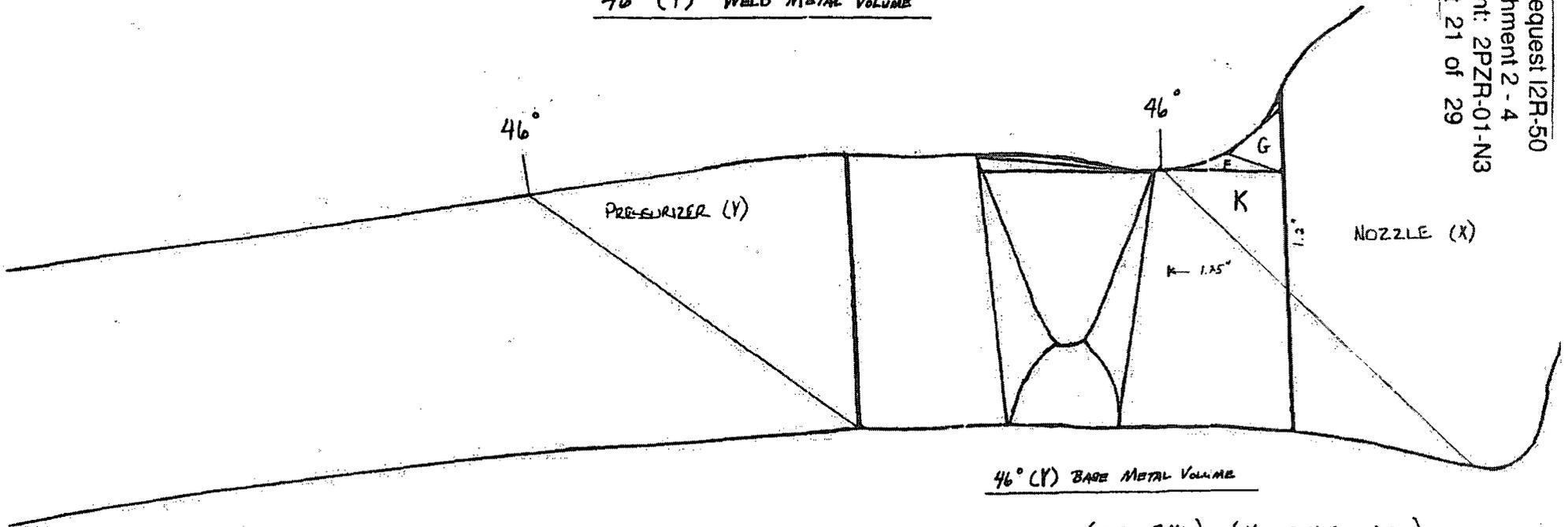
\* SEE MASTER REFERENCE SKETCH, PAGE E-025

PRESSURIZER NOZZLE COVERAGE PLOT  
46° SHEAR TRANSDUCER

PAGE 17 OF 25  
REPORT 99R82-UTD-026

Relief Request I2R-50  
Attachment 2 - 4  
Component: 2PZR-01-N3  
Sheet 21 of 29

46° (Y) BASE METAL VOLUME  
46° (Y) WELD METAL VOLUME



46° (Y) WELD METAL VOLUME

EXAM COVERAGE = EC = TOTAL WMV

$$\% EC = \frac{EC}{EW} = \frac{200.43 \text{ m}^3}{200.43 \text{ m}^3}$$

$\% EC = 100\%$  ACHIEVED

N-3 NOZZLE

$$\text{EXAM COVERAGE} = EC = (\text{TOTAL BMV}) - (\text{VOLUME NOT COVERED})$$

$$\text{VOLUME NOT COVERED} = \text{AREA}(F+G+K) \times L$$

$$\text{AREA "F" (TRIANGLE)} = \frac{1}{2} b \times h = \frac{1}{2} (.97)(.19) = .09 \text{ m}^2$$

$$\text{AREA "G" (TRIANGLE)} = \frac{1}{2} b \times h = \frac{1}{2} (.69)(.52) = .18 \text{ m}^2$$

$$\text{AREA "K" (TRIANGLE)} = \frac{1}{2} b \times h = \frac{1}{2} (1.2)(1.25) = .75 \text{ m}^2$$

$$\text{VOLUME NOT COVERED} = (.09 \text{ m}^2 + .18 \text{ m}^2 + .75 \text{ m}^2) \times (50.36) = 57.37 \text{ m}^3$$

$$\% EC = \frac{EC}{EW} = \frac{423.53 \text{ m}^3 - 57.37 \text{ m}^3}{423.53 \text{ m}^3} = 87.9\% \text{ ACHIEVED}$$

John Abel III 5/10/99  
Mel J. Vogl II 5/10/99  
Anthony Nahan II 5-10-99  
ANUVANI REVIEW  
PAGE 21 OF 25  
SEE ANOTHER REFERENCE SHEET

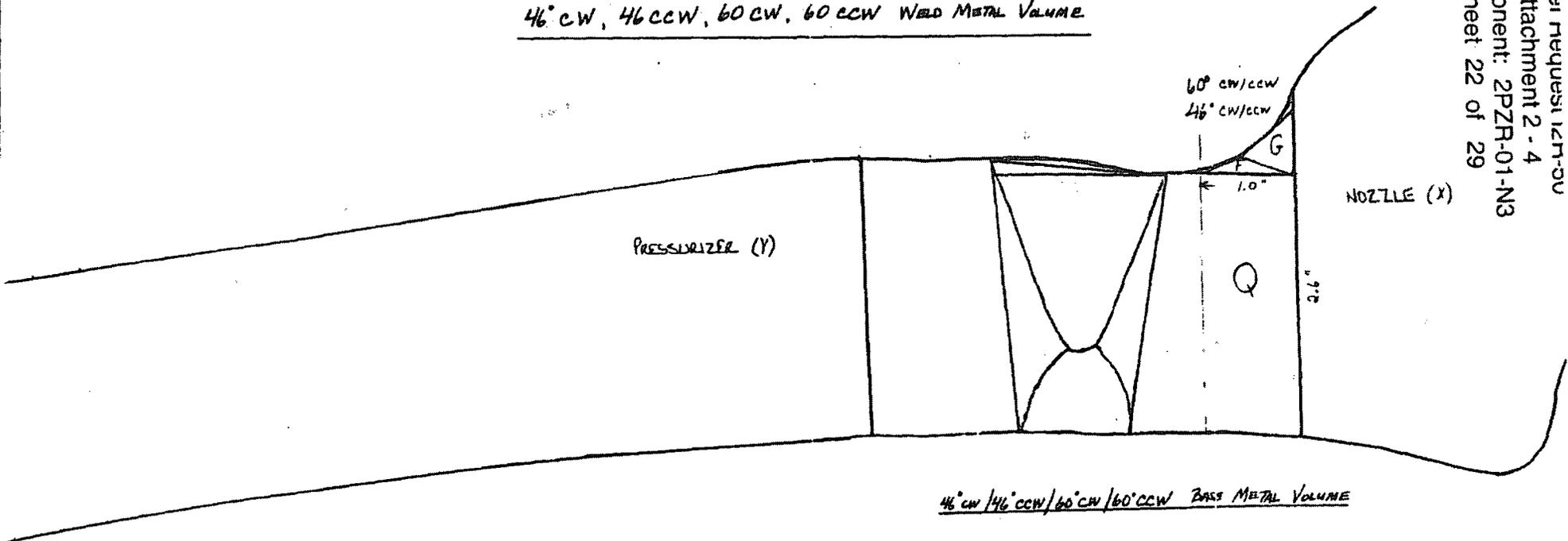
PRESSURIZER NOZZLE COVERAGE PLOT  
 46° AND 60° SHEAR TRANSDUCERS

PAGE 18 OF 25  
 REPORT 94882-010-026

46° CW, 46° CCW, 60° CW, 60° CCW BASE METAL VOLUME

46° CW, 46° CCW, 60° CW, 60° CCW WELD METAL VOLUME

Revised Request 12-1-90  
 Attachment 2-4  
 Component: 2PZR-01-N3  
 Sheet 22 of 29



