FPL Energy Duane Arnold, LLC
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Palo, Iowa 52324

FPL Energy.

Duane Arnold Energy Center

November 7, 2007

NG-07-0809
10 CFR 50.55a

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

Duane Arnold Energy Center
Docket 50-331
License No. DPR-49

Response to Request for Additional Information Related to the Relief Request for 3rd Period Limited Weld Examinations

References:
1. Letter, Gary Van Middlesworth (FPL Energy Duane Arnold) to Document Control Desk (USNRC) Relief Request for 3rd Period Limited Weld Examinations, dated May 18, 2007 (ML071510076)
2. Letter, Karl D. Feintuch (USNRC) to Richard L Anderson (FPL Energy Duane Arnold), Duane Arnold Energy Center - Request for Additional Information Re: Relief Request from American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, Rules for Inservice Inspection of Nuclear Power Components, 1998 Edition, Subsection IWB, Subarticle IWB-2500, "Examination and Pressure Test Requirements," and Subsection IWC, Subarticle IWC-2500, "Examination and Pressure Test Requirements," to Allow Performance of Limited Examinations of Various Welds (TAC No. MD5669), dated October 31, 2007 (ML072820132)

Reference 1 provided a request for relief from IWB-2500 and IWC-2500 to allow performance of limited examinations of various welds.

By letter dated October 31, 2007 (Reference 2), the Staff issued a request for additional information regarding Reference 1. The response to the requests of Reference 2 is provided in Enclosure 1 of this letter.

FPL Energy Duane Arnold requests approval of the request of Reference 1 by the end of May 2008.

This letter contains no new commitments nor revises any previous commitments.

A047

NRR

If you have any questions, please contact Steve Catron at (319) 851-7234.

Richard L. Anderson
Vice President, Duane Arnold Energy Center
FPL Energy Duane Arnold, LLC

Enclosures

cc: Administrator, Region III, USNRC
Project Manager, DAEC, USNRC
Senior Resident Inspector, DAEC, USNRC

Enclosure 1

Response to Request for Additional Information (RAI) Related to the Relief Request for 3rd Period Limited Weld Examinations

Response to Request for Additional Information (RAI) Related to the Relief Request for 3rd Period Limited Weld Examinations

2.1 ***Request for Relief, Examination Category B-D, Item B3.90, Full Penetration Welded Nozzles in Vessels***

The licensee previously proposed an alternative, which was approved by Safety Evaluation Report (SER) dated October 6, 2004 (ADAMS accession number ML042380089), to use ASME Code Case N-613-1, which limits the examination volume of Examination Category B-D welds to the weld and 1/2-inch of adjacent base material on each side, in lieu of the ASME Code-required examination volume of the weld and 1/2-T of adjacent base material, where T is the vessel thickness. The current request for relief indicates that achieving greater than 90% (of the volume approved by the October 6, 2004 SER) could not be accomplished for the subject reactor pressure vessel (RPV) nozzle-to-vessel welds.

2.1.1 *Please re-calculate and report the volumetric coverage(s) obtained for the subject Examination Category B-D nozzle-to-vessel welds with respect to ASME Code requirements, i.e., calculate the coverage when the volume required is the weld and 1/2-T of adjacent base material, where T is the vessel wall thickness.*

FPL Energy Duane Arnold Response:

The following Table provides the recalculated percentages

Component Number	Recalculated Coverage	Description
MSC-D001	56.83%	Main Steam Nozzle to Vessel Weld
MSD-D001	56.83%	Main Steam Nozzle to Vessel Weld
FWB-D001	56.71%	Feedwater Nozzle to Vessel Weld
FWC-D001	56.71%	Feedwater Nozzle to Vessel Weld
FWD-D001	56.71%	Feedwater Nozzle to Vessel Weld
RRG-D001	53.73%	Recirculation Riser Nozzle to Vessel Weld
JPB-D001	53.49%	Jet Pump Instrumentation Nozzle to Vessel Weld
LCA-D001	50.72%	Standby Liquid Control Nozzle to Vessel Weld
VIB-D001	57.45%	Vessel Instrumentation Nozzle to Vessel Weld

2.1.2 The licensee stated that the subject nozzle-to-vessel welds are accessible from the vessel side of the RPV, but examinations cannot be performed from the nozzle side due to forging curvature. It is also stated that certain nozzle-to-vessel weld examinations are additionally limited by RPV design obstructions. However, these statements do not provide adequate descriptive information and technical discussion to support a determination of impracticality and that the required examinations have been performed to the maximum extent possible at DAEC.

a. Provide a detailed description of examination limitations including access requirements for automated or manual ultrasonic techniques employed, and a description of each component geometry that restricts or limits examinations. The technical bases should include cross-sectional sketches of the weld indicating ultrasonic coverage(s) for each technique employed and details of the weld and base metal materials.

FPL Energy Duane Arnold Response:

The examination of all nozzle-to-vessel welds is limited by the nozzle forging curvature. The configuration for each of the above mentioned nozzles is included for review in Enclosure 2.

For nozzle LCA-D001, the examination is additionally limited by the proximity of the weld attaching the skirt knuckle to the RPV bottom head. The distance from the bottom of LCA-D001 weld to the skirt is approximately six inches.

For nozzle JPB-D001, the examination is additionally limited due to an insulation bracket welded on the vessel. Removal of this bracket is not feasible due to the fact that it supports the lower ring of RPV insulation.

b. In addition, the licensee should submit argument(s) as to why the use of other inspection methods (such as phased array ultrasonic testing) would not reasonably increase the examination coverage(s).

FPL Energy Duane Arnold Response:

As stated in Reference 1, the procedures used at DAEC incorporate examination techniques qualified under Appendix VIII of ASME Section XI Code by the Performance Demonstration Initiative (PDI) for examination of the nozzle-to-vessel shell welds. In addition, FPL Energy Duane Arnold contracted EPRI to computer model each nozzle-to-vessel weld and nozzle inner corner region to assist FPL Energy Duane Arnold in developing and qualifying ultrasonic techniques for these regions. At the time that these components were examined, the phased array technology had not been qualified by Performance Demonstration Initiative for examination of nozzle-

to-vessel welds or the nozzle inner corner region. With the computer modeling of the examination volume and the qualified PDI technique, the examinations were performed utilizing the latest technology.

2.1.3 State the total number of Examination Category B-D welds at DAEC, and provide a listing of the volumetric coverage(s) completed for each of these welds. Report any unacceptable flaws detected during the examination of the welds.

FPL Energy Duane Arnold Response:

The total number of Category B-D welds at the DAEC is 34 of which one is inaccessible due to the CRD array (the inaccessible nozzle is the bottom head drain). There have been no unacceptable flaws identified during the examinations of the listed welds. FPL Energy Duane Arnold has submitted three relief requests with Safety Evaluation Reports (SERs) dated October 18, 1999, March 7, 2001, and March 26, 2003. Below is a table with the accumulated percentages of nozzle to vessel welds from the above SERs.

List of Nozzle-to-Vessel Welds

Nozzle ID	Period Examined	Code Coverage*	Remarks
CRA-D001	1	61.3%	Control Rod Drive
CSA-D001	1	63%	Core Spray
CSB-D001	1	66%	Core Spray
FWA-D001	1	56.5%	Feedwater
HVA-D001	1	66.0%	Head Vent
HSB-D001	2	70.9%	Head Spare
JPA-D001	1	61.1%	Jet Pump
MSA-D001	1	59.6%	Main Steam
MSB-D001	2	63%	Main Steam
RHA-D001	1	65.7%	Head Spray
RCA-D001	2	59%	Recirculation Suction
RCB-D001	1	57%	Recirculation Suction
RRA-D001	1	63%	Recirculation Inlet
RRB-D001	1	63%	Recirculation Inlet
RRC-D001	1	63%	Recirculation Inlet
RRD-D001	1	51.4%	Recirculation Inlet
RRE-D001	1	64%	Recirculation Inlet
RRF-D001	2	73.36%	Recirculation Inlet
RRH-D001	1	64%	Recirculation Inlet
VIA-D001	2	86.2%	Vessel Instrumentation
VIC-D001	2	86.2%	Vessel Instrumentation
VID-D001	2	63%	Vessel Instrumentation
VIE-D001	1	66%	Vessel Instrumentation
VIF-D001	2	86.2%	Vessel Instrumentation

*Due to the nozzle design it is not feasible to effectively exam 100% of the required code volume as defined in Figure IWB-2500-7(b).

2.2 ***Request for Relief, Examination Category B-D, Item B3.100, Inner Radius Sections of Full Penetration Welded Nozzles in Vessels***

2.2.1 *The licensee stated that the proximity of the RPV skirt weld obstructed access for performing the inner radius section examination on Standby Liquid Control Nozzle LCA-D001. However, this statement does not provide adequate descriptive information and technical discussion to support a determination of impracticality and that the required examination was performed to the maximum extent possible at DAEC.*

a. *Provide a detailed description of examination limitations including access requirements for automated or manual ultrasonic techniques employed, and a description of the component geometry that restricts or limits the examination. The technical basis should include cross-sectional sketches of the inner radius section indicating ultrasonic coverage for each technique employed.*

FPL Energy Duane Arnold Response:

A description of examination limitations for performing the UT on the inner radius section on Standby Liquid Control Nozzle LCA-D001 is included for review as Enclosure 3. The configuration of the nozzle and a photo indicating the proximity of the nozzle to the skirt is also included for review. The request for additional information included a request for cross sectional sketches of the inner radius section. Since the limitation is due to the skirt welded to the vessel and not the configuration as it was on the nozzle-to-vessel welds discussed above, a cross-sectional view is not warranted. To clarify, the skirt limits the surface contact area of the transducer.

The manual ultrasonic techniques employed were as recommended in the EPRI modeling Report IR-2004-62. The techniques utilized were limited by the proximity of the weld attaching the Skirt Knuckle to the RPV bottom head. The supplied photo in Enclosure 3 shows that the nozzle is located close (approximately six inches) to the skirt weld.

b. *In addition, the licensee should submit an argument as to why the use of other inspection methods (such as phased array ultrasonic testing) would not reasonably increase the examination coverage.*

FPL Energy Duane Arnold Response:

Please refer to the Section 2.1.2 b response. FPL Energy Duane Arnold used the latest PDI demonstrated procedure for the examination of the listed welds at the DAEC.

2.3 ***Request for Relief, Examination Category B-J, Item B9.11, Pressure Retaining Welds in Piping***

2.3.1 *The licensee stated that Weld RBB-J001 is a branch connection of the recirculation bypass line to the recirculation discharge line, and that the weldolet side is not accessible for scanning due to geometry. However, this statement does not provide adequate descriptive information and technical discussion to support a determination of impracticality and that the required examination was performed to the maximum extent possible at DAEC.*

a. *Provide a detailed description of examination limitations including access requirements for automated or manual ultrasonic techniques employed, and a description of the component geometry that restricts or limits the examination. The technical basis should include cross-sectional sketches of the weld indicating ultrasonic coverage for each technique employed.*

FPL Energy Duane Arnold Response:

The weld RBB-J001 is a branch connection of the recirculation bypass line to the recirculation discharge line. The weldolet side of the weld is not accessible for scanning. The PDI qualified procedure is NOT qualified for "detection or length sizing of circumferentially oriented flaw indications when only single side access is available and the flaw is located on the far side of the weld." Because of this, only 50% coverage can be claimed. The examination of this weld is further limited by the existing weld crown. Included for review is Inservice Inspection Report I01070 in Enclosure 4.

b. *State the size, thickness and materials of construction of the subject weld.*

FPL Energy Duane Arnold Response:

The size of the weld is 4 inches, thickness 0.337 inches, and material is 304 stainless steel.

2.3.2 *The licensee listed this weld as Examination Category B-J, Item B9.11, which is for circumferential butt welds, NPS 4-inch and larger. However, the licensee stated that Weld RBB-J001 is a branch connection. Discuss why this weld is not listed as ASME Code Item B9.31 or B9.32.*

FPL Energy Duane Arnold Response:

The weld is the first circumferential weld off of a weld-o-let connection. Please refer to Enclosure 4 which illustrates the weld limitation.

2.3.3 *State the total population of ASME Code Examination Category B-J welds of similar pipe diameter and wall thickness examined on the same recirculation loop at DAEC, and discuss the volumetric coverage(s) obtained for each of these welds.*

FPL Energy Duane Arnold Response:

There are a total of nine welds on the same bypass line for Recirculation Loop B. Weld RBB-J001 was the only weld selected for examination under the ISI Program (1989 Edition of ASME Section XI). For the implementation of Risked Informed ISI, these nine welds are categorized as Category 6a (5a with IGSCC). None of these welds were selected under the RI-ISI Program.

2.4 ***Request for Relief, Examination Category C-A, Item C1.20, Pressure Retaining Welds in Vessels***

2.4.1 *The license stated that heat exchanger tie-down brackets obstruct access to the subject head-to-shell weld, limiting examination coverage. However, this statement does not provide adequate descriptive information and technical discussion to support a determination of impracticality and that the required examination was performed to the maximum extent possible at DAEC.*

a. *Provide further text and/or a cross-sectional sketch describing the basis for impracticality and showing volumetric coverage for Weld HEA-CA-05. In addition, state or show the material, thicknesses, and outside diameters for the subject component. Discuss why the tie-down brackets cannot be removed to allow greater access.*

FPL Energy Duane Arnold Response:

Please refer to the attached ISI Report I01098 page 54 of 56 (Enclosure 5) for location of the heat exchanger tie-down brackets that obstruct the head-to-shell weld on the Residual Heat Removal (RHR) Heat Exchanger (Weld HEA-CA-05), which limits the examination coverage. Also provided in Enclosure 5 are some photos showing typical welded attachments to the heat exchanger. The original Form U-1 (Enclosure 6) is attached to identify material, thickness, and outside diameter of the RHR Heat Exchanger.

b. State whether the volumetric examination was performed with procedures and personnel that have been qualified in accordance with ASME Code, Section XI, Appendix VIII.

FPL Energy Duane Arnold Response:

The FPL Energy Duane Arnold Administrative Control Procedure that was utilized at the DAEC for the examination on Weld HEA-CA-05 – Head to shell weld on the RHR Heat Exchanger was ACP 1211.34, "Manual Ultrasonic Examination of Ferritic Welds ≤ 2 inches Thickness." This procedure is in accordance with ASME Section XI, Appendix III.

2.4.1(1) State the total population of ASME Code Examination Category C-A welds at DAEC, and discuss the volumetric coverage(s) obtained for each of these welds.

FPL Energy Duane Arnold Response:

The DAEC has one category C-A Item C1.20 weld (HEA-CA-05) and two category C-A, Item C1.10 welds (HEA-CA-01 and HEA-CA-03). The following table provides the examination coverage of the three identified welds.

Examination Category	Item Number	Component Number	Period Examined	Code Coverage	Description
C-A	C1.10	HEA-CA-01	3	94%	RHR Heat Exchanger Tube Sheet to Shell Weld
C-A	C1.10	HEA-CA-03	1	100%	RHR Heat Exchanger Shell Course Weld
C-A	C1.20	HEA-CA-05	2	78.07%	RHR Heat Exchanger Head to Shell Weld

ULTRASONIC EXAMINATION DATA SHEET
REACTOR PRESSURE VESSEL WELDS

9

Site: DAEC	Report No.: I05005	Calibration Sheet No.:	C-110, C-111
		Data Sheet No.:	N/A

Procedure No.: ACP 1211.27 Rev. 1

System:	Reactor Vessel	Exam Surface Temp.:	111 °F	Couplant:	Humex
Weld ID:	MSC-D001	Thermometer S/N:	3991	Batch No.:	98165

Examination Surface: ID☐ OD☒		Material Type:	CS ☒ SS ☐	Exam Date:	04/14/05
L_o Reference	TDC	R_o Reference:	WCL	Exam Start:	10:00
				Exam End:	11:00

Scan Surface	Exam Number
Perpendicular UpStream	1
Perpendicular DownStream	2
Parallel CW	3
Parallel CCW	4

Search Unit Angle	Scan Sensitivity	Exam Number
60° RL Zone 1	76.7 dB	1, 3, 4
60° RL Zone 2	83.0 dB	1, 3, 4
N/A	N/A	N/A
N/A	N/A	N/A

INDICATIONS

Indication No.	L (in) From Ref			W (in) From Ref			Sweep Reading ☒MP or ☐ Depth			Max Amp % Dac	Examination (1 - 4)
	L-1	L-Max	L-2	W-1	W-Max	W-2	SW-1 ☐ M1 ☐	SW-Max	SW-2 ☐ M2 ☐		
NRI	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

REMARKS/LIMITATIONS

WO: 1129016

Single side access due to configuration. Reference EPRI modeling report No. IR-2004-62 for inner 15% examination. Obtained 79.38% coverage of required volume. See attached coverage plot.

☒ Previous Examination Data Reviewed

Stevermer, A. Examiner (s)	II Level	04/14/05 Date	Dohmen, F. Level III Review	4/19/05 Date	Bowers, J. ANII Review	4-20-05 Date

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-110
Linearity Sheet No.: L-002

Procedure No.: ACP 1211.27 Revision: 1

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01448103 (Serial No.)

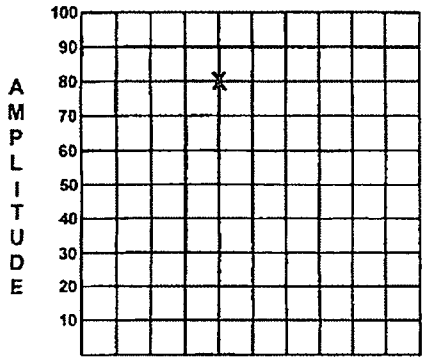
Search Unit: RTD (Manufacturer) | TRL2-ST FS~125 mm (Model) | 02-102 (Serial No.) | 2 (24X42) mm Rectangular (Size) | 2.0 MHz (Freq.) | 60° / RL (Angle / Mode) | 1.05" (Incident to wedge front)

Cable: 2 (RG-174) (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 66 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 6.329"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	6.329"
Pulse Width:	N/A	Velocity:	.2332
Rep Rate:	Auto	Delay:	0.00
Damping:	150 Ohms	Zero Offset:	12.98
Display Mode:	Fullwave	Gain - Axial Scan:	62.7 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator CS Rompas S/N LMT-17

Reflector:	1/4T SDH	2" RAD
Max Amplitude:	80%	80%
Sweep:	4.0	3.2
Gain:	62.7 dB	47.6 dB

Calibration Verification

Initial Calibration Time:	08:56	Verification Times:			
Final Calibration Time:	13:55	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
MSC-D001	I05005	Work Order: 1129016
MSD-D001	I05007	Work Order: 1129016
VCB-C005	I05090	Work Order: 1129072
		Squint Angle 5°
		Configuration of Elements: D-SBS
		Zone 1

Stevermer, A. (Examiner)	II (Level)	04/14/05 (Date)	Dohmen, F. (Level III Review)	4/19/05 (Date)	Bowers, J. (ANII Review)	4-20-05 (Date)

NG 142Z Rev. 4

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-111
Linearity Sheet No.: L-002

Procedure No.: ACP 1211.27 **Revision:** 1

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01448103 (Serial No.)