46° CW / 46° CCW / 60° CW / 60° CCW BASE METAL VOLUME

46° CW / 46° CCW / 60° CW / 60° CCW WELD METAL VOLUME

EXAM COVERAGE = EC = TOTAL WMV

$$\% EC = EC / EV = \frac{200.43 \text{ m}^3}{200.43 \text{ m}^3}$$

% EC = 100% ARRIVED

D. [Signature] 5/1/99

N-3 NOZZLE

$$\text{EXAM COVERAGE} = EC = (\text{TOTAL BMV}) - (\text{VOLUME NOT COVERED})$$

$$\text{VOLUME NOT COVERED} = \text{AREA (F+G+Q)} \times L$$

$$\ast \text{ AREA "F" (TRIANGLE)} = \frac{1}{2} b h = \frac{1}{2} (.97") (.18") = .09 \text{ m}^2$$

$$\ast \text{ AREA "G" (TRIANGLE)} = \frac{1}{2} b h = \frac{1}{2} (.68") (.52") = .18 \text{ m}^2$$

$$\text{AREA "Q" (RECTANGLE)} = l w = (2.6 \text{ m}) \times (1.0 \text{ m}) = 2.6 \text{ m}^2$$

$$\text{VOLUME NOT COVERED} = (.09 \text{ m}^2 + .18 \text{ m}^2 + 2.6 \text{ m}^2) \times (50.36 \text{ in}) = 144.53 \text{ m}^3$$

$$\% EC = EC / EV = \frac{423.53 \text{ m}^3 - 144.53 \text{ m}^3}{423.53 \text{ m}^3} = 65.9\% \text{ ARRIVED}$$

\* SEE MASTER DIMENSION SHEET.

John L. [Signature] III 7/6  
 [Signature] 5/10/99  
 [Signature] II 5-10-99

ANVANI REVIEW  
 PAGE 18 OF 25

**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit: 2 Procedure/ Rev.: NDT-C-5 / REV 4 Date: 4-27-99 Page 19 of 25  
 Calibration Report No.: Axial: 99BR2-UTC-032 Circ.: 99BR2-UTD-032 Exam. Report No.: 99BR2-UTD-026  
 System: PRESSURIZER Component #: 2PZR-01-N3 Weld Type: PRESSURIZER / RELIEF NOZZLE  
 Component Size: N/A Schedule / Thickness: N/A / 2.0625" Material: CARBON STEEL  
 Component Temp. / I.D. # 90° / 159175 Couplant: ULTRAGEL II Batch #: 99125  
 Scan Gain: N/A Axial: 56.0dB Circ.: 56.0dB  
 Lo Reference Point: STAMPED ZERO Wo Reference Point: WELD CENTERLINE

	Performed		Indications		
	YES	NO	NO	YES	
1. L-Wave - Base Metal & Weld	N/A	X	N/A	N/A	
2. Angle Beam - Perpendicular to Weld Clockwise "X" Side	X	N/A	X	N/A	
3. Angle Beam - Perpendicular to Weld Clockwise "Y" Side	X	N/A	X	N/A	
4. Angle Beam - Parallel to Weld Clockwise	X	N/A	X	N/A	
5. Angle Beam - Parallel to Weld Counterclockwise	X	N/A	X	N/A	
6. L-Wave Average Thickness	X	N/A	2.72"	2.81"	2.79"
			"X" Side	WELD	"Y" Side

Comments: **60° SHEAR NO RECORDABLE INDICATIONS**  
**10% FSH ID ROLL MAINTAINED DURING SCAN**  
**ADDITIONAL COVERAGE ACHIEVED WITH THE 40° AND 70°**  
**TOTAL EXAM COVERAGE 80.90%.**  
**REFERENCE EXAM COVERAGE SHEET FOR THE PERCENT OF COVERAGE FOR THIS**  
**ANGLE.**

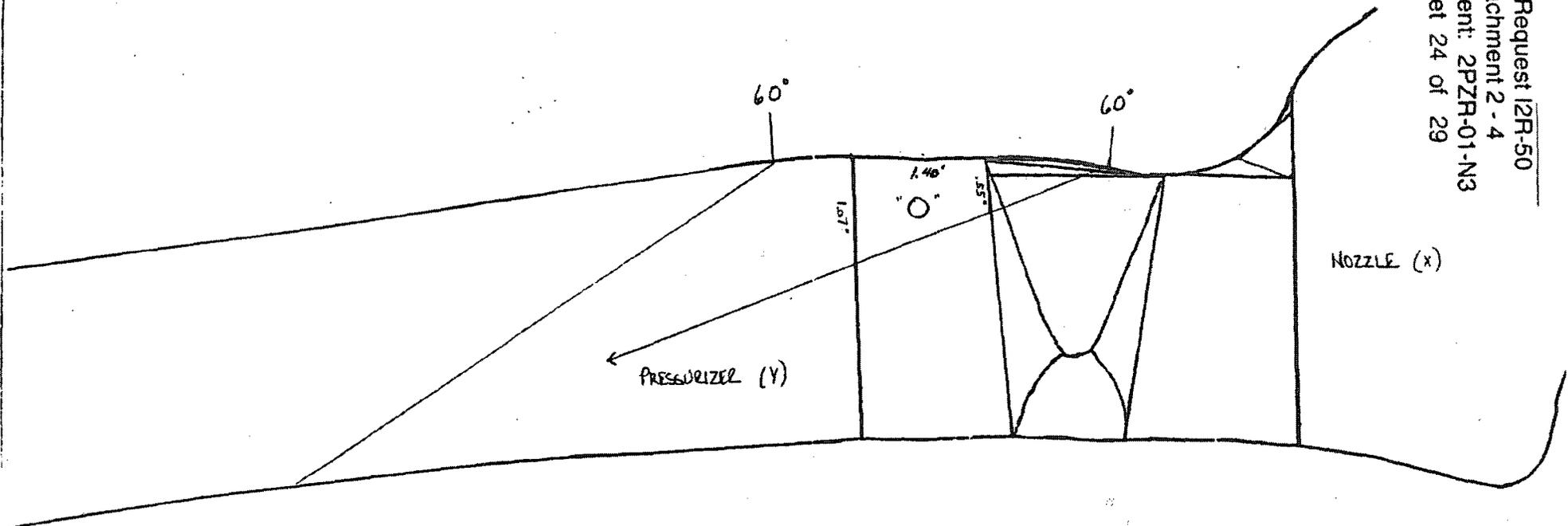
Examiner: meely well Timothy Gaba Level: II/II Date: 5/10/99  
 Reviewer: John Hall Level: III Date: 5/10/99  
 Reviewer: W. Miller Level: III Date: 5-11-99  
 Others: D. J. Campanelli Date: 5/11/99  
 ANII: L. Huan Date: 5-12-99