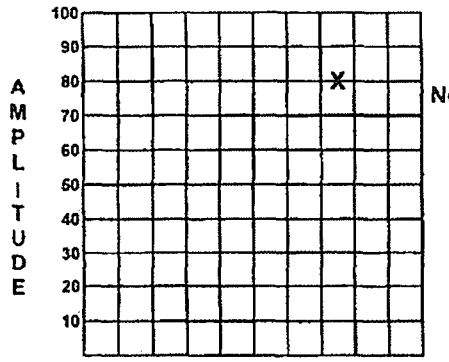
Search Unit: RTD (Manufacturer) | TRL2-ST FS~125 mm (Model) | 02-102 (Serial No.) | 2 (24X42) mm Rectangular (Size) | 2.0 MHz (Freq.) | 60° / RL (Angle / Mode) | 1.05" (Incident to wedge front)

Cable: 2 (RG-174) (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 66 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) **Thermometer:** 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 14.45"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	14.45"
Pulse Width:	N/A	Velocity:	.2332
Rep Rate:	Auto	Delay:	12.98
Damping:	150 Ohms	Zero Offset:	0.0
Display Mode:	Fullwave	Gain - Axial Scan:	71.0 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator: CS Rompas S/N: LMT-17

Reflector:	ID Notch	2" RAD
Max Amplitude:	80%	80%
Sweep:	7.5	1.2
Gain:	71.0 dB	47.2 dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	09:04				
Final Calibration Time:	13:58	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
MSC-D001	I05005	Work Order: 1129016
MSD-D001	I05007	Work Order: 1129016
VCB-C005	I05090	Work Order: 1129072
		Squint Angle 5°
		Configuration of Elements: D-SBS
		Zone 2

Stevermer, A. (Examiner)	II (Level)	04/14/05 (Date)	Dohmen, F. (Level III Review)	4/19/05 (Date)	Bowers, J. (ANII Review)	4-20-05 (Date)

NG 142Z Rev. 4

Nozzle to RPV Coverage Calculation Sheet

Coverage calculated to requirements of Code Case N-613 - I
Note: calculations performed using 2D plot only

Nozzle ID N3

Area required to be examined

Axial scan direction: Height x width

5.25 inches x 3.007 inches equals 15.7868 square inches

Parallel scan direction: Height x width

5.25 inches x 3.007 inches equals 15.7868 square inches

Total area required to be examined 31.5735 square inches required for complete exam

Actual area examined

60 degree R.L. Axial scan direction: Height x width

5.25 inches x 3.007 inches equals 15.7868 square inches

Triangular area not examined (if applies) 1.24 1/2 base x 2.16 height equals 1.3392 square inches

Axial scan direction area examined 14.4476 square inches

60 degree R.L. Parallel scan direction: Height x width

5.25 inches x 1.86 inches equals 9.765 square inches

Additional inner 15% area achieved using 40 & 45 degree shear techniques: Height x width

0.7875 inches x 1.08 inches equals 0.8505 square inches

Combining all scan directions: 25.0631 square inches for total exam

Divide area examined by required area: equals coverage achieved 79.38 % coverage for total exam

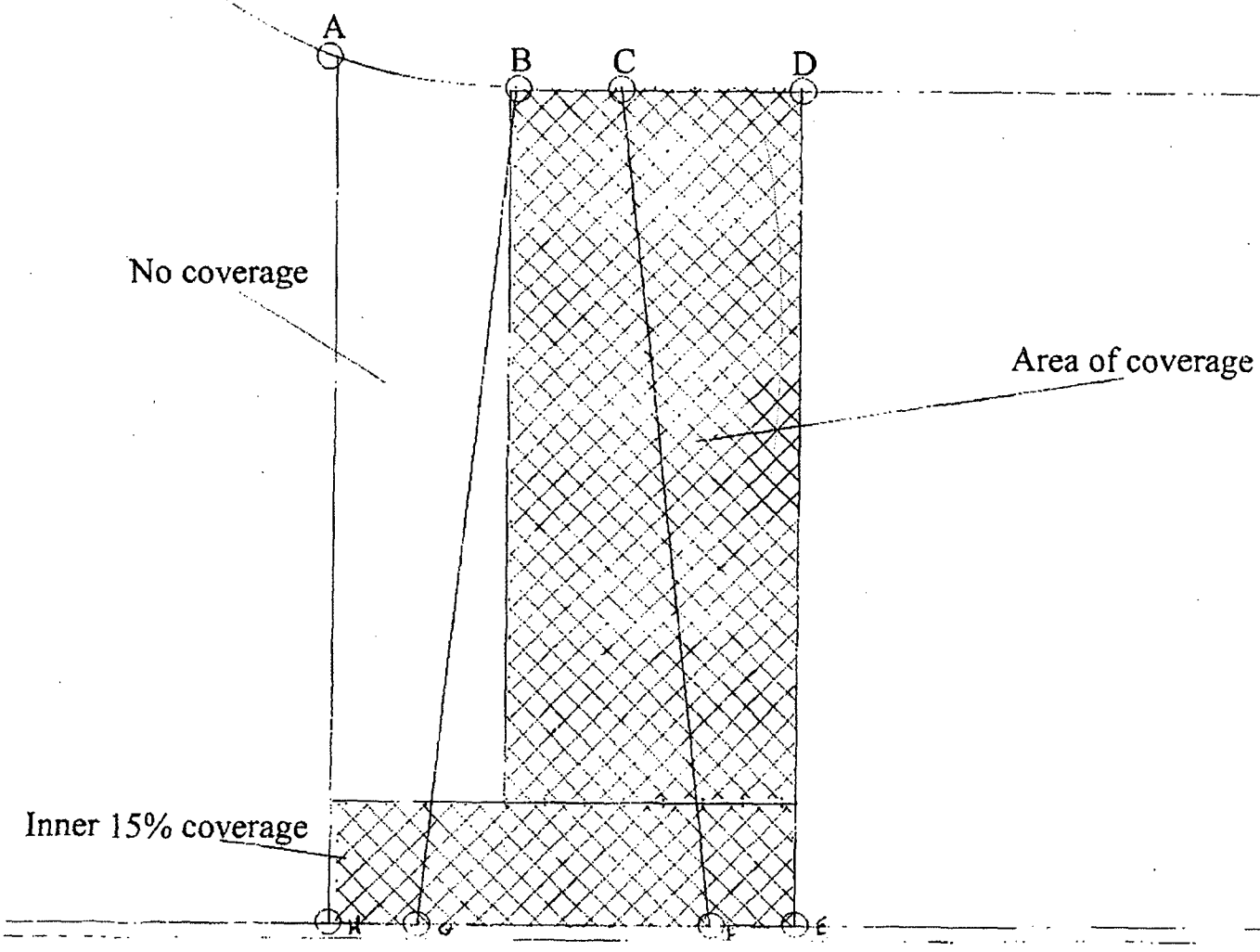
Calculations performed by: Todd Blechinger Level III

DAEC Review Frank Dohmen 4/11/05 Level III

ANII Review Jeremy Bowers
JBL 4 20 05

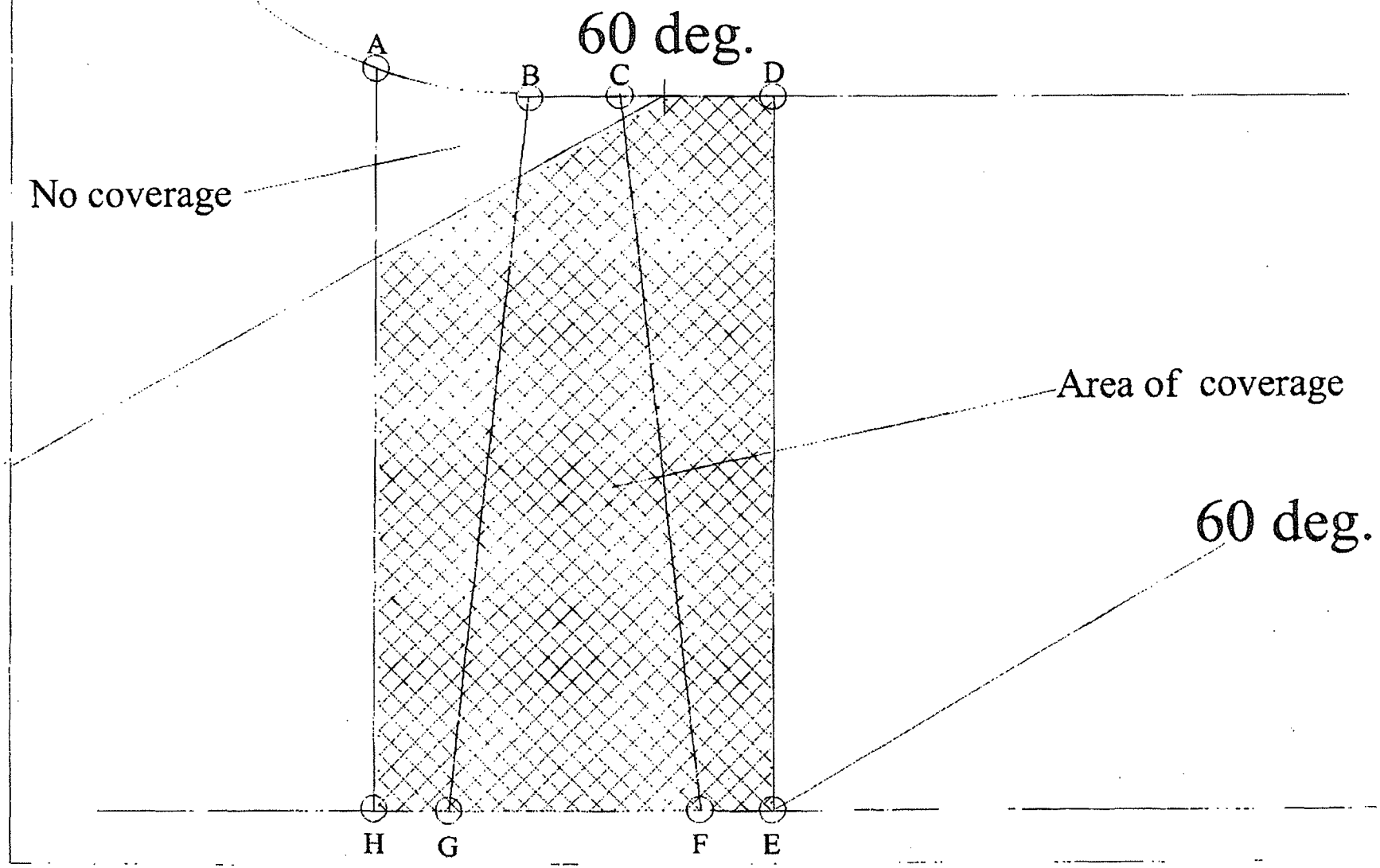
DAEC N3 Coverage Plot
Parallel scan direction

Examiner
Review AS 4-20-05
Report # I0500775
Page ___ of ___



DAEC N3 Coverage Plot
Axial scan direction

Examiner [illegible]
Review
Report # 105005
Page ___ of ___



DAEC N3 Coverage Plot
Axial scan direction

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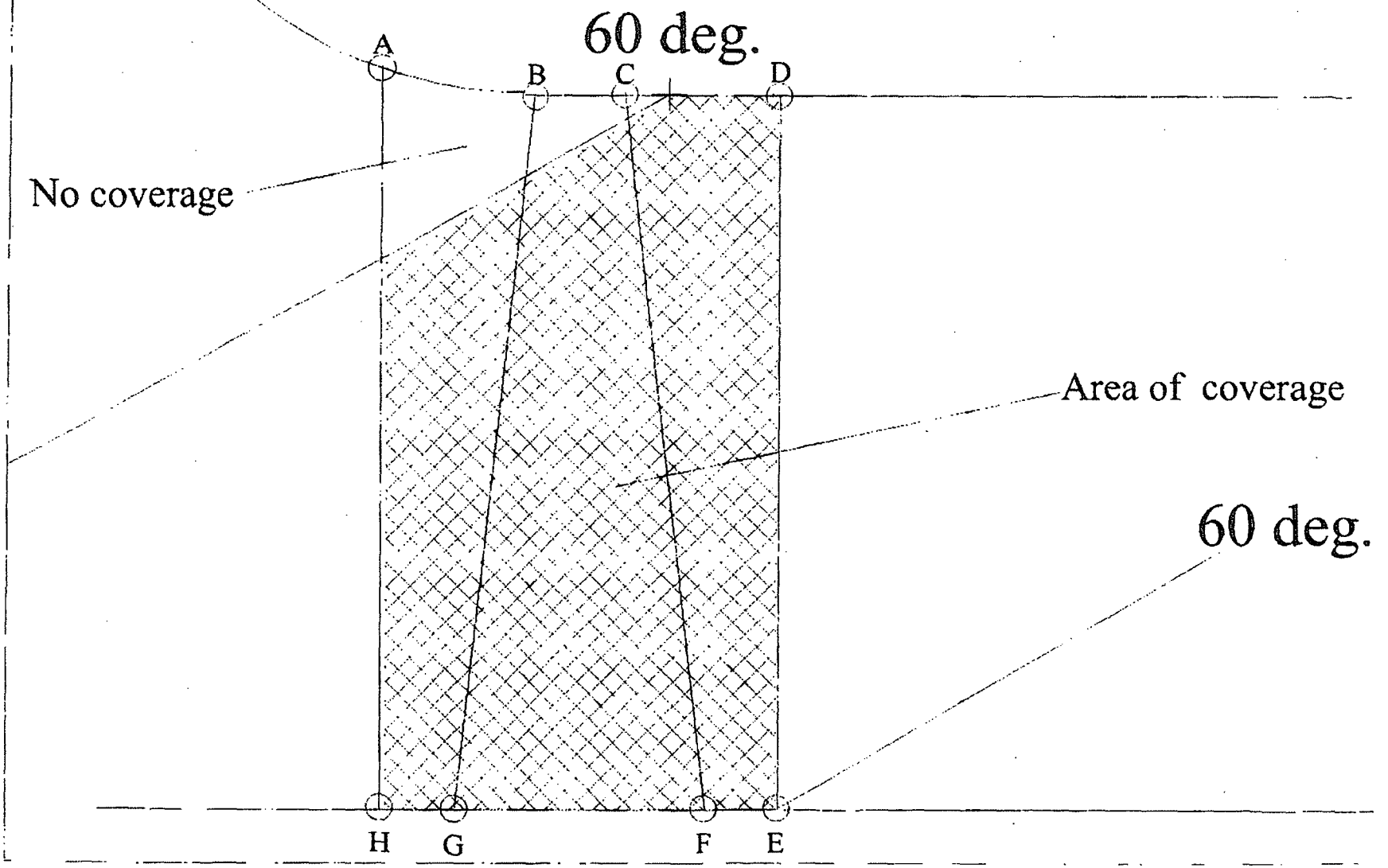


ULTRASONIC EXAMINATION DATA SHEET
REACTOR PRESSURE VESSEL WELDS

(10)

Site: DAEC	Report No.: I05007	Calibration Sheet No.:	C-110, C-111
		Data Sheet No.:	N/A

Procedure No.: ACP 1211.27 Rev. 1

System:	Reactor Vessel	Exam Surface Temp.:	111 °F	Couplant:	Humex
Weld ID:	MSD-D001	Thermometer S/N:	3991	Batch No.:	98165

Examination Surface: ID☐ OD☒	Material Type: CS ☒ SS ☐	Exam Date:	04/14/05
L_o Reference TDC	R_o Reference: WCL	Exam Start:	10:00
		Exam End:	11:00

Scan Surface	Exam Number
Perpendicular UpStream	1
Perpendicular DownStream	2
Parallel CW	3
Parallel CCW	4

Search Unit Angle	Scan Sensitivity	Exam Number
60° RL Zone 1	76.7 dB	1, 3, 4
60° RL Zone 2	83.0 dB	1, 3, 4
N/A	N/A	N/A
N/A	N/A	N/A

INDICATIONS

Indication No.	L (In) From Ref			W (In) From Ref			Sweep Reading ☒MP or ☐ Depth			Max Amp % Dac	Examination (1 - 4)
	L-1	L-Max	L-2	W-1	W-Max	W-2	SW-1 ☐ M1 ☐	SW-Max	SW-2 ☐ M2 ☐		
NRI	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

REMARKS/LIMITATIONS

WO: 1129016

Single side access due to configuration. Reference EPRI modeling report No. IR-2004-62 for inner 15% examination. Obtained 79.38% coverage of required volume. See attached coverage plot.

☒ Previous Examination Data Reviewed

II 04/14/05	4/19/05	JBL	4-20-05
Stevermer, A. Level Date Examiner (s)	Dohmen, F. Date Level III Review	Bowers, J. Date ANII Review	

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-110
Linearity Sheet No.: L-002

Procedure No.: ACP 1211.27 Revision: 1

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01448103 (Serial No.)

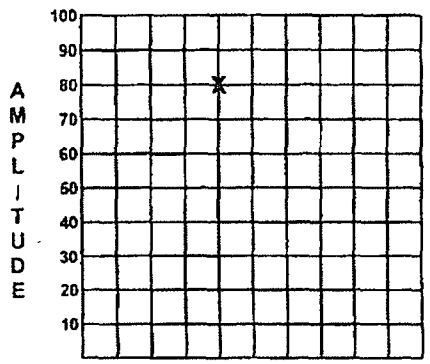
Search Unit: RTD (Manufacturer) | TRL2-ST FS~125 mm (Model) | 02-102 (Serial No.) | 2 (24X42) mm Rectangular (Size) | 2.0 MHz (Freq.) | 60° / RL (Angle / Mode) | 1.05" (Incident to wedge front)

Cable: 2 (RG-174) (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 66 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 6.329"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	6.329"
Pulse Width:	N/A	Velocity:	.2332
Rep Rate:	Auto	Delay:	0.00
Damping:	150 Ohms	Zero Offset:	12.98
Display Mode:	Fullwave	Gain - Axial Scan:	62.7 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator CS Rompas S/N LMT-17

Reflector:	1/4T SDH	2" RAD
Max Amplitude:	80%	80%
Sweep:	4.0	3.2
Gain:	62.7 dB	47.6 dB

Calibration Verification

Initial Calibration Time:	08:56	Verification Times:			
Final Calibration Time:	13:55	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
MSC-D001	I05005	Work Order: 1129016
MSD-D001	I05007	Work Order: 1129016
VCB-C005	I05090	Work Order: 1129072
		Squint Angle 5°
		Configuration of Elements: D-SBS
		Zone 1

Stevermer, A. (Examiner)	II (Level)	04/14/05 (Date)	Dohmen, F. (Level III Review)	4/19/05 (Date)	Bowers, J. (ANII Review)	4-20-05 (Date)

NG 142Z Rev. 4

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-111
Linearity Sheet No.: L-002

Procedure No.: ACP 1211.27 **Revision:** 1

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01448103 (Serial No.)

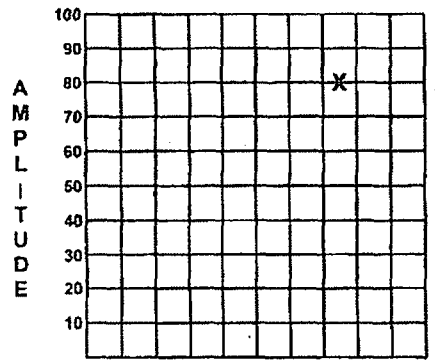
Search Unit: RTD (Manufacturer) | TRL2-ST FS~125 mm (Model) | 02-102 (Serial No.) | 2 (24X42) mm Rectangular (Size) | 2.0 MHz (Freq.) | 60° / RL (Angle / Mode) | 1.05" (Incident to wedge front)

Cable: 2 (RG-174) (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 66 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) **Thermometer:** 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 14.45"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	14.45"
Pulse Width:	N/A	Velocity:	.2332
Rep Rate:	Auto	Delay:	12.98
Damping:	150 Ohms	Zero Offset:	0.0
Display Mode:	Fullwave	Gain - Axial Scan:	71.0 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator: CS Rompas S/N: LMT-17

Reflector:	ID Notch	2" RAD
Max Amplitude:	80%	80%
Sweep:	7.5	1.2
Gain:	71.0 dB	47.2 dB

Calibration Verification

Initial Calibration Time:	09:04	Verification Times:			
Final Calibration Time:	13:58	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
MSC-D001	I05005	Work Order: 1129016
MSD-D001	I05007	Work Order: 1129016
VCB-C005	I05090	Work Order: 1129072
		Squint Angle 5°
		Configuration of Elements: D-SBS
		Zone 2

Stevermer, A. (Examiner)	II (Level)	04/14/05 (Date)	Dohmen, F. (Level III Review)	4/19/05 (Date)	Bowers, J. (ANII Review)	4-20-05 (Date)

NG 142Z Rev. 4

Nozzle to RPV Coverage Calculation Sheet

Coverage calculated to requirements of Code Case N-613-8
Note: calculations performed using 2D plot only

Nozzle ID N3

Area required to be examined

Axial scan direction: Height x width

5.25 inches x 3.007 inches equals 15.7868 square inches

Parallel scan direction: Height x width

5.25 inches x 3.007 inches equals 15.7868 square inches

Total area required to be examined 31.5735 *square inches required for complete exam*

Actual area examined

60 degree R.L. Axial scan direction: Height x width

5.25 inches x 3.007 inches equals 15.7868 square inches

Triangular area not examined (if applies) 1.24 1/2 base x 2.16 height equals 1.3392 square inches

Axial scan direction area examined 14.4476 square inches

60 degree R.L. Parallel scan direction: Height x width

5.25 inches x 1.86 inches equals 9.765 square inches

Additional Inner 15% area achieved using 40 & 45 degree shear techniques: Height x width

0.7875 inches x 1.08 inches equals 0.8505 square inches

Combining all scan directions: 25.0631 square inches for total exam

Divide area examined by required area: equals coverage achieved 79.38 % coverage for total exam

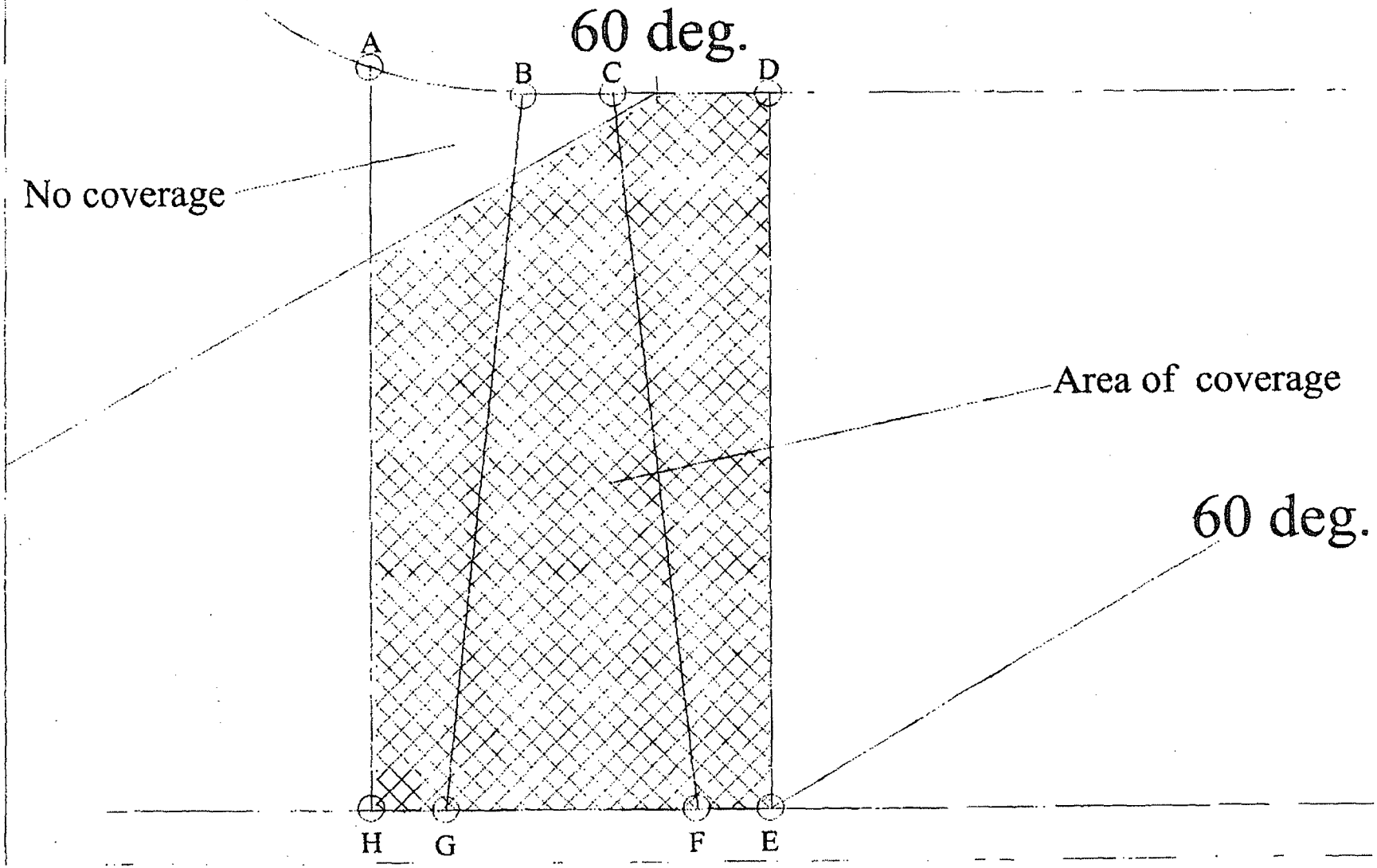
Calculations performed by: Todd Blechinger Level III

DAEC Review Frank Dohmen 4/19/05 Level III

ANII Review Jeremy Bowers
JBL 4-20-05

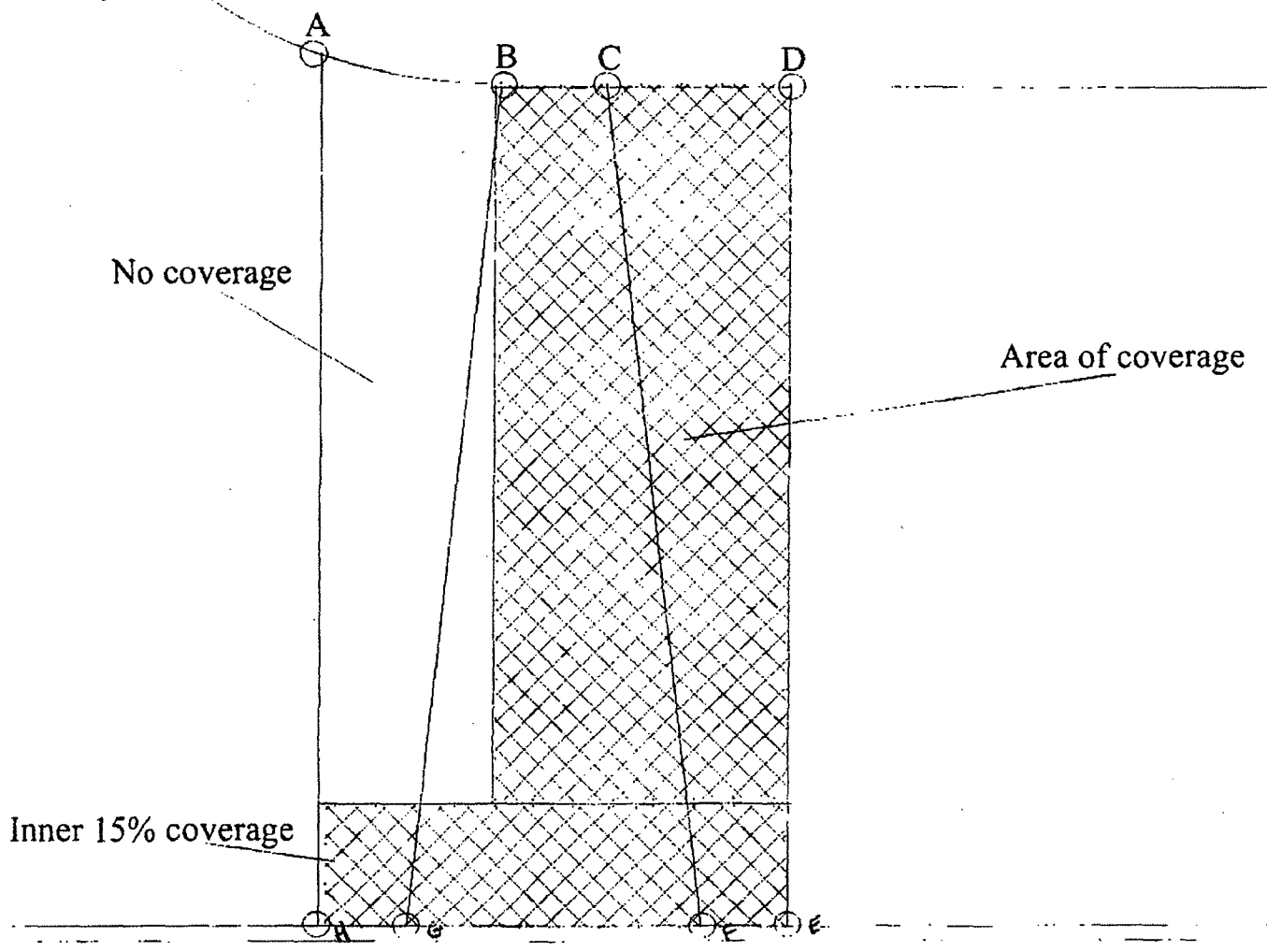
Examiner
Review
Report # 105007
Page ___ of ___

DAEC N3 Coverage Plot
Axial scan direction



DAEC N3 Coverage Plot
Parallel scan direction

Examiner
Review
Report # 105007
Page ____ of ____



Nozzle to RPV Coverage Calculation Sheet

Coverage Re-calculated using IWB-2500-7(b) volume 60°
Note: calculations performed using 2D plot only

Nozzle ID N3 Main Steam MSC-D001 & MSD-D001

Area required to be examined

Axial scan direction: Height x width

5.25 inches x 7.875 inches equals 41.344 square inches

Parallel scan direction: Height x width

5.25 inches x 7.875 inches equals 41.344 square inches

Total area required to be examined 82.688 square inches required for complete exam

Actual area examined

60° R.L. Axial scan direction: Height x width

5.25 inches x 7.875 inches equals 41.344 square inches

Triangular area not examined (if applies) 2.5 base x 4.25 height equals 5.3125 square inches A=bh/2
1.218 base x 2.125 height equals 1.2941 square inches
Axial scan direction area examined 34.737 square inches

60° R.L. Parallel scan direction: Height x width

5.25 inches x 7.875 inches equals 41.344 square inches

Area not examined (if applicable) 5.25 height x 3.2 width equals 16.8 square inches
5.25 height x 2.125 width equals 11.156 square inches
41.344 inches minus area not examined 27.956 inches equals 13.388 square inches

Combining all scan directions: 48.125 square inches for total exam

Divide area examined by required area: equals coverage achieved 58.2 % coverage for total exam

Calculations performed by: Frank Dohmen Level III

DAEC Review Gary Park

58.2	60°
56.1	40°
56.35	45°
170.65	
56.83	

Nozzle to RPV Coverage Calculation Sheet

Coverage Re-calculated using IWB-2500-7(b) volume 45 degree for Inner 15%
Note: calculations performed using 2D plot only

Nozzle ID N3 Main Steam MSC-D001 & MSD-D001

Area required to be examined

Axial scan direction: Height x width

0.7875 inches x 7.875 inches equals 6.20156 square inches

Parallel scan direction: Height x width

0.7875 inches x 7.875 inches equals 6.20156 square inches

Total area required to be examined 12.4031 square inches required for complete exam

Actual area examined

45 degree Axial scan direction: Height x width

0.7875 inches x 7.875 inches equals 6.20156 square inches

Triangular area not examined (if applies) 0.75 1/2 base x 0.7875 height equals 0.29531 square inches
Rect. area not examined (if applies) 1.375 x 0.7875 equals 1.08281
Axial scan direction area examined 4.82344 square inches

45 degree shear Parallel scan direction: Height x width

0.7875 inches x 7.875 inches equals 6.20156 square inches
Area not examined (if applies) 3.0 base x 0.7875 height equals 2.3625 square inches
Area not examined (if applies) 2.125 base x 0.7875 height equals 1.67344 square inches
Parallel scan direction area examined 2.16563 square inches

Combining all scan directions: 6.98906 square inches for total exam

Divide area examined by required area: equals coverage achieved 56.35 % coverage for total exam

Calculations performed by: Frank Dohmen Level III

DAEC Review Gary Park

ANII Review

Nozzle to RPV Coverage Calculation Sheet

Coverage Re-calculated using IWB-2500-7(b) volume 40 degree for Inner 15%
Note: calculations performed using 2D plot only

Nozzle ID N3 Main Steam MSC-D001 & MSD-D001

Area required to be examined

Axial scan direction: Height x width

0.7875 inches x 7.875 inches equals 6.20156 square inches

Parallel scan direction: Height x width

0.7875 inches x 7.875 inches equals 6.20156 square inches

Total area required to be examined 12.4031 square inches required for complete exam

Actual area examined

40 degree Axial scan direction: Height x width

0.7875 inches x 7.875 inches equals 6.20156 square inches

Triangular area not examined[1] (if applies)	0	1/2 base	x	0	height	equals	0	square inches
Rect. area not examined[1] (if applies)	0	x	0	equals	0			
Triangular area not examined[2] (if applies)	0.66	1/2 base	x	0.7875	height	equals	0.25988	square inches
Rect. area not examined[2] (if applies)	1.46	x	0.7875	equals	1.14975			
Axial scan direction area examined	4.79194	square inches						

40 degree shear Parallel scan direction: Height x width

0.7875 inches	x	7.875	inches	equals	6.20156	square inches		
Area not examined (if applies)		3.0	base	x	0.7875	height	equals	2.3625 square inches
Area not examined (if applies)		2.125	base	x	0.7875	height	equals	1.67344
Parallel scan direction area examined		2.16563	square inches					

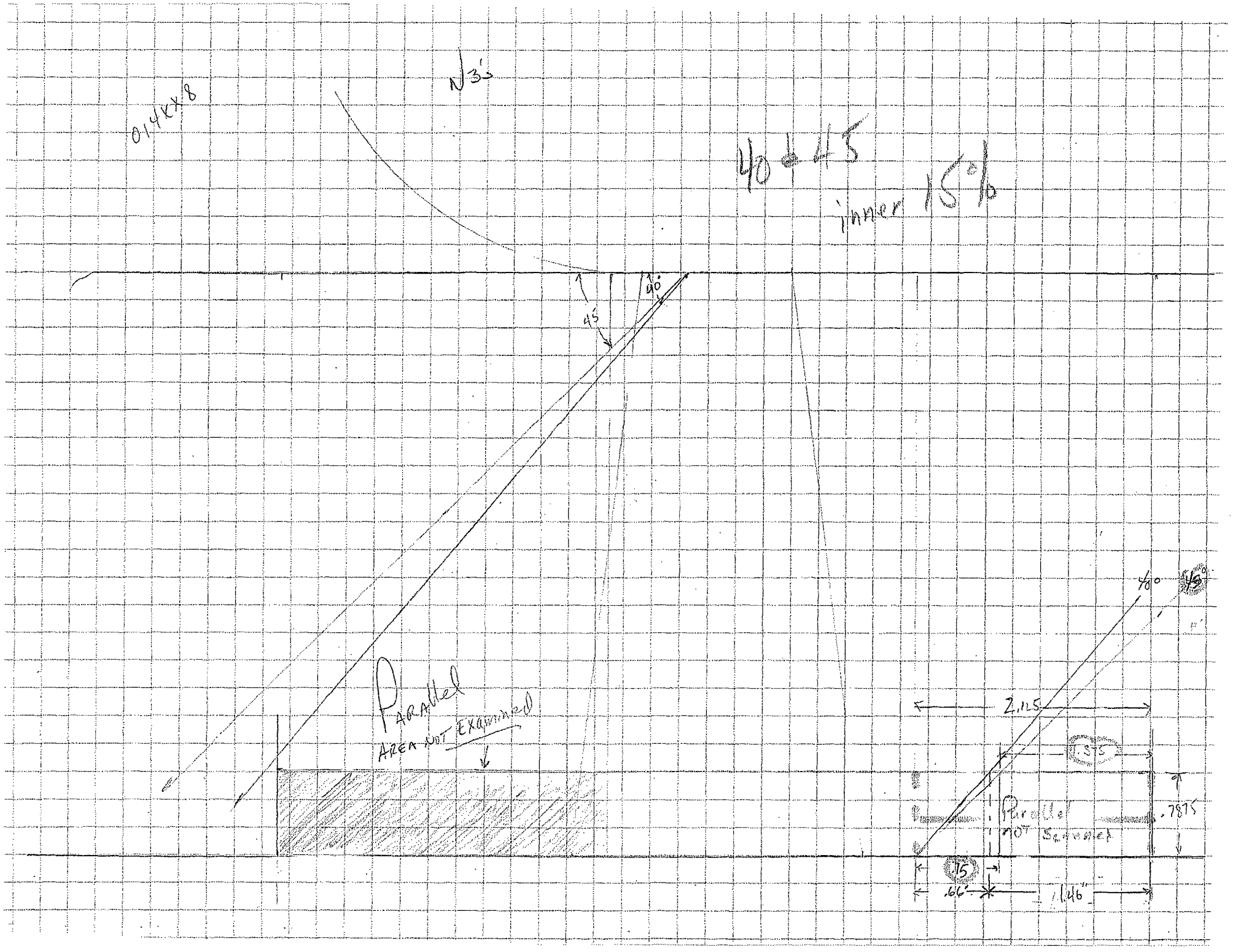
Combining all scan directions: 6.95756 square inches for total exam

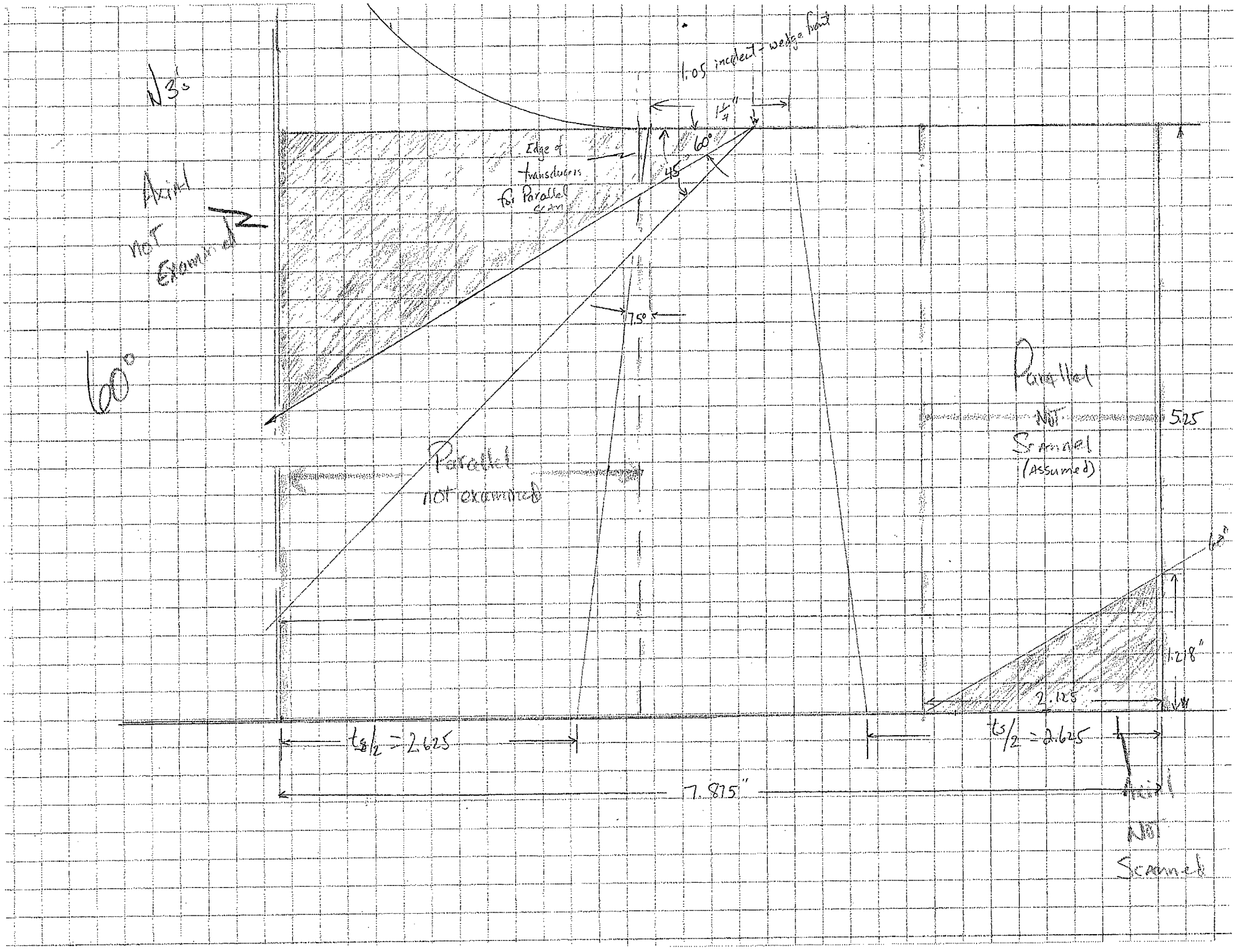
Divide area examined by required area: equals coverage achieved 56.1 % coverage for total exam