PRESSURIZER NOZZLE COVERAGE PLOT  
60° SHEAR TRANSDUCER

PAGE 20 OF 25  
REPORT 99R2-UTD-024

Relief Request 12R-50  
Attachment 2 - 4  
Component: 2PZR-01-N3  
Sheet 24 of 29

60° (X) BASE METAL VOLUME



N-3 NOZZLE

$$\text{EXAM COVERAGE} = EC = (\text{AREA 'O'}) \times L$$

$$\text{AREA 'O' (TRAPEZOID)} = \frac{1}{2} A (a+b) = \frac{1}{2} (1.40") (.55" + 1.07") = 1.134 \text{ m}^2$$

$$EC = (1.134 \text{ m}^2) \times (50.86 \text{ in}) = 57.11 \text{ in}^3$$

$$\% EC = \frac{EC}{EY} = \frac{57.11 \text{ in}^3}{423.53 \text{ in}^3}$$

$$\% EC = 13.5\% \text{ ACHIEVED}$$

*D. J. [Signature]*  
5/11/99

*Ann [Signature] III*  
*5/10/99*  
*5-10-99*

*[Signature]*  
5-11-99

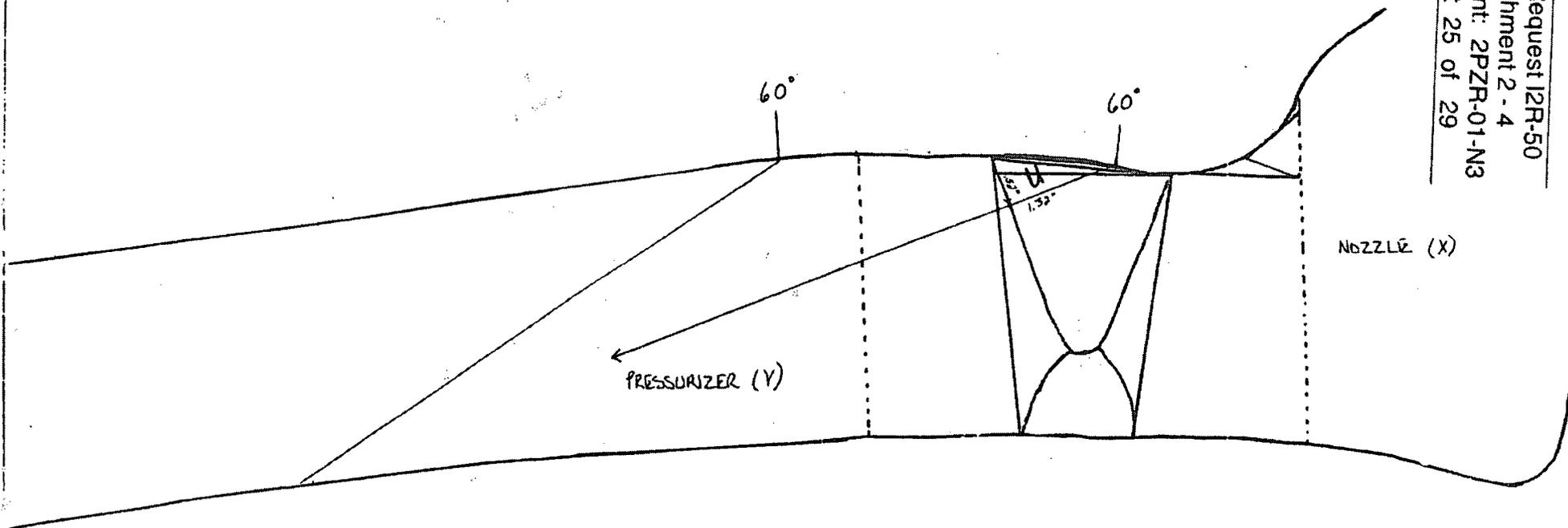
AN/ANI REVIEW  
[Signature]

PRESSURIZER NOZZLE COVERAGE PLOT  
60° SHEAR TRANSDUCER

PAGE 21 OF 25  
REPORT 99BR2-UTD-026

Relief Request 12R-50  
Attachment 2 - 4  
Component: 2PZR-01-N3  
Sheet 25 of 29

60° (X) WELD METAL VOLUME



EXAM COVERAGE = EC = (AREA "U") X L  
 AREA "U" =  $\frac{1}{2}bh = \frac{1}{2}(1.32)(.52) = .34 \text{ in}^2$   
 EC =  $(.34 \text{ in}^2)(50.96) = 17.12 \text{ in}^3$   
 % EC =  $\frac{EC}{EV} = \frac{17.12 \text{ in}^3}{200.43 \text{ in}^3}$   
 % EC = 8.5 % ACHIEVED

N-3 NOZZLE

*O.J. Chapman*  
5/11/99

*Joe Hall III* 5/10/99  
*meo J. V. 000 II* 5/10/99  
*Timothy Baker II* 5-10-99

*7 Miller*  
5-10-99

ANIRANII REVIEW  
5-12-99

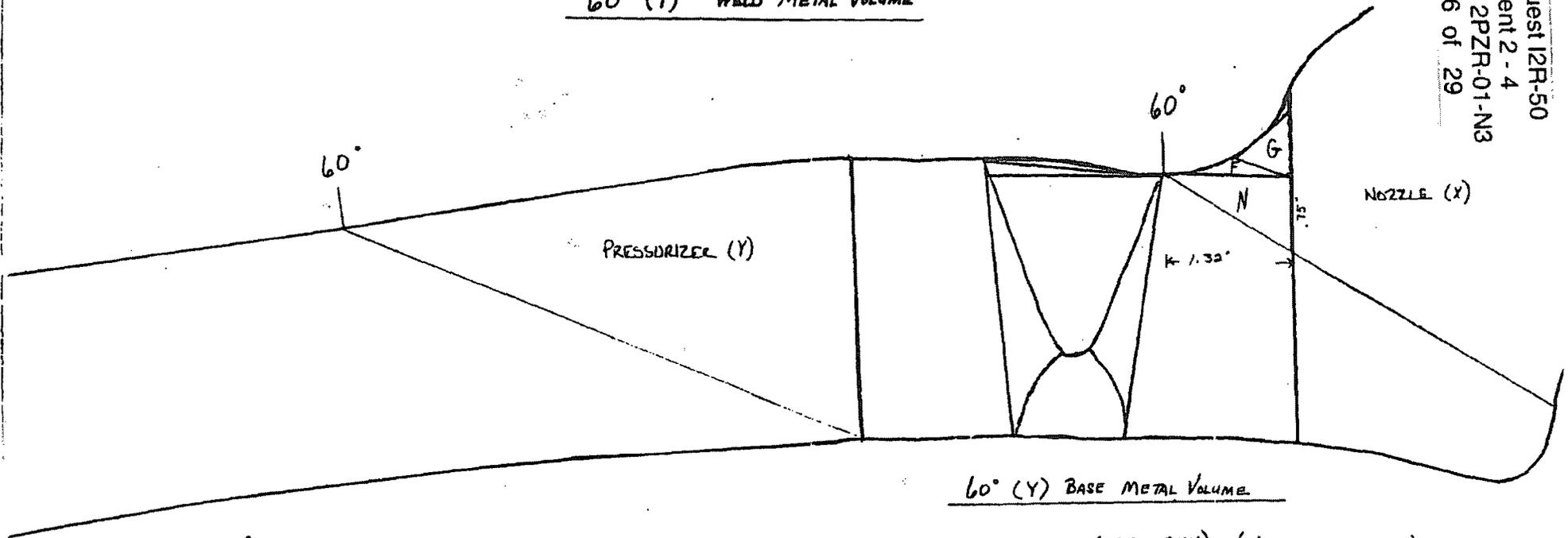
PRESSURIZER NOZZLE COVERAGE PLOT  
60° SHEAR TRANSDUCER

PAGE 22 OF 25  
REPORT 9882-UTD-021

Relief Request 12R-50  
Attachment 2-4  
Component: 2PZR-01-N3  
Sheet 26 of 29

60° (Y) BASE METAL VOLUME

60° (Y) WELD METAL VOLUME



60° (Y) WELD METAL VOLUME

EXAM COVERAGE = EC = TOTAL WMV

$$\% EC = EC/BV = \frac{200.43 \text{ in}^3}{200.43 \text{ in}^3}$$

% EC = 100% ACHIEVED

*D. [Signature]*  
5/11/99

*John [Signature]*  
5/10/99

*John [Signature]*  
5-10-99

*T. Miller*  
5-11-99

AN/ANI REVIEW  
*[Signature]*

SEE MASTER REFERENCE SHEET,  
PAGE 5 OF 25

N-3 NOZZLE

EXAM COVERAGE = EC = (TOTAL BMV) - (VOLUME NOT COVERED)

VOLUME NOT COVERED = AREA (F+G+N) X L

\* AREA "F" (TRIANGLE) =  $\frac{1}{2}bh = \frac{1}{2}(.97)(.18) = .09 \text{ in}^2$

\* AREA "G" (TRIANGLE) =  $\frac{1}{2}bh = \frac{1}{2}(.68)(.52) = .18 \text{ in}^2$

AREA "N" (TRIANGLE) =  $\frac{1}{2}bh = \frac{1}{2}(.25)(.82) = .10 \text{ in}^2$

VOLUME NOT COVERED =  $(.09 \text{ in}^2 + .18 \text{ in}^2 + .10 \text{ in}^2) \times (50.86 \text{ in}) = 38.53 \text{ in}^3$

% EC = EC/EV =  $\frac{423.53 \text{ in}^3 - 38.53 \text{ in}^3}{423.53 \text{ in}^3} = 90.9\% \text{ AC}$

**ULTRASONIC EXAMINATION DATA**

Station: BRAIDWOOD Unit: 2 Procedure/ Rev.: NDT-C-5 / REV 4 Date: 4-27-99 Page 23 of 25  
 Calibration Report No.: Axial: 99BR2-UTC-033 Circ.: N/A Exam. Report No.: 99BR2-LTD-026  
 System: PRESSURIZER Component #: 2PZR-01-N3 Weld Type: PRESSURIZER / RELIEF NOZZLE  
 Component Size: N/A Schedule / Thickness: N/A / 2.0825" Material: CARBON STEEL  
 Component Temp. / I.D. # 90° / 159175 Couplant: ULTRAGEL II Batch #: 99125  
 Scan Gain: N/A Axial: 68.4dB Circ.: N/A  
 Lo Reference Point: STAMPED ZERO Wo Reference Point: WELD CENTERLINE

	Performed		Indications		
	YES	NO	NO	YES	
1. L-Wave - Base Metal & Weld	N/A	X	N/A	N/A	
2. Angle Beam - Perpendicular to Weld Clockwise "X" Side	N/A	X	N/A	N/A	
3. Angle Beam - Perpendicular to Weld Clockwise "Y" Side	X	N/A	X	N/A	
4. Angle Beam - Parallel to Weld Clockwise	N/A	X	N/A	N/A	
5. Angle Beam - Parallel to Weld Counterclockwise	N/A	X	N/A	N/A	
6. L-Wave Average Thickness	X	N/A	2.72"	2.81"	2.78"
			"X" Side	WELD	"Y" Side

Comments:

70° SHEAR NO RECORDABLE INDICATIONS  
 10% ID ROLL MAINTAINED DURING SCAN  
 70° SUPPLEMENTS THE 60° FOR ADDITIONAL COVERAGE  
 TOTAL EXAM COVERAGE 80.90%.  
 REFERENCE EXAM COVERAGE SHEET FOR THE PERCENT OF COVERAGE FOR THIS ANGLE.

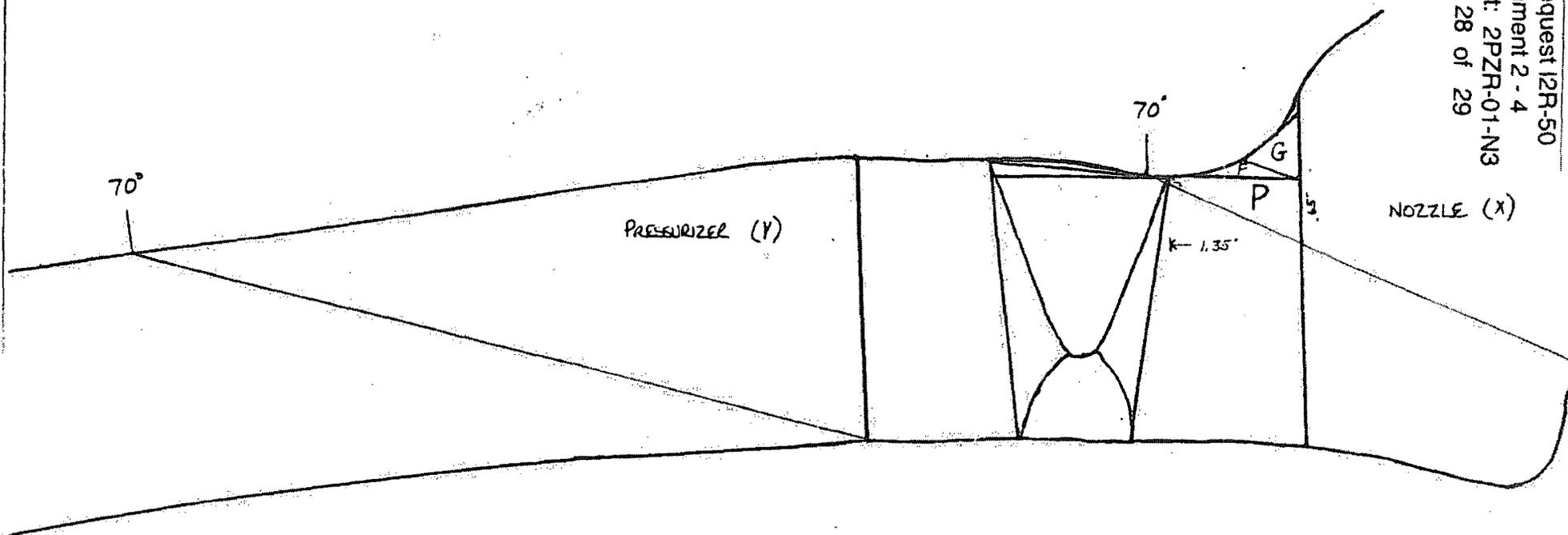
Examiner: nee J. Keel Timothy Kahan Level: II/II Date: 5/10/99  
 Reviewer: Tom T. Lee Level: III Date: 5/10/99  
 Reviewer: W. Green Level: III Date: 5-11-99  
 Others: D. J. Chyranicki Date: 5/11/99  
 ANII: L. Green Date: 5-12-99