Calculations performed by: Frank Dohmen Level III

DAEC Review Gary Park

ANII Review

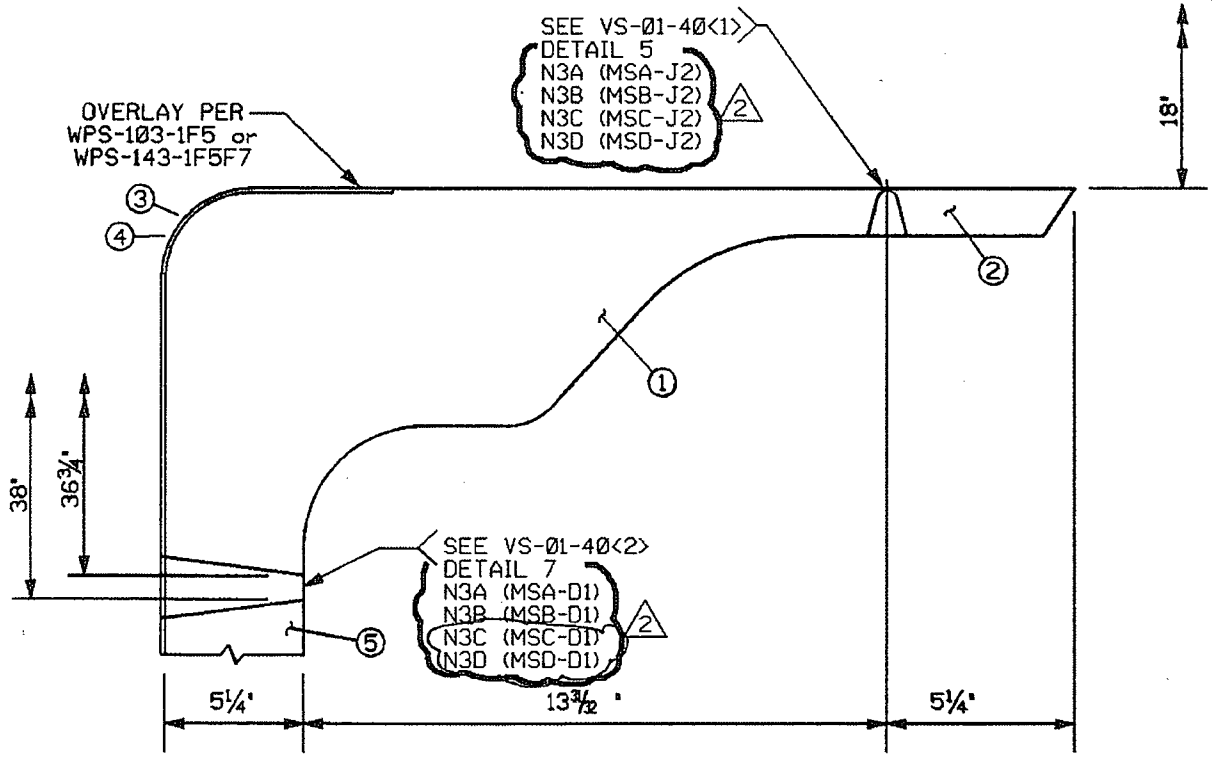

014X8
N3'
40 & 45
inner 15°/o
45
40
Parallel
AREA NOT EXAMINED
40
45
2.125
1.375
Parallel
not Scanned
.7875
15
.66
1.46"


1.05 incident wedge point
1 1/4"
60°
45
Edge of transducers for Parallel scan
75°
N3°
Axial
NOT Examined
60°
Parallel
NOT Scanned
(Assumed)
5.25
Parallel
not examined
60°
1.218"
2.125
$t_3/2 = 2.625$
$t_3/2 = 2.625$
7.875"
Axial
NOT Scanned

NO.	DATE	REVISION	DRFTR.	CHK'D.	ENGR.	VER.
2	8/8/95	REVISED PER DURF-0011	DA	GD	SS	SS
1	12-09-94	DRAFTED FOR VESSEL INSPECTION PROGRAM	MS	DF	GP	SS

NO.	DESCRIPTION	BILL OF MATL.	PROCED.
1	FORGING	SA508 CLASS 2	
2	SAFE END FORGING	SA508 CLASS 1	
3	1ST CLAD LAYER	309	
4	2ND & 3RD CLAD LAYER	308L	
5	SHELL PLATE #4	SA533 CLASS 1 GR.B	

REFERENCE DRAWING:
APED-B11-2655-098



IES:
Inservice Inspection Program
Reactor Pressure Vessel Sketch

STEAM OUTLET
NOZZLE MK N3A/D

DWG. NO. VS-01-12

REV. 2

ULTRASONIC EXAMINATION DATA SHEET
REACTOR PRESSURE VESSEL WELDS

Site: DAEC | Report No.: I05011 | Calibration Sheet No.: C-071, C-072 | Data Sheet No.: N/A

Procedure No.: ACP 1211.27 Rev. 1

11

System:	Reactor Vessel	Exam Surface Temp.:	96 °F	Couplant:	Humex
Weld ID:	FWB-D001	Thermometer S/N:	3991	Batch No.:	98165

Examination Surface: ID☐ OD☒		Material Type: CS ☒ SS ☐		Exam Date:	4/11/05
L_o Reference	TDC	R_o Reference:	WCL	Exam Start:	10:40
				Exam End:	12:00

Scan Surface	Exam Number
Perpendicular UpStream	1
Perpendicular DownStream	2
Parallel CW	3
Parallel CCW	4

Search Unit Angle	Scan Sensitivity	Exam Number
60° RL ZONE 1	74.5 dB	1, 3, 4
60° RL ZONE 2	79.0 dB	1, 3, 4

INDICATIONS

Indication No.	L (In) From Ref			W (In) From Ref			Sweep Reading ☒MP or ☐ Depth			Max Amp % Dac	Examination (1 - 4)
	L-1	L-Max	L-2	W-1	W-Max	W-2	SW-1 ☐ M1 ☐	SW-Max	SW-2 ☐ M2 ☐		
NRI	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

REMARKS/LIMITATIONS

WO:1129008
Obtained 87.67% coverage of required volume.
See attached coverage plot.

☒ Previous Examination Data Reviewed

Stevermer, A. Examiner (s)	II Level	04/11/05 Date	TPB Dohmen, F. Level III Review	4/18/05 Date	Bowers, J. ANII Review	4-19-05 Date

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-071
Linearity Sheet No.: L-004

Procedure No.: ACP 1211.27 Revision: 1

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01435501 (Serial No.)

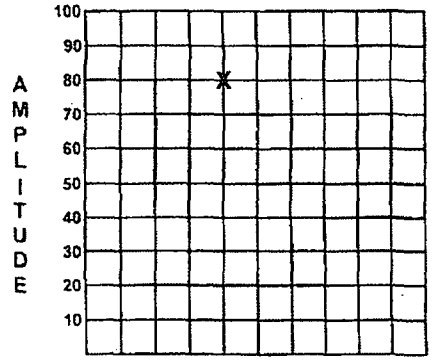
Search Unit: RTD (Manufacturer) | TRL2-Aust FS~125 mm (Model) | 00-447 (Serial No.) | 2 (24X42) mm Rectangular (Size) | 2.0 MHz (Freq.) | 60° / Long. (Angle / Mode) | 1.05" (Incident to wedge front)

Cable: 2 (RG-174) (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 66 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 8.003"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	8.003"
Pulse Width:	N/A	Velocity:	.2309
Rep Rate:	Auto	Delay:	0.000
Damping:	150 Ohms	Zero Offset:	12.38
Display Mode:	Fullwave	Gain - Axial Scan:	62.0 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator CS Rompas S/N LMT-17

Reflector:	1/4T SDH	2" RAD
Max Amplitude:	80%	80%
Sweep:	4.0	3.4
Gain:	62.0 dB	48.0 dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	08:01				
Final Calibration Time:	16:40	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
FWB-D001	I05011	WO-1129008
FWC-D001	I05017	WO-1129009
		Squint Angle 3°
		Configuration of Elements: D-SBS
		ZONE 1 60° RL CAL

Stevermer, A.	II	04/11/05	Dohmen, F.	4/18/05	Bowers, J.	4-19-05
Examiner	Level	Date	Level III Review	Date	ANII Review	Date

NG 142Z Rev. 4

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-072

Linearity Sheet No.: L-004

Procedure No.: ACP 1211.27 Revision: 1

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01435501 (Serial No.)

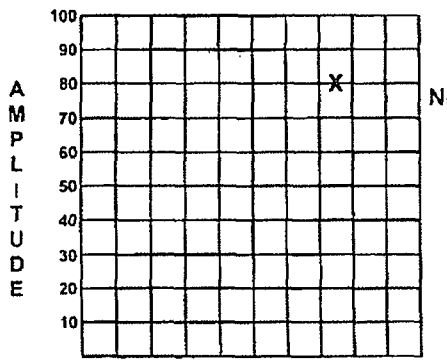
Search Unit: RTD (Manufacturer) | TRL2-Aust FS~125 mm (Model) | 00-447 (Serial No.) | 2 (24X42) mm Rectangular (Size) | 2.0 MHz (Freq.) | 60° / Long. (Angle / Mode) | 1.05" (Incident to wedge front)

Cable: 2 (RG-174) (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 66 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 16.27"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	16.27"
Pulse Width:	N/A	Velocity:	.2309
Rep Rate:	Auto	Delay:	0.000
Damping:	150 Ohms	Zero Offset:	12.38
Display Mode:	Fullwave	Gain - Axial Scan:	73.0 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator CS Rompas S/N LMT-17

Reflector:	ID Notch	2" RAD
Max Amplitude:	80%	80%
Sweep:	7.5	1.2
Gain:	73.0 dB	48.0 dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	07:58				
Final Calibration Time:	16:42	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
FWB-D001	I05011	WO: 1129008
FWC-D001	I05017	WO: 1129009
		Squint Angle 3°
		Configuration of Elements: D-SBS
		ZONE 2 60° RL CAL

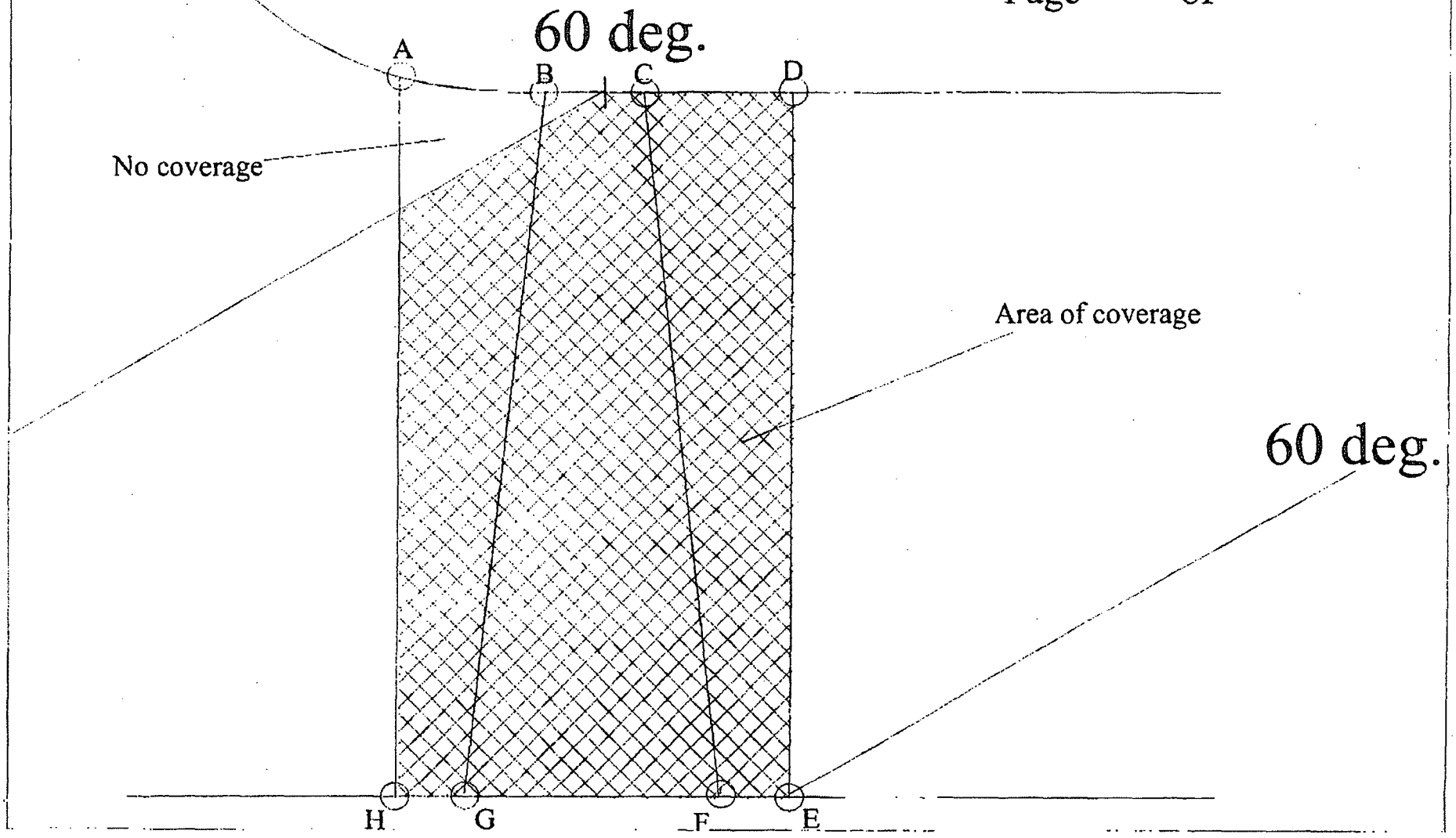
Stevermer, A. (Examiner)	II (Level)	04/11/05 (Date)	Dohmen, F. (Level III Review)	4/18/05 (Date)	Bowers, J. (ANII Review)	4-19-05 (Date)

NG 142Z Rev. 4

DAEC N4 coverage plot

Axial scan direction

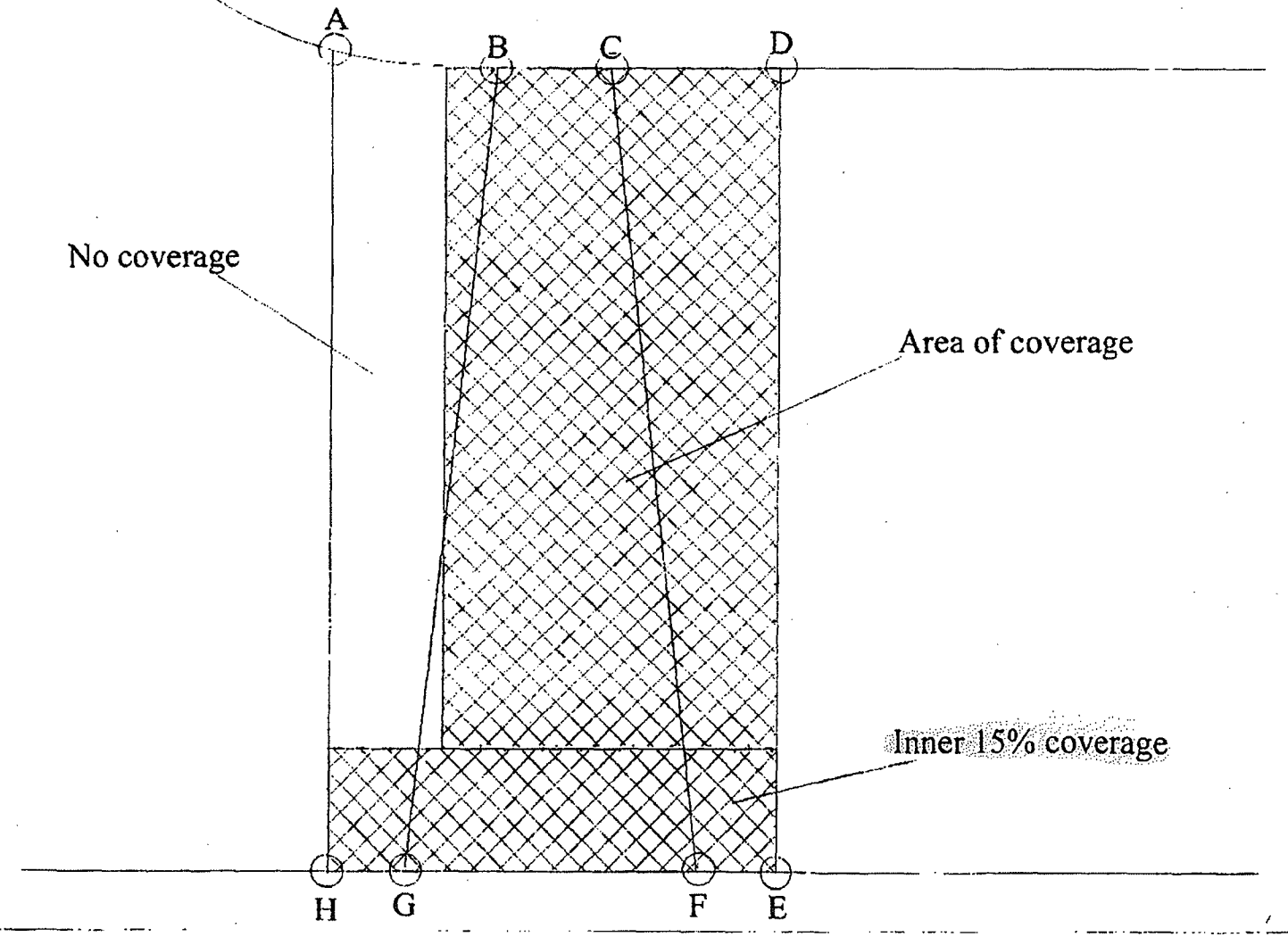
Examiner [signature] 4-11-05
Review
Report # I05011
Page ___ of ___



DAEC N4 coverage plot

Parallel scan direction

Examiner [signature] 4-11-05
Review
Report # I05011
Page ___ of ___



ULTRASONIC EXAMINATION DATA SHEET
NOZZLE TO SHELL WELD AND INNER RADIUS

Site: DAEC	Report No.: I05011	Calibration Sheet No.: C-075 THROUGH C-081	
		Data Sheet No.: N/A	

Procedure No.: ACP 1211.44 Rev. 0

System: Reactor Vessel	Exam Surface Temp.: 96 °F	Couplant: Humex
Nozzle ID: FWB-Bore, FWB-Nozzle, FWB-D001 IR	Thermometer S/N: 3991	Batch No.: 98165

Examination Surface: ID☐ OD☒	Material Type: CS ☒ SS ☐	Exam Date: 04/11/05
L_o Reference TDC	R_o Reference: WCL	Exam Start: 10:40
		Exam End: 12:00

Scan Surface	Exam Number
Vessel CW	1
Vessel CCW	2
Blend CW	3
Blend CCW	4
Nozzle Boss CW	5
Nozzle Boss CCW	6

Search Unit Angle / Skew	Scan Sensitivity	Exam Number
21.8° +- 90°	63.5 dB	5, 6
25° +-90°	63.5 dB	3, 4
40° +- 90°	53.5 dB	3, 4
70° +- 24°	78.5 dB	3, 4
70° (+- 13° to 36°)	78.5 dB	1, 2
45° (+-59° to 80°)	55.5 dB	1,2

Ind. #	Transducer Azimuth Location	Indication Metal Path	Transducer 'R' Location	Transducer Skew	Scan Sensitivity	Exam Number
NRI	N/A	N/A	N/A	N/A	N/A	N/A

REMARKS/LIMITATIONS

100% Coverage obtained based on modeling program for nozzle examinations. Reference EPRI report no.: IR-2004-62.
21.8° Exam obtained 95.69% of required volume due to thermocouple obstruction.
See attached limitation sheet.

WO: 1129008

☒ Previous Examination Data Reviewed

Stevermer, A. Examiner	II Level	04/11/05 Date	TPB Dohmen, F. Level III Review	4/19/05 Date	JB Bowers, J. ANII Review	4-19-05 Date

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-080

Linearity Sheet No.: L-004

Procedure No.: ACP 1211.44 Revision: 0

Instrument: Panametrics (Manufacturer) Epoch III (Model No.) 01435501 (Serial No.)