PRESSURIZER NOZZLE COVERAGE PLOT  
70° SHEAR TRANSDUCER

PAGE 24 OF 28  
REPORT 99B2-UTD-02

70° (Y) BASE METAL VOLUME

Relief Request 12R-50  
Attachment 2 - 4  
Component: 2PZR-01-N3  
Sheet 28 of 29



EXAM COVERAGE = EC = (TOTAL BMV) -- (VOLUME NOT COVERED)

VOLUME NOT COVERED = AREA (F+G+P) X L

\* AREA "F" (TRIANGLE) =  $\frac{1}{2} b \cdot h = \frac{1}{2} (.97") (.19") = .09 \text{ m}^2$

\* AREA "G" (TRIANGLE) =  $\frac{1}{2} b \cdot h = \frac{1}{2} (.69") (.52") = .18 \text{ m}^2$

AREA "P" (TRAPEZOID) =  $\frac{1}{2} h (a+b) = \frac{1}{2} (1.35") (.1" + .65") = .51 \text{ m}^2$

VOLUME NOT COVERED =  $(.09 \text{ m}^2 + .18 \text{ m}^2 + .51 \text{ m}^2) \times (50.36 \text{ in}) = 39.28 \text{ m}^3$

% EC =  $\frac{BC}{EV} = \frac{423.53 \text{ m}^3 - 39.28 \text{ m}^3}{423.53 \text{ m}^3} = 90.7\%$

N-3 NOZZLE

*D. J. ...*  
5/11/99

*... of ... III ...*  
MOD. CORR II 5/10/99  
... II 5-10-99

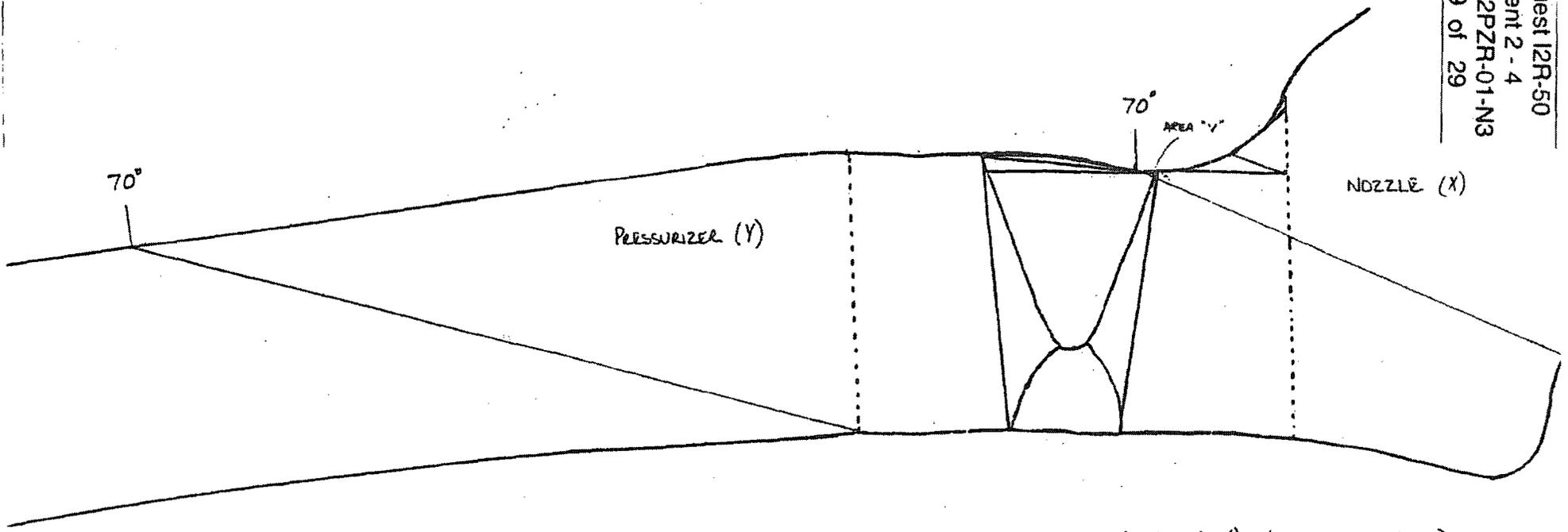
AN/ANII REVIEW  
Initial: *[Signature]*

\* SEE MATHE REFERENCE SHEET,  
PAGE 5 OF 25

PRESSURIZER NOZZLE COVERAGE PLOT  
70° SHEAR TRANSDUCER

Relief Request 12R-50  
Attachment 2 - 4  
Component: 2PZR-01-N3  
Sheet 29 of 29

70° (Y) WELD METAL VOLUME



N-3 NOZZLE

EXAM COVERAGE = EC = (TOTAL W/M/V) - (VOLUME NOT COVERED)

VOLUME NOT COVERED = AREA "V" x L

AREA "V" (TRIANGLE) =  $\frac{1}{2}bh = \frac{1}{2}(.2)(.1) = .01 m^2$

VOLUME NOT COVERED =  $(.01 m^2) \times (50.16 m) = .504 m^3$

% EC =  $EC/EV = \frac{200.43 m^3 - .504 m^3}{200.43 m^3} = 99.7\%$

*D. J. [Signature]*  
5/11/99  
*John L. Lee III* 5/13/99  
*meel J. Lee II* 5/10/99  
*Tim [Signature]* 5/11/99  
*Timothy [Signature]* 5-10-99

AN/ANII REVIEW  
5-11-99

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 2-5**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 1 of 7)

**1.0 Component**

Weld Number: 2SG-01-SGC-02  
Code Category / Item: C-A / C1.30  
Configuration: Steam Generator Tube Sheet-to-Stub Barrel Weld

**2.0 Applicable Code Edition and Addenda**

ASME Section XI 1989 Edition with no Addenda (including Mandatory Appendices)

**3.0 Applicable Code Requirement**

Table IWC-2500-1, Examination Category C-A requires volumetric examination of Item C1.30 (Tube Sheet-to-Shell welds). Table IWC-2500-1 Note (1) states essentially 100% of the weld length shall be examined.

Figure IWC-2500-2 depicts the required examination volume (E-F-G-H), which includes the actual circumferential weld and adjacent base metal ½" on either side of the weld from the extremities of the weld crown.

ASME Section XI Mandatory Appendix I requires ultrasonic examination of vessel welds greater than 2" thick to be conducted in accordance with ASME Section V, Article 4.

ASME Section V, Article 4 requires:

T-441.3.2.4 Extent of Scanning: Wherever feasible, the scanning of the examination volume shall be carried out from both sides of the weld on the same surface. Where the configuration or adjacent parts of the component are such that scanning from both sides is not feasible, this fact shall be included in the report of the examination.

T-441.3.2.5 Angle Beam Scanning: Wherever feasible, each examination shall be performed in two directions, i.e., approaching the weld from the opposite directions and parallel to the weld from opposite directions.