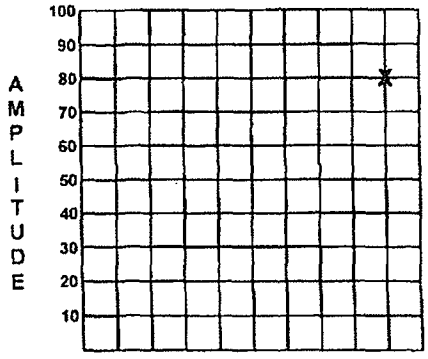
Search Unit: Krautkramer (Manufacturer) Comp G 389-055-750 (Model) 014XX3 (Serial No.) .75" Round (Size) 2.25 MHz (Freq.) * ° / Shear (Angle / Mode) .8" (Incident to wedge front)

Cable: RG-174 (Type) 12' (Length) 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) Carbon Steel (Material) NA / 5.25" (Size / Thickness) 66 °F (Temp.)

Couplant: Humex (Type) 98165 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 8.650"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	8.650"
Pulse Width:	N/A	Velocity:	.1228
Rep Rate:	Auto	Delay:	0.00
Damping:	150 Ohms	Zero Offset:	16.92
Display Mode:	Fullwave	Gain - Axial Scan:	47.5 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☒ Pulse Echo	☐ Dual
Pulse Amplitude:	Fixed		

Field Simulator N/A S/N N/A

Reflector:	ID Notch	N/A
Max Amplitude:	80%	N/A
Sweep:	9.0	N/A
Gain:	47.5 dB	N/A

Calibration Verification

Initial Calibration Time:	08:04	Verification Times:			
Final Calibration Time:	16:58	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
FWB-D001	I05011	Work Order: 1129008
FWC-D001	I05017	Work Order: 1129009
		Wedge S/N:366-003-087
		Configuration of Elements: Single
		* 40° +- 80°

Stevermer, A. (Examiner)	II (Level)	04/11/05 (Date)	Dohmen, F. (Level III Review)	4/19/05 (Date)	Bowers, J. (ANII Review)	4-19-05 (Date)

NG 142Z Rev. 4

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-081
Linearity Sheet No.: L-004

Procedure No.: ACP 1211.44 Revision: 0

Instrument: Panametrics (Manufacturer) Epoch III (Model No.) 01435501 (Serial No.)

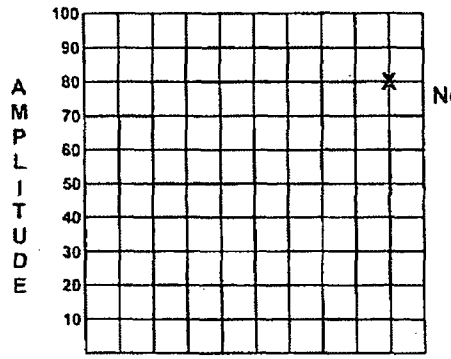
Search Unit: Krautkramer (Manufacturer) Comp G 389-055-750 (Model) 014XX8 (Serial No.) .75" Round (Size) 2.25 MHz (Freq.) 45° / Shear (Angle / Mode) .8" (Incident to wedge front)

Cable: RG-174 (Type) 12' (Length) 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) Carbon Steel (Material) NA / 5.25" (Size / Thickness) 66 °F (Temp.)

Couplant: Humex (Type) 98165 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 8.650"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	8.650"
Pulse Width:	N/A	Velocity:	.1228
Rep Rate:	Auto	Delay:	0.00
Damping:	150 Ohms	Zero Offset:	16.92
Display Mode:	Fullwave	Gain - Axial Scan:	47.5 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☒ Pulse Echo	☐ Dual
Pulse Amplitude:	Fixed		

Field Simulator CS Rompas S/N LMT-17

Reflector:	ID Notch	.7" SDH
Max Amplitude:	80%	80%
Sweep:	9.0	1.2
Gain:	47.5 dB	36.0dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	08:02				
Final Calibration Time:	16:52	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
FWB-D001	I05011	Work Order: 1129008
FWC-D001	I05017	Work Order: 1129009
		Wedge S/N:366-001-204
		Configuration of Elements: Single

[signature]	II	04/11/05	[signature]	4/19/05	[signature]	4-19-05
Stevermer, A.	Level	Date	Dohmen, F.	Date	Bowers, J.	Date
Examiner			Level III Review		ANII Review	

NG 142Z Rev. 4

Nozzle to RPV Coverage Calculation Sheet

Coverage calculated to requirements of Code Case N-613-1
Note: calculations performed using 2D plot only

Nozzle ID N4

Area required to be examined

Axial scan direction: Height x width

5.25 inches x 2.86 inches equals 15.015 square inches

Parallel scan direction: Height x width

5.25 inches x 2.86 inches equals 15.015 square inches

Total area required to be examined 30.03 square inches required for complete exam

Actual area examined

60 degree R.L. Axial scan direction: Height x width

5.25 inches x 2.86 inches equals 15.015 square inches

Triangular area not examined (if applies) 0.88 1/2 base x 1.54 height equals 0.6776 square inches

Axial scan direction area examined 14.3374 square inches

60 degree R.L. Parallel scan direction: Height x width

5.25 inches x 2.17 inches equals 11.3925 square inches

Additional Inner 15% area achieved using 40 & 45 degree shear techniques: Height x width

0.7875 inches x 0.76 inches equals 0.5985 square inches

Combining all scan directions: 26.3284 square inches for total exam

Divide area examined by required area: equals coverage achieved 87.67 % coverage for total exam

Calculations performed by: Todd Blechinger Level III

DAEC Review Frank Dohmen 4/8/05 Level III

ANIII Review Jeremy Bowers JB 4-19-05

ULTRASONIC EXAMINATION DATA SHEET
REACTOR PRESSURE VESSEL WELDS

Site: DAEC	Report No.: I05017	Calibration Sheet No.:	C-071, C-072
		Data Sheet No.:	N/A

Procedure No.: ACP 1211.27 Rev. 1

(12)

System:	Reactor Vessel	Exam Surface Temp.:	96 °F	Couplant:	Humex
Weld ID:	FWC-D001	Thermometer S/N:	3991	Batch No.:	98165

Examination Surface: ID☐ OD☒		Material Type: CS ☒ SS ☐		Exam Date:	4/11/05
L_o Reference	TDC	R_o Reference:	WCL	Exam Start:	14:40
				Exam End:	16:00

Scan Surface	Exam Number
Perpendicular UpStream	1
Perpendicular DownStream	2
Parallel CW	3
Parallel CCW	4

Search Unit Angle	Scan Sensitivity	Exam Number
60° RL ZONE 1	74.5 dB	1, 3, 4
60° RL ZONE 2	79.0 dB	1, 3, 4

INDICATIONS

Indication No.	L (In) From Ref			W (In) From Ref			Sweep Reading ☒MP or ☐ Depth			Max Amp % Dac	Examination (1 - 4)
	L-1	L-Max	L-2	W-1	W-Max	W-2	SW-1 ☐ M1 ☐	SW-Max	SW-2 ☐ M2 ☐		
NRI	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

REMARKS/LIMITATIONS

WO:1129009
Obtained 87.67% coverage of required volume.
See attached coverage plot.

☒ Previous Examination Data Reviewed

Stevermer, A.	II	04/11/05	Dohmen, F.	4/18/05	Bowers, J.	4-19-05
Examiner (s)	Level	Date	Level III Review	Date	ANII Review	Date

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-071
Linearity Sheet No.: L-004

Procedure No.: ACP 1211.27 Revision: 1

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01435501 (Serial No.)

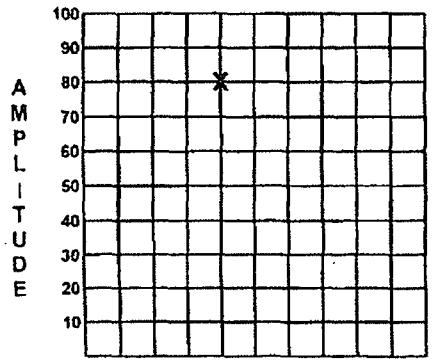
Search Unit: RTD (Manufacturer) | TRL2-Aust FS~125 mm (Model) | 00-447 (Serial No.) | 2 (24X42) mm Rectangular (Size) | 2.0 MHz (Freq.) | 60° / Long. (Angle / Mode) | 1.05" (Incident to wedge front)

Cable: 2 (RG-174) (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 66 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 8.003"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	8.003"
Pulse Width:	N/A	Velocity:	.2309
Rep Rate:	Auto	Delay:	0.000
Damping:	150 Ohms	Zero Offset:	12.38
Display Mode:	Fullwave	Gain - Axial Scan:	62.0 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator CS Rompas S/N LMT-17

Reflector:	1/4T SDH	2" RAD
Max Amplitude:	80%	80%
Sweep:	4.0	3.4
Gain:	62.0 dB	48.0 dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	08:01				
Final Calibration Time:	16:40	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
FWB-D001	I05011	WO-1129008
FWC-D001	I05017	WO-1129009
		Squint Angle 3°
		Configuration of Elements: D-SBS
		ZONE 1 60° RL CAL

[signature]	II	04/11/05	[signature]	4/18/05	[signature]	4-19-05
Stevermer, A.	Level	Date	Dohmen, F.	Date	Bowers, J.	Date
Examiner			Level III Review		ANII Review	

NG 142Z Rev. 4

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-072

Linearity Sheet No.: L-004

Procedure No.: ACP 1211.27 Revision: 1

Instrument: Panametrics (Manufacturer) Epoch III (Model No.) 01435501 (Serial No.)

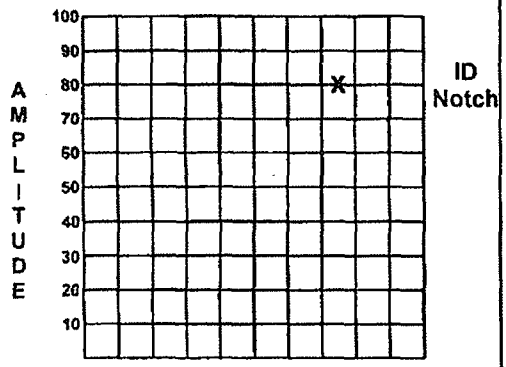
Search Unit: RTD (Manufacturer) TRL2-Aust FS~125 mm (Model) 00-447 (Serial No.) 2 (24X42) mm Rectangular (Size) 2.0 MHz (Freq.) 60° / Long. (Angle / Mode) 1.05" (Incident to wedge front)

Cable: 2 (RG-174) (Type) 12' (Length) 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) Carbon Steel (Material) NA / 5.25" (Size / Thickness) 66 °F (Temp.)

Couplant: Humex (Type) 98165 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 16.27"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	16.27"
Pulse Width:	N/A	Velocity:	.2309
Rep Rate:	Auto	Delay:	0.000
Damping:	150 Ohms	Zero Offset:	12.38
Display Mode:	Fullwave	Gain - Axial Scan:	73.0 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator CS Rompas S/N LMT-17

Reflector:	ID Notch	2" RAD
Max Amplitude:	80%	80%
Sweep:	7.5	1.2
Gain:	73.0 dB	48.0 dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	07:58				
Final Calibration Time:	16:42	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
FWB-D001	I05011	WO: 1129008
FWC-D001	I05017	WO: 1129009
		Squint Angle 3°
		Configuration of Elements: D-SBS
		ZONE 2 60° RL CAL

Stevermer, A. (Examiner)	II (Level)	04/11/05 (Date)	Dohmen, F. (Level III Review)	4/18/05 (Date)	Bowers, J. (ANII Review)	4-19-05 (Date)

NG 142Z Rev. 4

Nozzle to RPV Coverage Calculation Sheet

Coverage calculated to requirements of Code Case N-613-1
Note: calculations performed using 2D plot only

Nozzle ID N4

Area required to be examined

Axial scan direction: Height x width

5.25 inches x 2.86 inches equals 15.015 square inches

Parallel scan direction: Height x width

5.25 inches x 2.86 inches equals 15.015 square inches

Total area required to be examined 30.03 square inches required for complete exam

Actual area examined

60 degree R.L. Axial scan direction: Height x width

5.25 inches x 2.86 inches equals 15.015 square inches

Triangular area not examined (if applies) 0.88 1/2 base x 1.54 height equals 0.6776 square inches

Axial scan direction area examined 14.3374 square inches

60 degree R.L. Parallel scan direction: Height x width

5.25 inches x 2.17 inches equals 11.3925 square inches

Additional Inner 15% area achieved using 40 & 45 degree shear techniques: Height x width

0.7875 inches x 0.76 inches equals 0.5985 square inches

Combining all scan directions: 26.3284 square inches for total exam

Divide area examined by required area: equals coverage achieved 87.67 % coverage for total exam

Calculations performed by: Todd Blechinger Level III

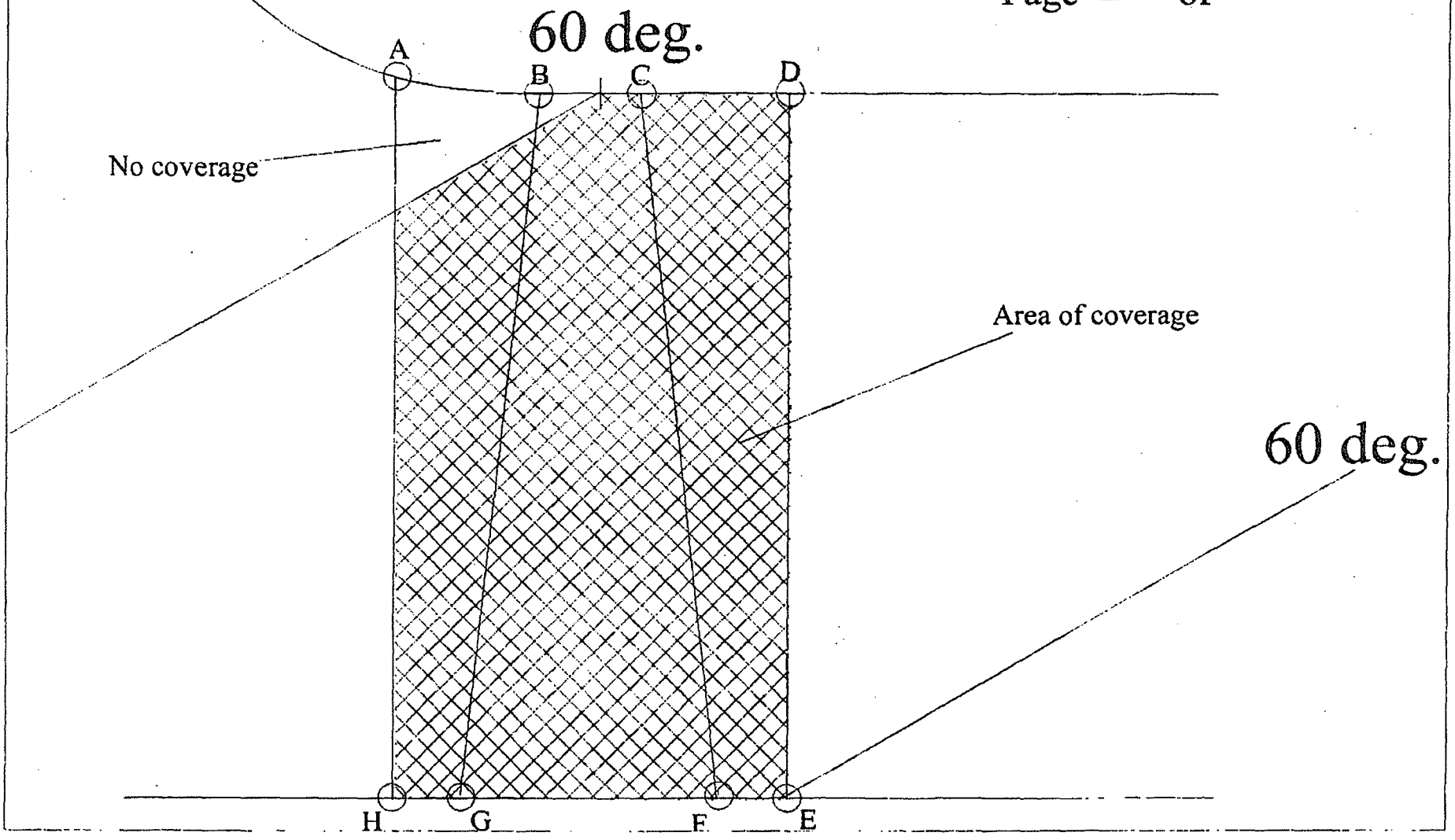
DAEC Review Frank Dohmen 4/18/05 Level III

ANIII Review Jeremy Bowers 4-19-05

DAEC N4 coverage plot

Axial scan direction

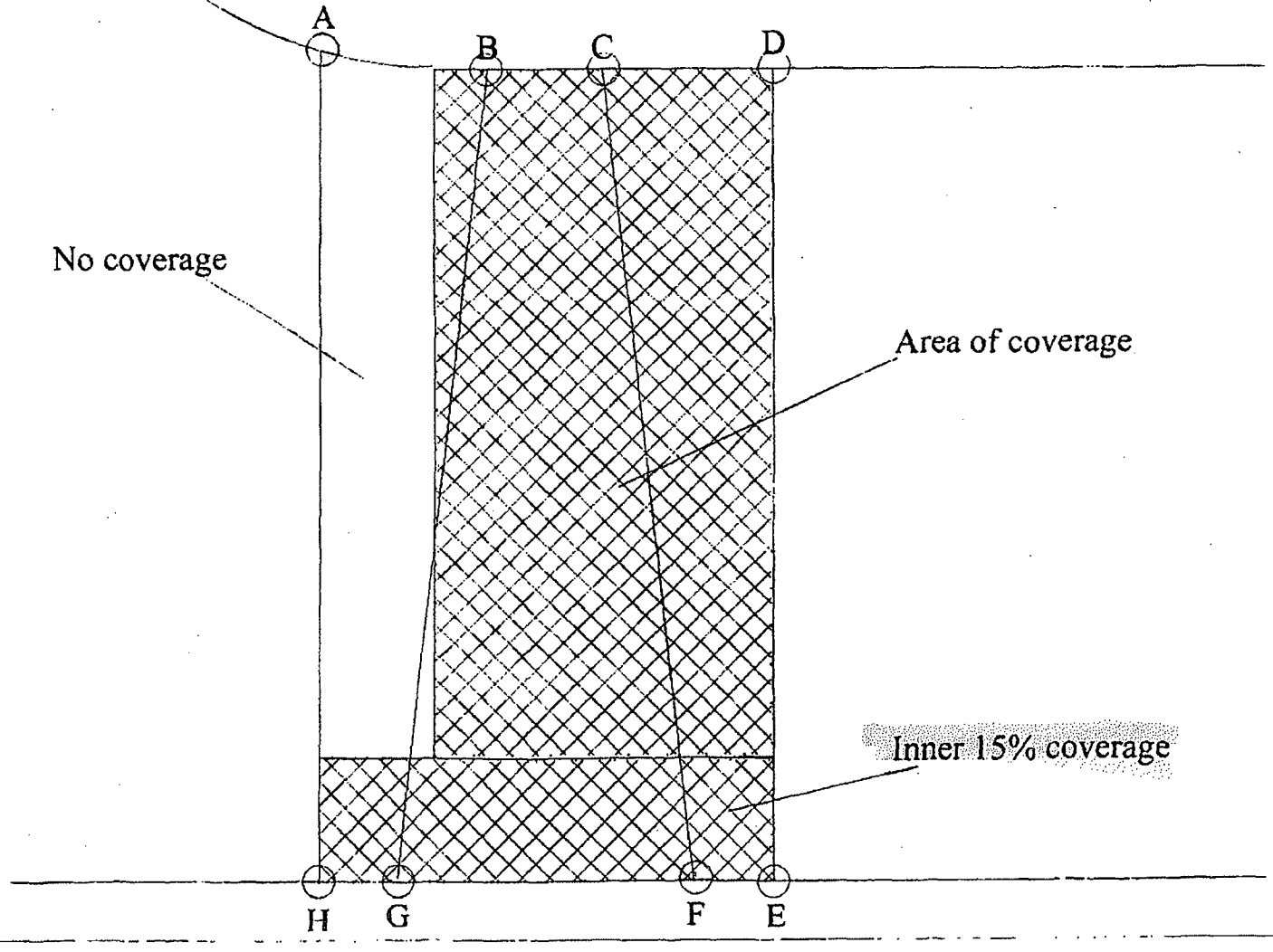
Examiner [signature] 4-11-05
Review
Report # I05017
Page ___ of ___



DAEC N4 coverage plot

Parallel scan direction

Examiner [signature] 4-11-05
Review
Report # I05017
Page ___ of ___



ULTRASONIC EXAMINATION DATA SHEET
NOZZLE TO SHELL WELD AND INNER RADIUS

Site: DAEC	Report No.: I05017	Calibration Sheet No.:	C-075 THROUGH C-081
		Data Sheet No.:	N/A

Procedure No.: ACP 1211.44 Rev. 0

System:	Reactor Vessel	Exam Surface Temp.:	96 °F	Couplant:	Humex
Nozzle ID:	FWC-Bore, FWC-Nozzle, FWC-D001 IR	Thermometer S/N:	3991	Batch No.:	98165

Examination Surface: ID☐ OD☒		Material Type: CS ☒ SS ☐		Exam Date:	04/11/05
L_o Reference	TDC	R_o Reference:	WCL	Exam Start:	14:40
				Exam End:	16:00

Scan Surface	Exam Number
Vessel CW	1
Vessel CCW	2
Blend CW	3
Blend CCW	4
Nozzle Boss CW	5
Nozzle Boss CCW	6

Search Unit Angle / Skew	Scan Sensitivity	Exam Number
21.8° +- 90°	63.5 dB	5, 6
25° +-90°	63.5 dB	3, 4
40° +- 90°	53.5 dB	3, 4
70° +- 24°	78.5 dB	3, 4
70° (+- 13° to 36°)	78.5 dB	1, 2
45° (+-59° to 80°)	55.5 dB	1,2

Ind. #	Transducer Azimuth Location	Indication Metal Path	Transducer 'R' Location	Transducer Skew	Scan Sensitivity	Exam Number
NRI	N/A	N/A	N/A	N/A	N/A	N/A

REMARKS/LIMITATIONS

100% Coverage obtained based on modeling program for nozzle examinations. Reference EPRI report no.: IR-2004-62.