T-441.3.2.6 Scanning for Reflectors Oriented Parallel to the Weld: The angle beam search units shall be aimed at right angles to the weld axis, with the search unit manipulated so that the ultrasonic beams pass through the entire volume of weld metal. The adjacent base metal in the examination volume must be completely scanned by two angle beams, but need not be scanned by both angle beams from both directions.

T-441.3.2.7 Scanning for Reflectors Oriented Transverse to the Weld: The angle beam search units shall be aimed parallel to the axis of the longitudinal and circumferential welds. The search unit shall be manipulated so that the ultrasonic beams pass through of the examination volume. Scanning shall be done in two directions 180 degrees to

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 2-5**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 2 of 7)

each other to the extent possible. Areas blocked by geometric conditions shall be examined from at least one direction.

Code Case N-460, which accepts a reduction in examination coverage provided the reduction is less than 10%.

**4.0 Impracticality/Burden**

The steam generator tube sheet-to-stub barrel weld is approximately 3.3" thick. Access to scanning the complete circumference of this weld in all required directions is limited by a number of inspection covers, branch connections, a weld pad, and a vessel identification plate. These factors result in limited examination coverage from the scan directions required by ASME Section V and Section XI. These limitations are inherent to the original design of the steam generator vessel. Conformance with the ASME Section XI requirements for essentially 100% of the volumetric coverage would require extensive structural modifications to the steam generator vessel.

**5.0 Alternative Examinations or Testing**

The required 0, 45, and 60 degree scans required by Appendix I, were completed to the extent practical. The location and extent of the noted limitations precludes any additional scanning angles increasing examination coverage. The aggregate examination coverage achieved was 88.4%.

In addition to completing the required volumetric examination to the extent practical, numerous system leakage tests (ASME Section XI Category B-P and Generic Letter 88-05) at nominal system operating pressure (885 psig) and temperature (445°F) were completed with no evidence of leakage associated with the tube sheet-to-shell weld noted during the course of the interval.

Radiography as an alternative is not feasible because access is not available for film placement.

**6.0 Justification for Granting Relief**

No additional examinations were completed during the inspection interval; however, the examination coverage of 88.4% along with the results of the completed pressure tests provide reasonable assurance that pressure boundary integrity has been maintained for this component throughout the interval.

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**ISI Program Plan**  
**Braidwood Station Units 1 & 2, Second Interval**

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**10 CFR 50.55a RELIEF REQUEST I2R-50**  
**Attachment 2-5**  
**Braidwood Station Unit 1 Limited Examinations**  
**Revision 0**  
(Page 3 of 7)

**7.0 Precedents**

Similar limitations (structural limitations) on a Category C-A steam generator shell circumferential weld were encountered and accepted for the following unit:

Catawba Unit 2:

Letter from E. C. Marinos (U. S. NRC) to D. Jamil (Catawba Nuclear Station), "Catawba Nuclear Station, Unit 2, Request for Relief from the Requirements of the ASME Code (TAC Nos. MC7004, MC9197, MC9198, MC9199, MC9200, MC9202, MC9203, MC9204, MC9205, MC9206 and MC9207)," dated April 3, 2006

**8.0 References**

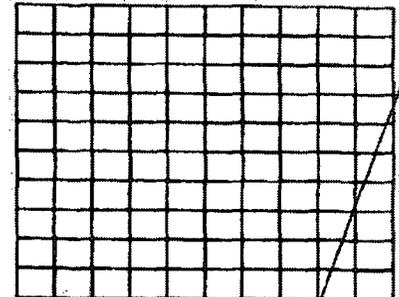
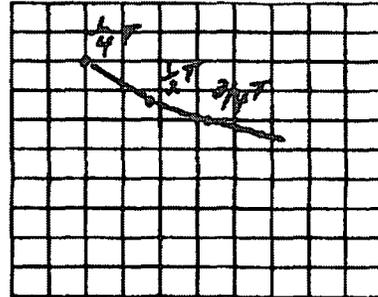
- 8.1 EPRI TR-112657 Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure"



# Calibration Data Sheet

Plant / Unit BRAIDWOOD / 2  
 Company EXELON  
 Comp / System Tube Sheet - Stub Barrel / SG  
 Procedure No. EXE-ISI-210  
 Rev / Chng. No. Rev 0  
 Cal. Block No. BWD 062  
 Cal. Block Temp. 75°F  
 Thermometer S/N: 105537  
 Size N/A Sch. N/A / 3.95" "T"

Data Sheet # A2R13-UT-037  
 Page 1 of 4



Cal. Checks	Time
Initial Calib.	07:32
Initial Calib. Date	4/24/08
Intermediate	N/A
Intermediate	N/A
Final Calib.	14:15
Final Calib. Date	4/24/08

Ferritic  Austenitic  
 Each Major CRT Div. = 0.60"

Cal. Direction:  Axial  Circ.  Both

Scan Area: || to Weld   
|| to Weld

Code Category: C-A Code Item: C01.30 Type: ULTRAGEL II  
 Batch: 06225

Examination Area / Weld	Access	Recordable Indications			Exam Sens.
		Yes	No	Geom	
<u>2SG-01-SGC-02</u>	<u>Tube Sheet Stub Barrel</u>		<u>X</u>		<u>44.0 dB</u>

Remarks / Reason for Incomplete Scan(s) COMPONENT TEMP: 89°F  
Scanned +14dB over reference sensitivity. See attached sheet for limitations.  
88.4% Code coverage obtained. NRI

Examiners: Douglas Tranter Level II Date 4/24/08  
Thomas E. Johnson Level II Date 4/24/08

Reviewers: Philip Abasco Level III Date 4/24/08 Further Evaluation Required?  Yes  No

EXELON LEVEL III REVIEW / DATE Kevin Hall III 4/29/08

Search Unit #1  
 Manufacture: KBA  
 Serial No.: 01BTJR  
 No. of Elements: 1  
 Size: 1.0" Shape: Round  
 Freq. 2.25 MHz Style: Gamma  
 Exam Angle: 0° Mode: Long  
 Measured Angle: N/A  
 Wedge Style: N/A

Search Unit Cable  
 Type: RG-174  
 Length: 6' No. of Con.: 0

Instrument Settings  
 Make / Model: Krautkramer USN 58L SW  
 Serial No.: 104765  
 Delay: 1.0241 Range: 6.0"  
 M'tl Cal / Vel: 0.2326 Pulsar: SQUARE  
 Damping: 500 Reject: 0%  
 Rep. Rate: AUTO HIGH Freq: 2.25 MHz  
 Filter: FIXED Mode: DUAL OFF  
 Rectify: FULLWAVE Voltage: 450  
 Pulse Width: 100  
 Reference Sensitivity (Sens.)  
 Axial: N/A Circ: N/A  
 SDH Sensitivity: 30.0  
 Zero: N/A

Search Unit #2  
 Manufacture: \_\_\_\_\_  
 Serial No.: \_\_\_\_\_  
 No. of Elements: \_\_\_\_\_  
 Size: \_\_\_\_\_ Shape: \_\_\_\_\_  
 Freq. \_\_\_\_\_ Style: \_\_\_\_\_  
 Exam Angle: \_\_\_\_\_ Mode: \_\_\_\_\_  
 Measured Angle: \_\_\_\_\_  
 Wedge Style: \_\_\_\_\_

Search Unit Cable  
 Type: \_\_\_\_\_  
 Length: \_\_\_\_\_ No. of Con.: \_\_\_\_\_