WO: 1129009

☒ Previous Examination Data Reviewed

Stevermer, A. Examiner	II Level	04/11/05 Date	Dohmen, F. Level III Review	4/19/05 Date	Bowers, J. ANII Review	4-19-05 Date

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-080
Linearity Sheet No.: L-004

Procedure No.: ACP 1211.44 **Revision:** 0

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01435501 (Serial No.)

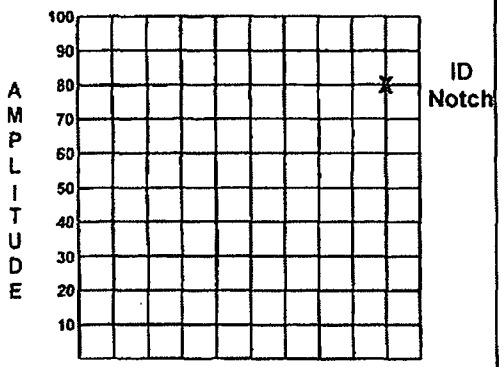
Search Unit: Krautkramer (Manufacturer) | Comp G 389-055-750 (Model) | 014XX3 (Serial No.) | .75" Round (Size) | 2.25 MHz (Freq.) | * ° / Shear (Angle / Mode) | .8" (Incident to wedge front)

Cable: RG-174 (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 66 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) **Thermometer:** 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 8.650"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	8.650"
Pulse Width:	N/A	Velocity:	.1228
Rep Rate:	Auto	Delay:	0.00
Damping:	150 Ohms	Zero Offset:	16.92
Display Mode:	Fullwave	Gain - Axial Scan:	47.5 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☒ Pulse Echo	☐ Dual
Pulse Amplitude:	Fixed		

Field Simulator N/A S/N N/A

Reflector:	ID Notch	N/A
Max Amplitude:	80%	N/A
Sweep:	9.0	N/A
Gain:	47.5 dB	N/A

Calibration Verification

		Verification Times:			
Initial Calibration Time:	08:04				
Final Calibration Time:	16:58	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
FWB-D001	105011	Work Order: 1129008
FWC-D001	105017	Work Order: 1129009
		Wedge S/N:366-003-087
		Configuration of Elements: Single
		* 40° +- 80°

Stevermer, A. (Examiner)	II (Level)	04/11/05 (Date)	Dohmen, F. (Level III Review)	4/19/05 (Date)	Bowers, J. (ANII Review)	4-19-05 (Date)

NG 142Z Rev. 4

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-081
Linearity Sheet No.: L-004

Procedure No.: ACP 1211.44 **Revision:** 0

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01435501 (Serial No.)

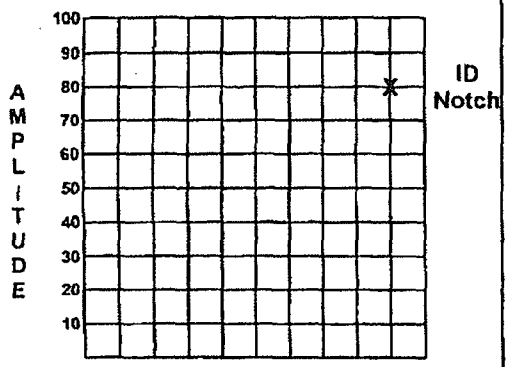
Search Unit: Krautkramer (Manufacturer) | Comp G 389-055-750 (Model) | 014XX8 (Serial No.) | .75" Round (Size) | 2.25 MHz (Freq.) | 45° / Shear (Angle / Mode) | .8" (Incident to wedge front)

Cable: RG-174 (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 66 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) **Thermometer:** 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 8.650"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	8.650"
Pulse Width:	N/A	Velocity:	.1228
Rep Rate:	Auto	Delay:	0.00
Damping:	150 Ohms	Zero Offset:	16.92
Display Mode:	Fullwave	Gain - Axial Scan:	47.5 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☒ Pulse Echo	☐ Dual
Pulse Amplitude:	Fixed		

Field Simulator: CS Rompas S/N: LMT-17

Reflector:	ID Notch	.7" SDH
Max Amplitude:	80%	80%
Sweep:	9.0	1.2
Gain:	47.5 dB	36.0dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	08:02				
Final Calibration Time:	16:52	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
FWB-D001	I05011	Work Order: 1129008
FWC-D001	I05017	Work Order: 1129009
		Wedge S/N:366-001-204
		Configuration of Elements: Single

Stevermer, A. (Examiner)	II (Level)	04/11/05 (Date)	Dohmen, F. (Level III Review)	4/19/05 (Date)	Bowers, J. (ANII Review)	4-19-05 (Date)

NG 142Z Rev. 4

ULTRASONIC EXAMINATION DATA SHEET
REACTOR PRESSURE VESSEL WELDS

Site: DAEC | Report No.: I05019 | Calibration Sheet No.: C-067, C-068 | Data Sheet No.: N/A

Procedure No.: ACP 1211.27 Rev. 1

13

System:	Reactor Vessel	Exam Surface Temp.:	96 °F	Couplant:	Humex
Weld ID:	FWD-D001	Thermometer S/N:	3991	Batch No.:	98165

Examination Surface: ID☐ OD☒		Material Type: CS ☒ SS ☐		Exam Date:	4/11/05
L_o Reference	TDC	R_o Reference:	WCL	Exam Start:	12:15
				Exam End:	13:50

Scan Surface	Exam Number
Perpendicular UpStream	1
Perpendicular DownStream	2
Parallel CW	3
Parallel CCW	4

Search Unit Angle	Scan Sensitivity	Exam Number
60° RL ZONE 1	74.5 dB	1, 3, 4
60° RL ZONE 2	79.0 dB	1, 3, 4

INDICATIONS

Indication No.	L (In) From Ref			W (In) From Ref			Sweep Reading ☒MP or ☐ Depth			Max Amp % Dac	Examination (1 - 4)
	L-1	L-Max	L-2	W-1	W-Max	W-2	SW-1 ☐ M1 ☐	SW-Max	SW-2 ☐ M2 ☐		
NRI	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

REMARKS/LIMITATIONS

WO:1129010
Obtained 87.67% coverage of required volume.
See attached coverage plot.

☒ Previous Examination Data Reviewed

	II	04/11/05	4/18/05		4-21-05
VanRuler, C.	Level	Date	Dohmen, F.	Date	Bowers, J.	Date
Examiner (s)			Level III Review		ANII Review	

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-0067
Linearity Sheet No.: L-004

Procedure No.: ACP 1211.27 Revision: 1

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01435501 (Serial No.)

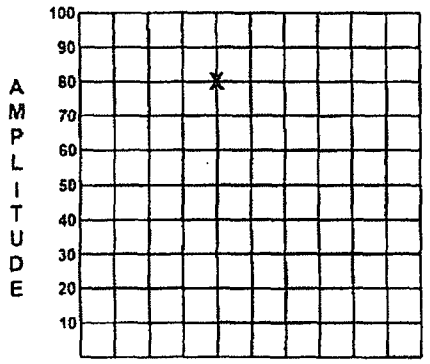
Search Unit: RTD (Manufacturer) | TRL2-Aust FS~125 mm (Model) | 00-447 (Serial No.) | 2 (24X42) mm Rectangular (Size) | 2.0 MHz (Freq.) | 60° / Long. (Angle / Mode) | 1.05" (Incident to wedge front)

Cable: 2 (RG-174) (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 66 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 8.003"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	8.003"
Pulse Width:	N/A	Velocity:	.2309
Rep Rate:	Auto	Delay:	0.000
Damping:	150 Ohms	Zero Offset:	12.38
Display Mode:	Fullwave	Gain - Axial Scan:	62.0 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator CS Rompas S/N LMT-17

Reflector:	1/4T SDH	2" RAD
Max Amplitude:	80%	80%
Sweep:	4.0	3.4
Gain:	62.0 dB	48.0 dB

Calibration Verification

Initial Calibration Time:	08:01	Verification Times:			
Final Calibration Time:	16:40	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
FWD-D001	I05019	Squint Angle 3°
		Configuration of Elements: D-SBS
		ZONE 1 60° RL CAL
		WORK ORDER:1129010

VanRuler, C. (Examiner)	II (Level)	04/11/05 (Date)	Dohmen, F. (Level III Review)	4/18/05 (Date)	Bowers, J. (ANII Review)	4-20-05 (Date)

NG 142Z Rev. 4

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-0068
Linearity Sheet No.: L-004

Procedure No.: ACP 1211.27 **Revision:** 1

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01435501 (Serial No.)

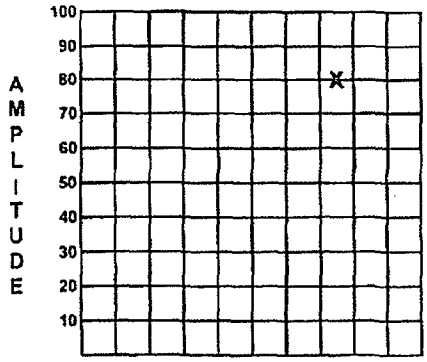
Search Unit: RTD (Manufacturer) | TRL2-Aust FS~125 mm (Model) | 00-447 (Serial No.) | 2 (24X42) mm Rectangular (Size) | 2.0 MHz (Freq.) | 60° / Long. (Angle / Mode) | 1.05" (Incident to wedge front)

Cable: 2 (RG-174) (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 66 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) **Thermometer:** 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 16.27"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	16.27"
Pulse Width:	N/A	Velocity:	.2309
Rep Rate:	Auto	Delay:	0.000
Damping:	150 Ohms	Zero Offset:	12.38
Display Mode:	Fullwave	Gain - Axial Scan:	73.0 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator CS Rompas S/N LMT-17

Reflector:	ID Notch	2" RAD
Max Amplitude:	80%	80%
Sweep:	7.5	1.2
Gain:	73.0 dB	48.0 dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	07:58				
Final Calibration Time:	16:42	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
FWD-D001	I05019	Squint Angle 3°
		Configuration of Elements:
		D-SBS
		ZONE 2 60° RL CAL
		WORK ORDER:1129010

VanRuler, C. (Examiner)	II (Level)	04/11/05 (Date)	Dohmen, F. (Level III Review)	4/18/05 (Date)	Bowers, J. (ANII Review)	4-20-05 (Date)

NG 142Z Rev. 4

Nozzle to RPV Coverage Calculation Sheet

Coverage calculated to requirements of Code Case N-613
Note: calculations performed using 2D plot only

Nozzle ID N4

Area required to be examined

Axial scan direction: Height x width

5.25 inches x 2.86 inches equals 15.015 square inches

Parallel scan direction: Height x width

5.25 inches x 2.86 inches equals 15.015 square inches

Total area required to be examined 30.03 square inches required for complete exam

Actual area examined

60 degree R.L. Axial scan direction: Height x width

5.25 inches x 2.86 inches equals 15.015 square inches

Triangular area not examined (if applies) 0.88 1/2 base x 1.54 height equals 0.6776 square inches

Axial scan direction area examined 14.3374 square inches

60 degree R.L. Parallel scan direction: Height x width

5.25 inches x 2.17 inches equals 11.3925 square inches

Additional Inner 15% area achieved using 40 & 45 degree shear techniques: Height x width

0.7875 inches x 0.76 inches equals 0.5985 square inches

Combining all scan directions: 26.3284 square inches for total exam

Divide area examined by required area: equals coverage achieved 87.67 % coverage for total exam

Calculations performed by: Todd Biechinger Level III

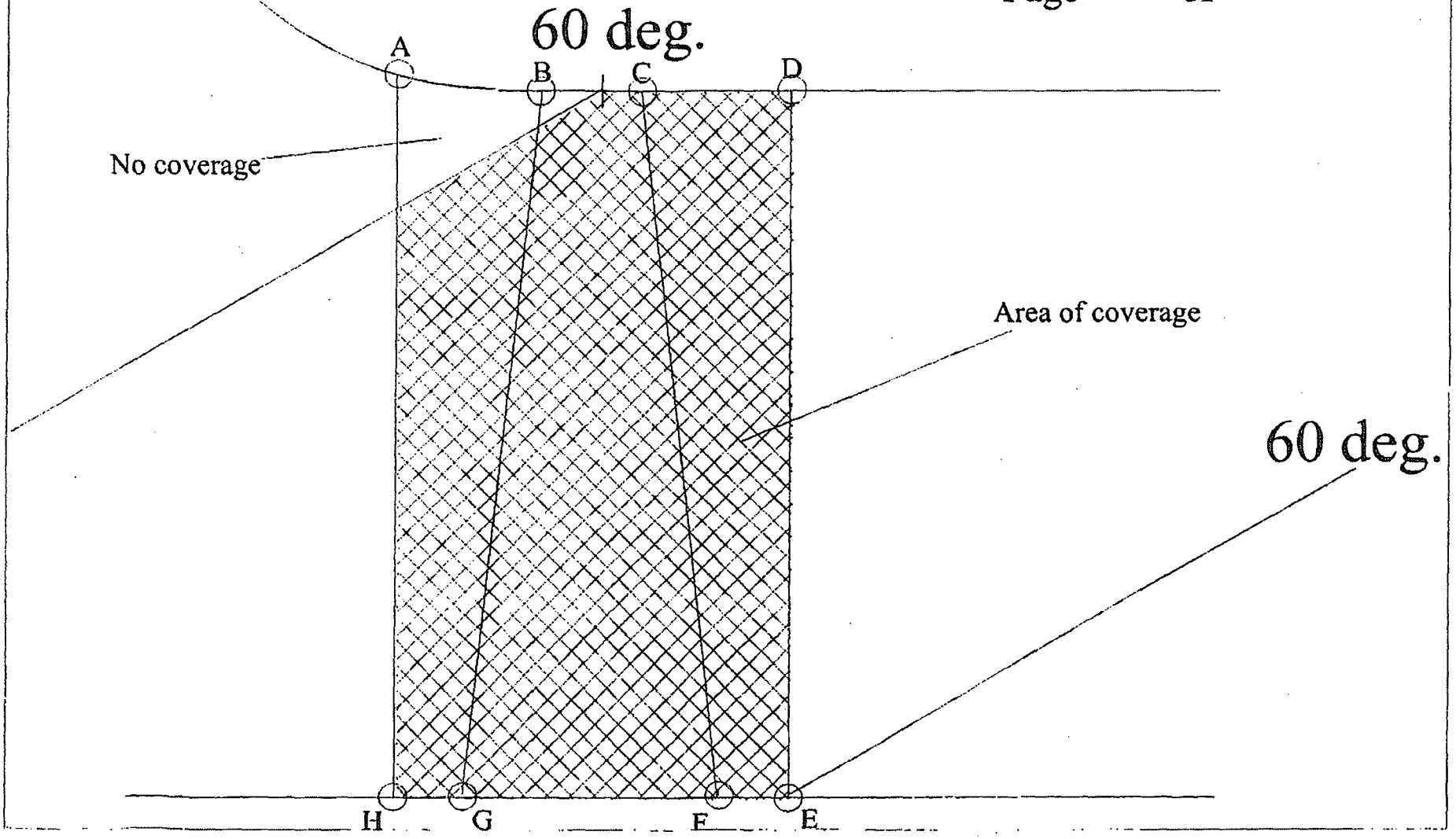
DAEC Review Frank Dohmen 4/18/05 Level III

ANIII Review Jeremy Bowers 4-20-05

DAEC N4 coverage plot

Axial scan direction

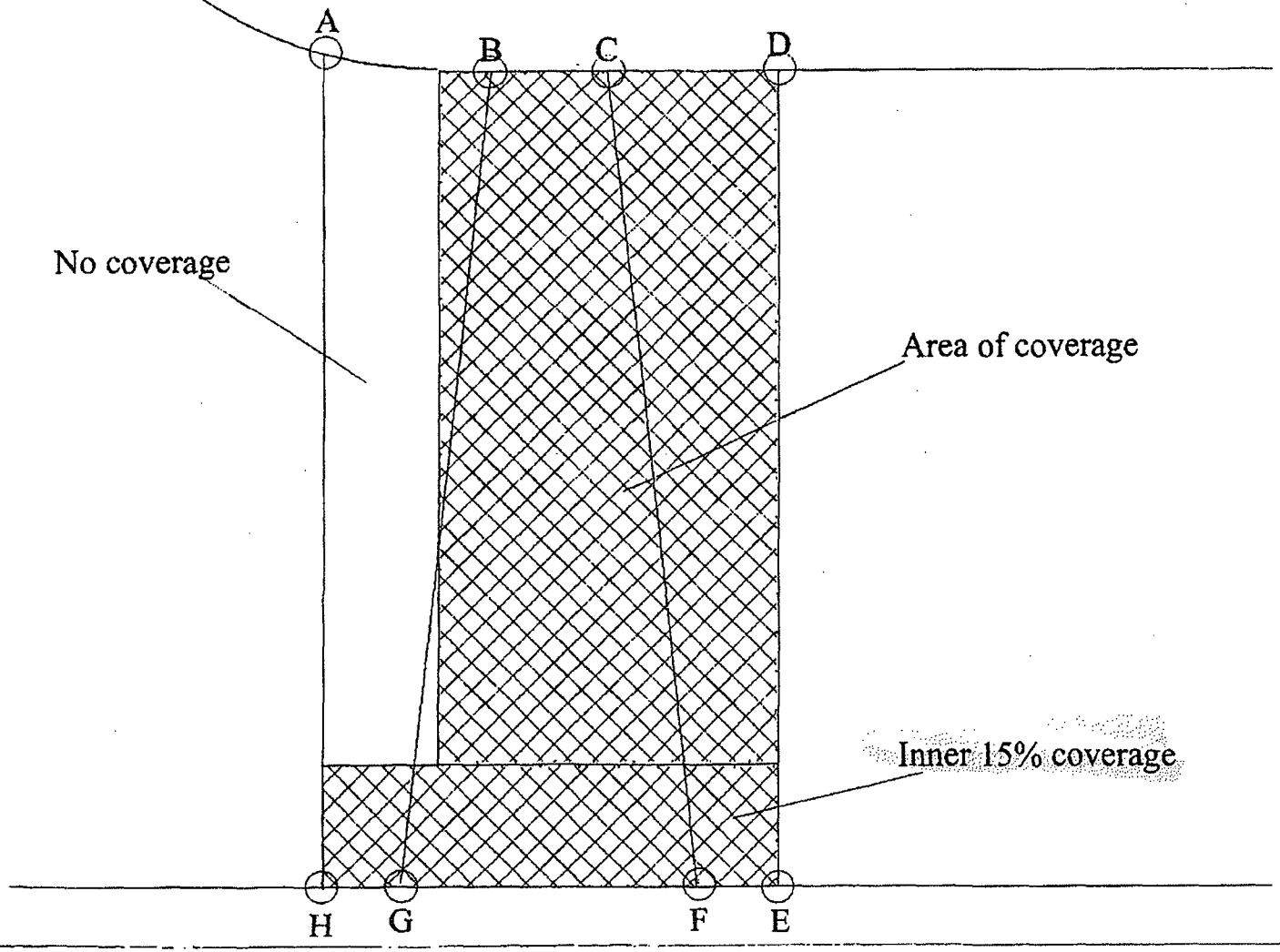
Examiner [illegible] II 04-11-05
Review [illegible] Frank Dohmen 4/15/05
Report # I05019
Page ____ of ____



DAEC N4 coverage plot

Parallel scan direction

Examiner [illegible] II 04-11-05
Review [illegible] 4/18/05
Report # I05019
Page ____ of ____



ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-065
Linearity Sheet No.: L-004

Procedure No.: ACP 1211.44 Revision: 0

Instrument: Panametrics (Manufacturer) Epoch III (Model No.) 01435501 (Serial No.)