Instrument Settings  
 Make / Model: \_\_\_\_\_  
 Serial No.: \_\_\_\_\_  
 Delay: \_\_\_\_\_ Range: \_\_\_\_\_  
 M'tl Cal / Vel: \_\_\_\_\_ Pulsar: \_\_\_\_\_  
 Damping: \_\_\_\_\_ Reject: \_\_\_\_\_  
 Rep. Rate: \_\_\_\_\_ Freq: \_\_\_\_\_  
 Filter: \_\_\_\_\_ Mode: \_\_\_\_\_  
 Rectify: \_\_\_\_\_ Voltage: \_\_\_\_\_  
 Pulse Width: \_\_\_\_\_  
 Reference Sensitivity (Sens.)  
 Axial: \_\_\_\_\_ Circ: \_\_\_\_\_  
 SDH Sensitivity: \_\_\_\_\_  
 Zero: \_\_\_\_\_

Relief Request 12R-50  
 Attachment 2 - 5  
 Component: 2SG-01-SGC-02  
 Sheet 4 of 7

EXELON LEVEL III REVIEW / DATE Rubita 4/30/08

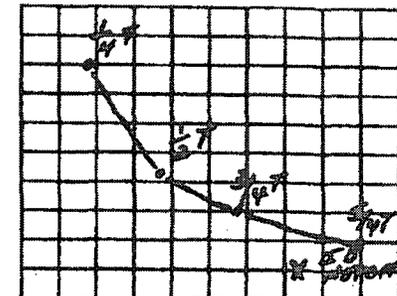
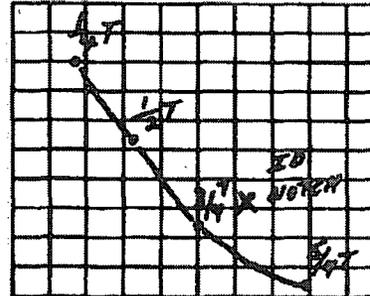


# Calibration Data Sheet

Plant / Unit BRAIDWOOD / 2  
 Company EXELON  
 Comp / System Tube Sheet - Stub Barrel / SG  
 Procedure No. EXE-ISI-210  
 Rev / Chng. No. Rev 0  
 Cal. Block No. BWD 062  
 Cal. Block Temp. 75°F  
 Thermometer S/N: 105537  
 Size N/A Sch. N/A / 3.95" "T"

Data Sheet # A2R13-UT-037  
 Page 2 of 4

Cal. Checks	Time
Initial Calib.	07:36 / 07:41
Initial Calib. Date	4/24/08
Intermediate	N/A
Intermediate	N/A
Final Calib.	14:18 / 14:22
Final Calib. Date	4/24/08



Ferritic  Austenitic  
 Each Major CRT Div. = 0.90" / 1.2"

Cal. Direction:  Axial  Circ.  Both

Scan Area: || to Weld   
|| to Weld

Code Category: C-A Code Item: C01.30 Type: ULTRAGEL II  
 Batch: 08225

Couplant

Examination Area / Weld	Access	Recordable Indications			Exam Sens.
		Yes	No	Geom	
2SG-01-SGC-02 (45° AX)	Tube Sheet Stub Barrel		X		55.5 dB
2SG-01-SGC-02 (45° CW/CCW)	Tube Sheet Stub Barrel		X		55.5 dB
2SG-01-SGC-02 (60° AX)	Tube Sheet Stub Barrel		X		59.5 dB
2SG-01-SGC-02 (60° CW/CCW)	Tube Sheet Stub Barrel		X		59.5 dB

Remarks / Reason for Incomplete Scan(s) COMPONENT TEMP: 89°F  
Scanned +14dB over reference sensitivity. See attached sheet for limitations.  
88.4% Code coverage obtained. NRI

Examiners: [Signature] Level II Date 4/24/08  
[Signature] Level II Date 4/24/08

Reviewers: [Signature] Further Evaluation Required?  Yes  No

Search Unit #1  
 Manufacture: KBA  
 Serial No.: 009XBK  
 No. of Elements: 1  
 Size: 0.5" x 1.0" Shape: Rect  
 Freq. 2.25 MHz Style: Gamma  
 Exam Angle: 45° Mode: Shear  
 Measured Angle: 45°  
 Wedge Style: Non Integral

Search Unit Cable

Type: RG-174  
 Length: 6' No. of Con.: 0

Instrument Settings

Make / Model: Krautkramer USN 58L SW  
 Serial No.: 104765  
 Delay: 12.6662 Range: 9.0"  
 M'tl Cal / Vel: .1269 Pulser: SQUARE  
 Damping: 500 Reject: 0%  
 Rep. Rate: AUTO HIGH Freq: 2.25 MHz  
 Filter: FIXED Mode: DUAL OFF  
 Rectify: FULLWAVE Voltage: 450  
 Pulse Width: 100  
 Reference Sensitivity (Sens.)  
 Axial: N/A Circ: N/A  
 SDH Sensitivity: 41.5  
 Zero: N/A

Search Unit #2  
 Manufacture: KBA  
 Serial No.: H25005  
 No. of Elements: 1  
 Size: 0.5" x 1.0" Shape: Rec  
 Freq. 2.25 MHz Style: Gamma  
 Exam Angle: 60° Mode: She  
 Measured Angle: 59°  
 Wedge Style: Non Integral

Search Unit Cable

Type: RG-174  
 Length: 6' No. of Con.: 0

Instrument Settings

Make / Model: Krautkramer USN 58L SW  
 Serial No.: 104765  
 Delay: 15.2038 Range: 12.0"  
 M'tl Cal / Vel: .1270 Pulser: SQUARE  
 Damping: 500 Reject: 0%  
 Rep. Rate: AUTO HIGH Freq: 2.25 MHz  
 Filter: FIXED Mode: DUAL OFF  
 Rectify: FULLWAVE Voltage: 450  
 Pulse Width: 100  
 Reference Sensitivity (Sens.)  
 Axial: N/A Circ: N/A  
 SDH Sensitivity: 45.5  
 Zero: N/A

Component: 2SG-01-SGC-02 Sheet 5 of 7

Relief Request I2R-50 Attachment 2-5

EXELON LEVEL II REVIEW / DATE [Signature] 04-29-08

LEVEL II REVIEW / DATE [Signature] 4-30-08



NUCLEAR SERVICES  
INSPECTION SERVICES

A2R13-UT-037  
Page 3 of 4

WELD PROFILE / DATA

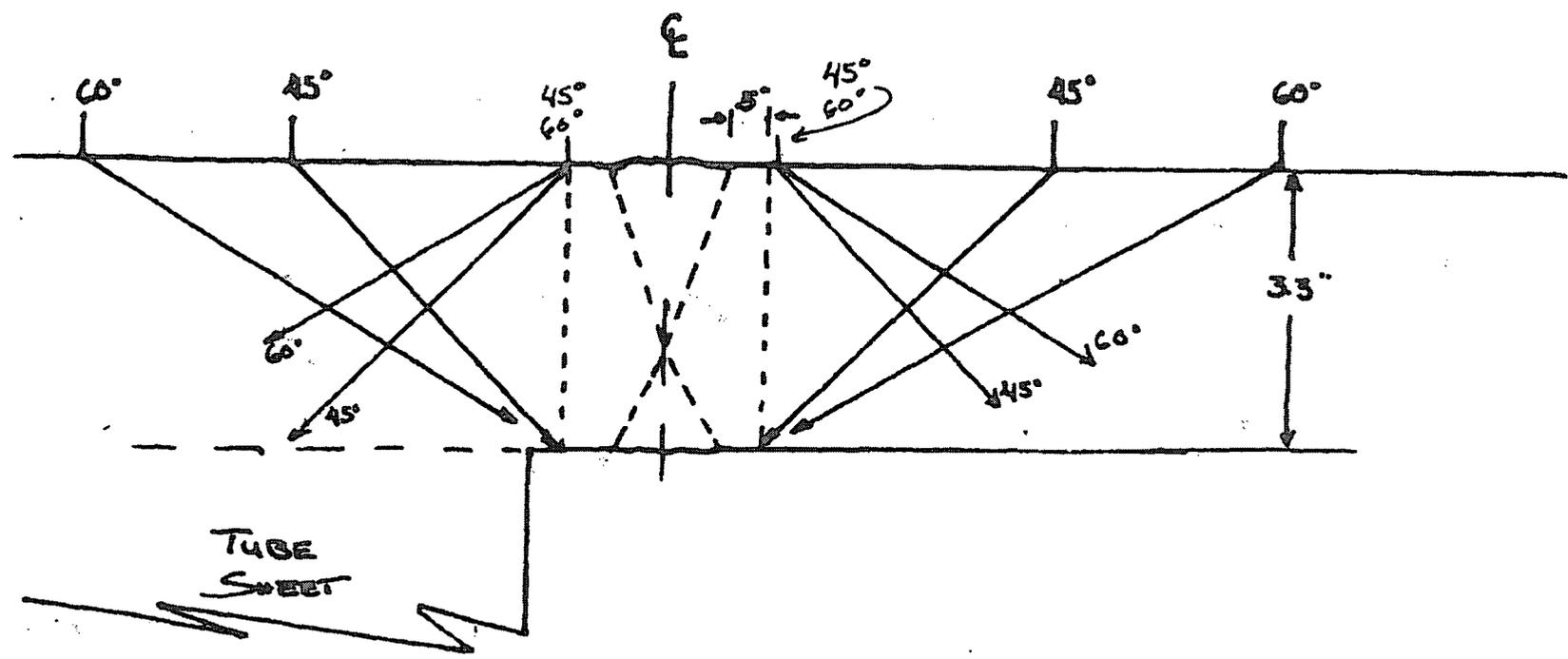
PLANT BRAIDWOOD UNIT 2 SKETCH 2SG-01

SYST./COMP. SG / Steam Generator 2RC01BA PROCEDURE EXE-ISI-210, Rev. 0

EXAMINER Douglas Gronewold DATE 4/24/2008 IDENT. 2SG-01-SGC-02  
Douglas Gronewold, Level II

WELD CROWN 1.7" 1/2 SCALE

UP  
1



Relief Request 12R-50  
Attachment 2 - 5  
Component: 2SG-01-SGC-02  
Sheet 6 of 7

Philip Moran to III 4/20/08

BELOW LEVEL OF REVIEW / DATE: KENNETH HALL III 4-29-08

Above REVIEW / DATE: Rubita 4/30/08



LIMITATION TO EXAMINATION

PLANT BRAIDWOOD UNIT 2 SKETCH 2SG-01  
 SYSTEM/COMPONENT SG / Steam Generator 2RC01BA PROCEDURE EXE-ISI-210, Rev. 0  
 EXAMINER Douglas Gronewald DATE 4/24/2008  
 Douglas Gronewald, Level II

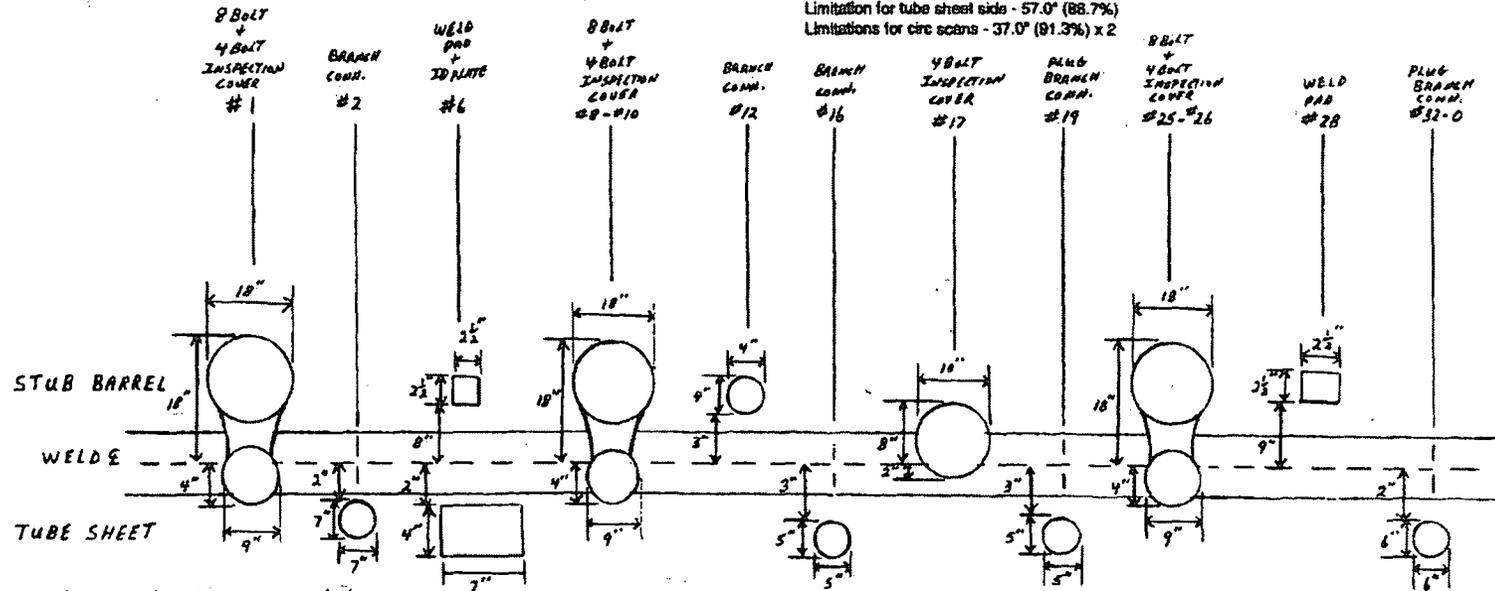
RELATED TO: UT X PT     MT     VT     IDENT. NO. 2SG-01-SGC-02

PROVIDE GENERAL INFORMATION TO DESCRIBE APPROXIMATE SIZE, LOCATION AND TYPE OF LIMITATION.

Weld Length - 427.5"

88.4% Coverage

Limitations on stud barrel side - 68.0" (84.1%)  
 Limitation for tube sheet side - 57.0" (88.7%)  
 Limitations for circ scans - 37.0" (91.3%) x 2



EXELON REVIEW / DATE  
 REVIEW WALL TIME 2:00 4-29-08

ADD REVIEW DATE  
White 4/30/08

Relief Request 12R-50  
 Attachment 2 - 5  
 Component: 2SG-01-SGC-02  
 Sheet 7 of 7