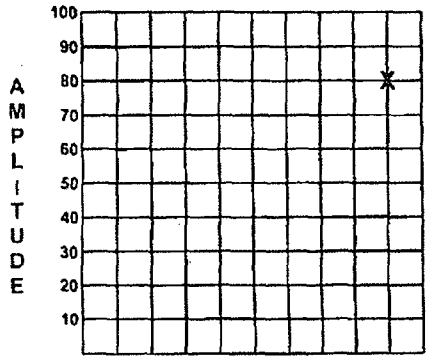
Search Unit: Krautkramer (Manufacturer) Comp G 389-055-750 (Model) 014XX3 (Serial No.) .75" Round (Size) 2.25 MHz (Freq.) * ° / Shear (Angle / Mode) .8" (Incident to wedge front)

Cable: RG-174 (Type) 12' (Length) 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) Carbon Steel (Material) NA / 5.25" (Size / Thickness) 66 °F (Temp.)

Couplant: Humex (Type) 98165 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 8.650"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	8.650"
Pulse Width:	N/A	Velocity:	.1228
Rep Rate:	Auto	Delay:	0.00
Damping:	150 Ohms	Zero Offset:	16.92
Display Mode:	Fullwave	Gain - Axial Scan:	47.5 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☒ Pulse Echo	☐ Dual
Pulse Amplitude:	Fixed		

Field Simulator N/A S/N N/A

Reflector:	ID Notch	N/A
Max Amplitude:	80%	N/A
Sweep:	9.0	N/A
Gain:	47.5 dB	N/A

Calibration Verification

		Verification Times:			
Initial Calibration Time:	08:04				
Final Calibration Time:	16:58	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
FWD-D001	I05019	Work Order: 1129010
		Wedge S/N:366-003-087
		Configuration of Elements: Single
		* 40° +- 90°

VanRuler, C.	II	04/11/05	Dohmen, F.	4/18/05	Bowers, J.	4-20-05
Examiner	Level	Date	Level III Review	Date	ANII Review	Date

NG 142Z Rev. 4

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-059
Linearity Sheet No.: L-004

Procedure No.: ACP 1211.44 Revision: 0

Instrument: Panametrics (Manufacturer) Epoch III (Model No.) 01435501 (Serial No.)

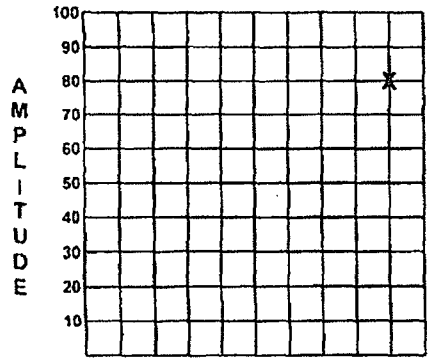
Search Unit: Krautkramer (Manufacturer) Comp G 389-055-750 (Model) 014XX8 (Serial No.) .75" Round (Size) 2.25 MHz (Freq.) 45° / Shear (Angle / Mode) .8" (Incident to wedge front)

Cable: RG-174 (Type) 12' (Length) 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) Carbon Steel (Material) NA / 5.25" (Size / Thickness) 66 °F (Temp.)

Couplant: Humex (Type) 98165 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 8.650"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	8.650
Pulse Width:	N/A	Velocity:	.1228
Rep Rate:	Auto	Delay:	0.00
Damping:	150 Ohms	Zero Offset:	16.92
Display Mode:	Fullwave	Gain - Axial Scan:	47.5 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☒ Pulse Echo	☐ Dual
Pulse Amplitude:	Fixed		

Field Simulator CS Rompas S/N LMT-17

Reflector:	ID Notch	.7" SDH
Max Amplitude:	80%	80%
Sweep:	9.0	1.2
Gain:	47.5 dB	36.0dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	08:02				
Final Calibration Time:	16:52	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
FWD-D001	I05019	Work Order: 1129010
		Wedge S/N:366-001-204
		Configuration of Elements: Single

VanRuler, C. (Examiner)	II (Level)	04/11/05 (Date)	Dohmen, F. (Level III Review)	4/18/05 (Date)	Bowers, J. (ANII Review)	4-20-05 (Date)

NG 142Z Rev. 4

ULTRASONIC EXAMINATION DATA SHEET
NOZZLE TO SHELL WELD AND INNER RADIUS

Site: DAEC | Report No.: I05019 | Calibration Sheet No.: C-059 THROUGH C-065

Data Sheet No.: N/A

Procedure No.: ACP 1211.44 Rev. 0

System:	Reactor Vessel	Exam Surface Temp.:	96 °F	Couplant:	Humex
Nozzle ID:	FWD-Bore, FWD-Nozzle, FWD-D001 IR	Thermometer S/N:	3991	Batch No.:	98165

Examination Surface: ID☐ OD☒	Material Type: CS ☒ SS ☐	Exam Date:	04/11/05
L_o Reference TDC	R_o Reference: WCL	Exam Start:	12:15
		Exam End:	13:50

Scan Surface	Exam Number
Vessel CW	1
Vessel CCW	2
Blend CW	3
Blend CCW	4
Nozzle Boss CW	5
Nozzle Boss CCW	6

Search Unit Angle / Skew	Scan Sensitivity	Exam Number
21.8° +- 90°	63.5 dB	5, 6
25° +-90°	63.5 dB	3, 4
40° +- 90°	53.5 dB	3, 4
70° +- 24°	78.5 dB	3, 4
70° (+- 13° to 36°)	78.5 dB	1, 2
45° (+-59° to 80°)	55.5 dB	1,2

Ind. #	Transducer Azimuth Location	Indication Metal Path	Transducer 'R' Location	Transducer Skew	Scan Sensitivity	Exam Number
NRI	N/A	N/A	N/A	N/A	N/A	N/A

REMARKS/LIMITATIONS

100% Coverage obtained based on modeling program for nozzle examinations. Reference EPRI report no.: IR-2004-62.
21.8° Exam obtained 95.69% of required volume due to thermocouple obstruction.
See attached limitation sheet.

WO: 1129010

☒ Previous Examination Data Reviewed

VanRuler, C.	II	04/11/05	FPB Dohmen, F.	4/18/05	JBL Bowers, J.	4-20-05
Examiner	Level	Date	Level III Review	Date	ANII Review	Date

Nozzle to RPV Coverage Calculation Sheet

Coverage Re-calculated using IWB-2500-7(b) volume 60°
Note: calculations performed using 2D plot only

Nozzle ID N4 Feedwater FWB/C/D-D001

Area required to be examined

Axial scan direction: Height x width

4.687 inches x 7.187 inches equals 33.685 square inches

Parallel scan direction: Height x width

4.687 inches x 7.187 inches equals 33.685 square inches

Total area required to be examined 67.371 square inches required for complete exam

Actual area examined

60° R.L. Axial scan direction: Height x width

4.687 inches x 7.187 inches equals 33.685 square inches

Triangular area not examined (if applies) 2.3 base x 3.94 height equals 4.531 square inches A=bh/2
1.06 base x 1.85 height equals 0.9805 square inches
Axial scan direction area examined 28.174 square inches

60° R.L. Parallel scan direction: Height x width

4.687 inches x 7.187 inches equals 33.685 square inches

Area not examined (if applicable) 4.687 height x 2.95 width equals 13.827 square inches
4.687 height x 1.85 width equals 8.671 square inches
33.685 inches minus area not examined 22.498 inches equals 11.188 square inches

Combining all scan directions: 39.362 square inches for total exam

Divide area examined by required area: equals coverage achieved 58.43 % coverage for total exam

Calculations performed by: Frank Dohmen Level III

DAEC Review Gary Park

58.43	60°
56.46	45°
55.4	40°
170.29	
56.71	

Nozzle to RPV Coverage Calculation Sheet

Coverage Re-calculated using IWB-2500-7(b) volume 45 degree for Inner 15%
Note: calculations performed using 2D plot only

Nozzle ID N4 Feedwater FWB/C/D-D001

Area required to be examined

Axial scan direction: Height x width

0.703 inches x 7.187 inches equals 5.05246 square inches

Parallel scan direction: Height x width

0.703 inches x 7.187 inches equals 5.05246 square inches

Total area required to be examined 10.1049 square inches required for complete exam

Actual area examined

45 degree Axial scan direction: Height x width

0.703 inches x 7.187 inches equals 5.05246 square inches

Triangular area not examined (if applies) 0.703 1/2 base x 0.703 height equals 0.247 square inches
Rect. area not examined (if applies) 1.127 x 0.703 equals 0.79228
Axial scan direction area examined 4.01308 square inches

45 degree shear Parallel scan direction: Height x width

0.703 inches x 7.187 inches equals 5.05246 square inches
Area not examined (if applies) 2.95 base x 0.703 height equals 2.07385 square inches
Area not examined (if applies) 1.830 base x 0.7030 height equals 1.28649 square inches
Parallel scan direction area examined 1.69212 square inches

Combining all scan directions: 5.7052 square inches for total exam

Divide area examined by required area: equals coverage achieved 56.46 % coverage for total exam

Calculations performed by: Frank Dohmen Level III

DAEC Review Gary Park

ANII Review

Nozzle to RPV Coverage Calculation Sheet

Coverage Re-calculated using IWB-2500-7(b) volume 40 degree for Inner 15%
Note: calculations performed using 2D plot only

Nozzle ID N4 Feedwater FWB/C/D-D001

Area required to be examined

Axial scan direction: Height x width

0.703 inches x 7.187 inches equals 5.05246 square inches

Parallel scan direction: Height x width

0.703 inches x 7.187 inches equals 5.05246 square inches

Total area required to be examined 10.1049 square inches required for complete exam

Actual area examined

40 degree Axial scan direction: Height x width

0.703 inches x 7.187 inches equals 5.05246 square inches

Triangular area not examined (1) (if applies)	0.38	1/2 base	x	0.3	height	equals	0.057	square inches
Rect. area not examined (1) (if applies)	0	x	0	equals	0			
Triangular area not examined (2) (if applies)	0.6	1/2 base	x	0.703	height	equals	0.2109	square inches
Rect. area not examined (2) (if applies)	1.25	x	0.703	equals	0.87875			
Axial scan direction area examined	3.90581	square inches						

40 degree shear Parallel scan direction: Height x width

0.703 inches x 7.187 inches equals 5.05246 square inches

Area not examined (if applies)	2.95	base	x	0.703	height	equals	2.07385	square inches
Area not examined (if applies)	1.830	base	x	0.703	height	equals	1.28649	
Parallel scan direction area examined	1.69212	square inches						

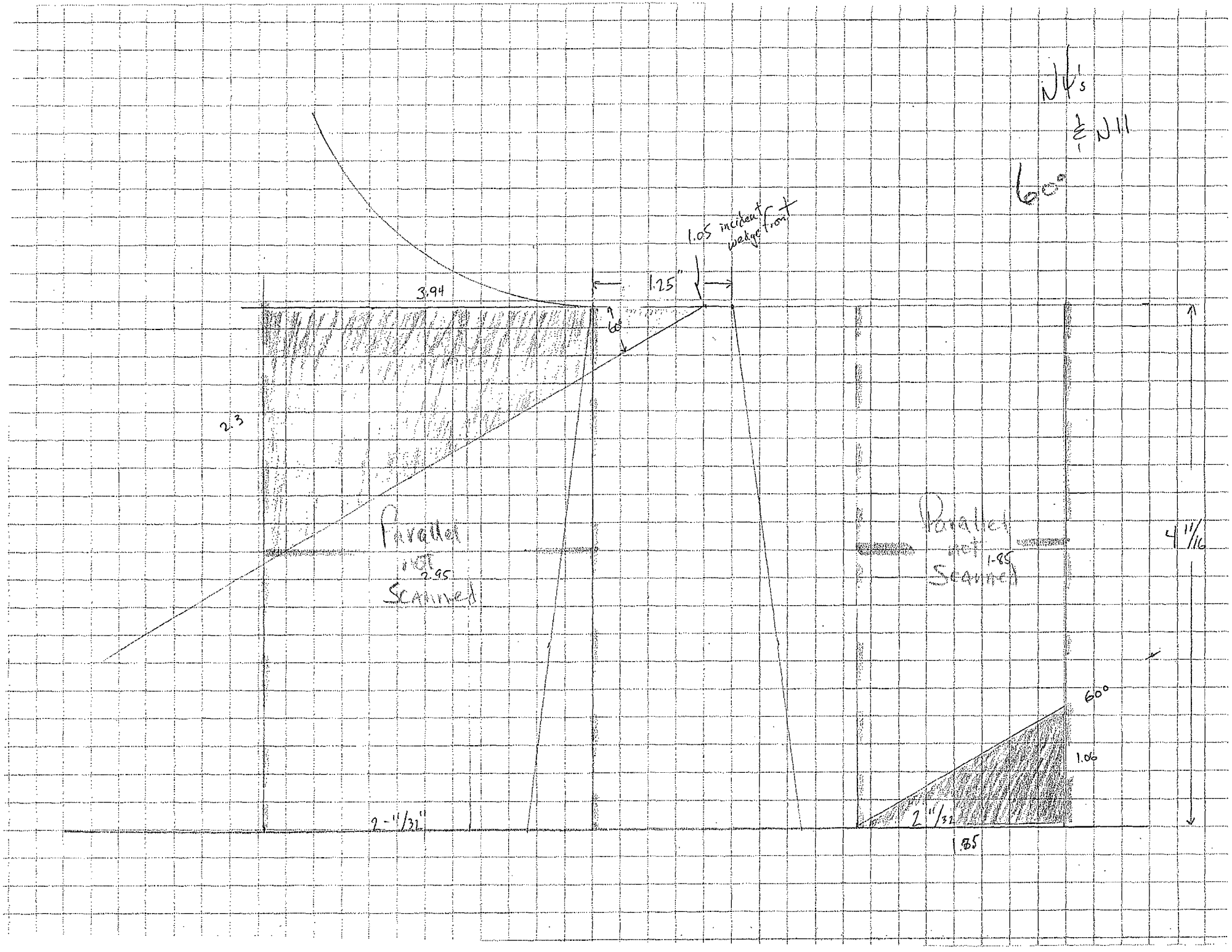
Combining all scan directions: 5.59793 square inches for total exam

Divide area examined by required area: equals coverage achieved 55.4 % coverage for total exam

Calculations performed by: Frank Dohmen Level III

DAEC Review Gary Park

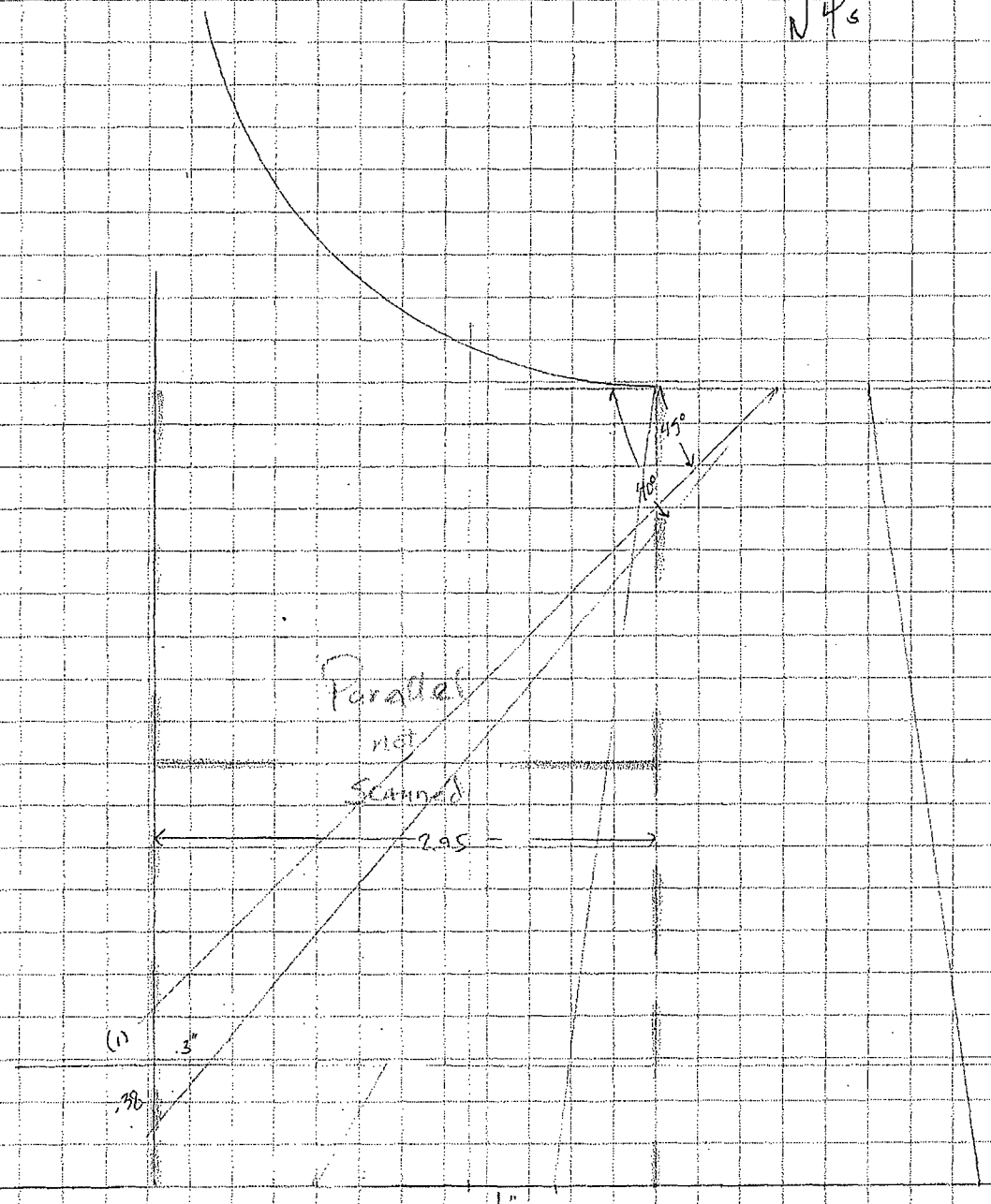
ANII Review

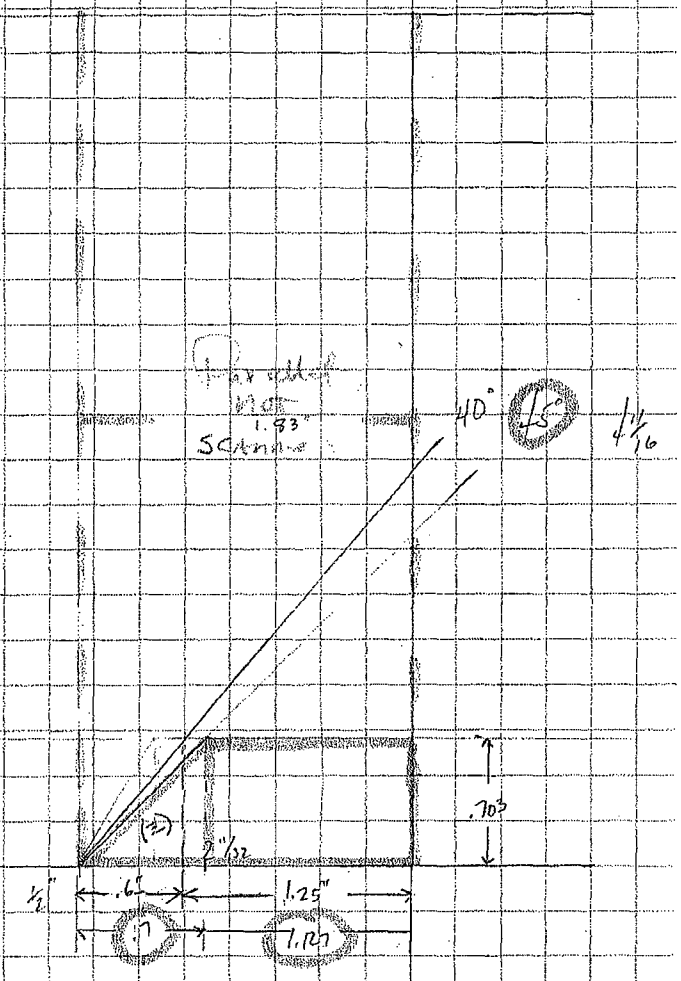

Wt's
& Nil
60°
1.05 incident wedge front
1.25"
3.94
60°
2.3
Parallel
not
2.95
Scanned
2-1/32"
Parallel
not
1.85
Scanned
4 11/16
60°
1.06
2 1/32
1.85

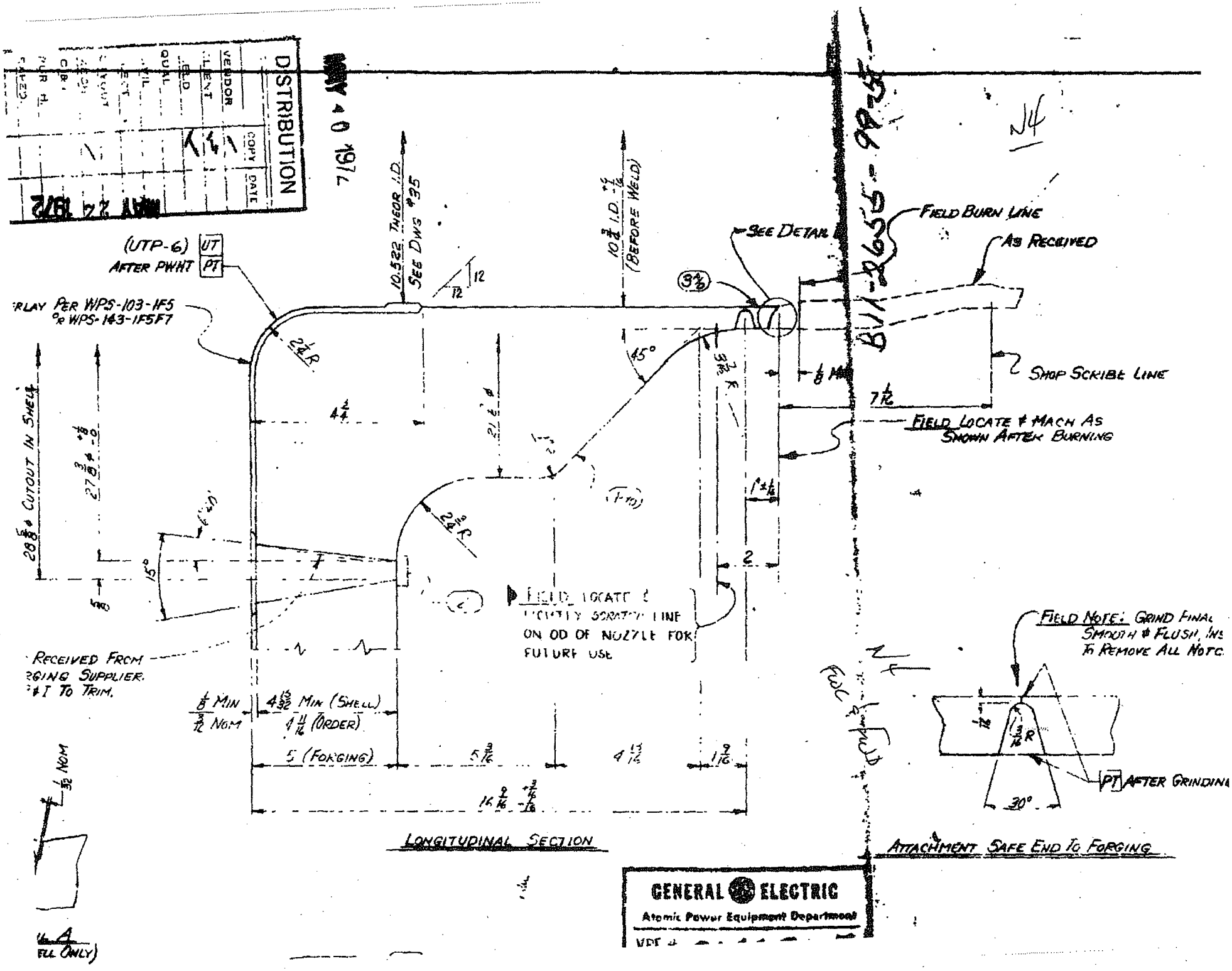
N 4½

45° & 40°

(½ N 11)



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10.522 THEOR I.D.
SEE DWG #35
12
10 3/4 I.D. +1/16 -0
(BEFORE WELD)
SEE DETAIL
FIELD BURN LINE
AS RECEIVED
3 1/8
BVI-2655-99-5
N4
OVERLAY PER WPS-103-1F5
OR WPS-143-1F5F7
2 1/4 R
45°
3 3/32 R
1/8 MIN
SHOP SCRIBE LINE
7 1/2
FIELD LOCATE & MACH AS
SHOWN AFTER BURNING
4 1/4
21 1/2 ø
28 5/8 ø CUTOUT IN SHELL
27 3/8 ø +1/8 -0
15°
2 9/16 R
1 1/16
2
FIELD LOCATE &
LIGHTLY SCRATCH LINE
ON OD OF NOZZLE FOR
FUTURE USE
RECEIVED FROM
FORGING SUPPLIER.
NDT TO TRIM.
1/8 MIN
3/32 NOM
4 15/32 MIN (SHELL)
4 11/16 (ORDER)
5 (FORGING)
5 3/16
4 15/16
1 9/16
16 9/16 +3/16 -1/16
1/32 NOM
N4
(FULL ONLY)
LONGITUDINAL SECTION
FIELD NOTE: GRIND FINAL
SMOOTH & FLUSH, INS
TO REMOVE ALL NOTC
1/16
1 3/16 R
PT AFTER GRINDING
30°
ATTACHMENT SAFE END TO FORGING
GENERAL ELECTRIC
Atomic Power Equipment Department

ULTRASONIC EXAMINATION DATA SHEET
REACTOR PRESSURE VESSEL WELDS

Site: DAEC	Report No.: I05045	Calibration Sheet No.:	C-020 C-021
		Data Sheet No.:	N/A

Procedure No.: ACP 1211.27 Rev. 1

14

System:	Reactor Vessel	Exam Surface Temp.:	88 °F	Couplant:	Ultragel II
Weld ID:	RRG-D001	Thermometer S/N:	3991	Batch No.:	00325

Examination Surface:	ID☐ OD☒	Material Type:	CS ☒ SS ☐	Exam Date:	04/04/2005
Lo Reference	TDC	Ro Reference:	WCL	Exam Start:	09:10
				Exam End:	10:15

Scan Surface	Exam Number
Perpendicular UpStream	1
Perpendicular DownStream	2
Parallel CW	3
Parallel CCW	4

Search Unit Angle	Scan Sensitivity	Exam Number
60° RL ZONE 1	74.5 dB	1, 3, 4
60° RL ZONE 2	72.5 dB	1, 3, 4
N/A	N/A	N/A
N/A	N/A	N/A

INDICATIONS

Indication No.	L (In) From Ref			W (In) From Ref			Sweep Reading ☒MP or ☐ Depth			Max Amp % Dac	Examination (1 - 4)
	L-1	L-Max	L-2	W-1	W-Max	W-2	SW-1 ☐ M1 ☐	SW-Max	SW-2 ☐ M2 ☐		
NRI	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

REMARKS/LIMITATIONS

Single sided access due to configuration. Reference EPRI Modeling Report no. IR-2004-62 for inner 15% examinations.
Obtained 80.44% code required volume.
Obtained 80.44% coverage of required volume.
See attached coverage plot.

☒ Previous Examination Data Reviewed

Stevermer, A. Examiner (s)	II Level	04/04/05 Date	Dohmen, F. Level III Review	4/17/05 Date	Bowers, J. ANII Review	4-19-05 Date

Nozzle to RPV Coverage Calculation Sheet

Coverage calculated to requirements of Code Case N-613-1
Note: calculations performed using 2D plot only

Nozzle ID N2G

Area required to be examined

Axial scan direction: Height x width

5.25 inches x 3.008 inches equals 15.792 square inches

Parallel scan direction: Height x width

5.25 inches x 3.008 inches equals 15.792 square inches

Total area required to be examined 31.584 square inches required for complete exam

Actual area examined

60 degree R.L. Axial scan direction: Height x width

5.25 inches x 3.008 inches equals 15.792 square inches

Triangular area not examined (if applies) 1.3 1/2 base x 2.24 height equals 1.456 square inches

Axial scan direction area examined 14.336 square inches

60 degree R.L. Parallel scan direction: Height x width

5.25 inches x 1.95 inches equals 10.2375 square inches

Additional Inner 15% area achieved using 40 & 45 degree shear techniques: Height x width

0.7875 inches x 1.058 inches equals 0.83318 square inches

Combining all scan directions: 25.4067 square inches for total exam

Divide area examined by required area: equals coverage achieved 80.44 % coverage for total exam

Calculations performed by: Todd Blechinger Level III

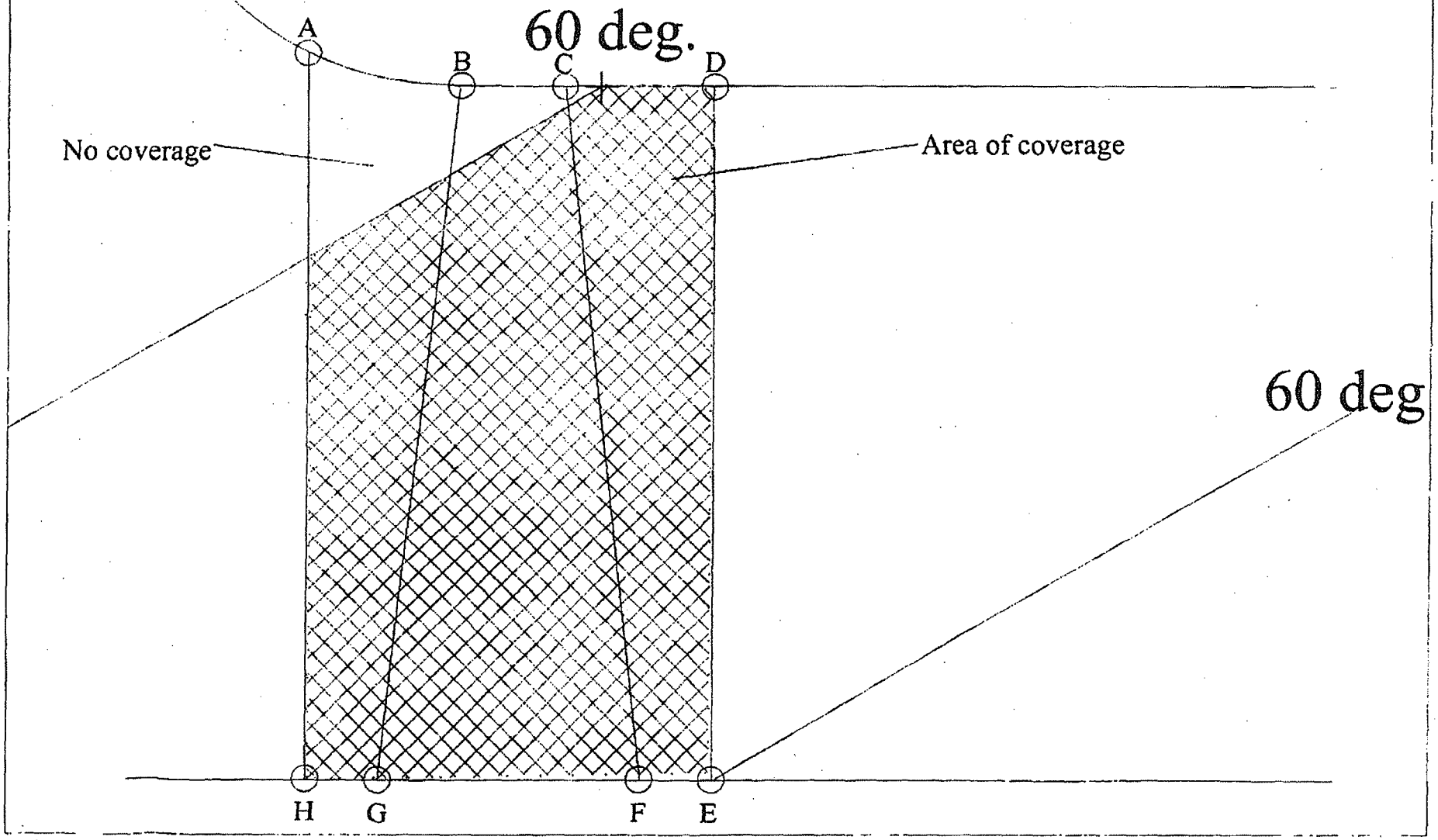
DAEC Review Frank Dohmen 4/14/05 Level III

ANII Review Jeremy Bowers 4-14-05

Page of

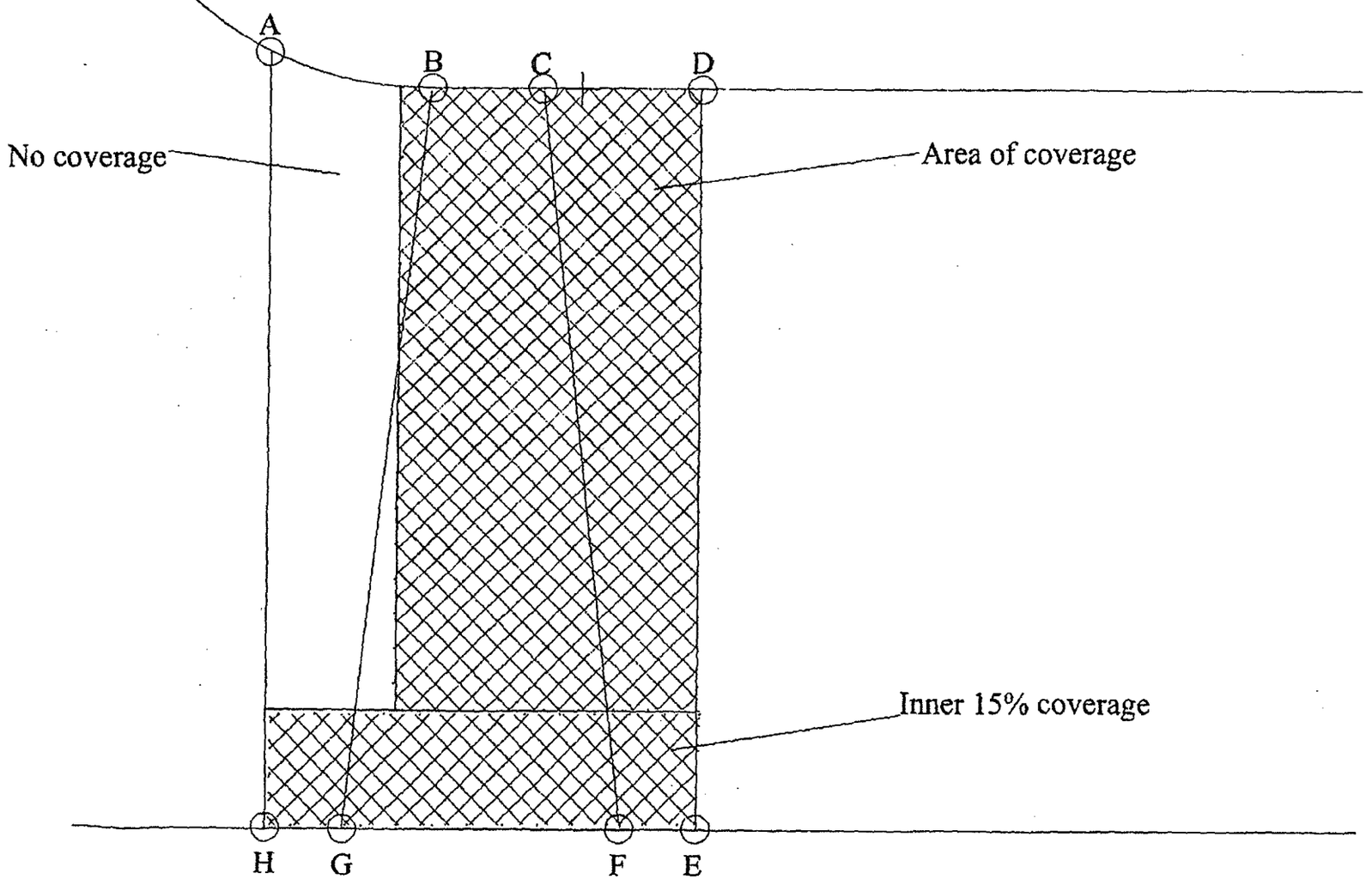
DAEC N2G Coverage Plot
Axial scan direction

Examiner [signature] 4-4-05
Review
Report # I05045
Page ___ of ___



DAEC N2G Coverage Plot
Parallel scan direction

Examiner [illegible] 4-4-05
Review
Report # I05045
Page ___ of ___



ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-020
Linearity Sheet No.: L-004

Procedure No.: ACP 1211.27 Revision: 1

Instrument: Panametrics (Manufacturer) Epoch III (Model No.) 01435501 (Serial No.)

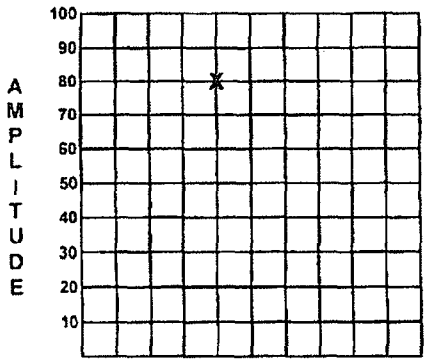
Search Unit: RTD (Manufacturer) TRL2-AUST FS~125 mm (Model) 00-447 (Serial No.) 2(24x42) mm Rec (Size) 2.0 MHz (Freq.) 60° / Long. (Angle / Mode) 1.05" (Incident to wedge front)

Cable: 2 (RG-174) (Type) 12' (Length) 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) Carbon Steel (Material) NA / 5.25" (Size / Thickness) 65 °F (Temp.)

Couplant: Ultragel II (Type) 00325 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 8.003"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	HIGH	Frequency:	FIXED
Pulse Energy:	HIGH	Range:	8.003"
Pulse Width:	N/A	Velocity:	.2309
Rep Rate:	AUTO	Delay:	0.000
Damping:	150 OHMs	Zero Offset:	12.38
Display Mode:	Full Wave	Gain - Axial Scan:	60.5 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	OFF	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator: CS ROMPAS S/N LMT-17

Reflector:	1/4 T SDH	2" RAD
Max Amplitude:	80%	80%
Sweep:	4.0	2.6
Gain:	60.5 dB	49.1 dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	07:11				
Final Calibration Time:	11:50	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments:
RRG-D001	I05045	Squint Angle 3°
		Configuration of Elements: D-SBS
		ZONE 1 60° RL Cal

Stevermer, A. (Examiner)	II (Level)	04/04/05 (Date)	Dohmen, F. (Level III Review)	4/17/05 (Date)	Bowers, J. (ANII Review)	4-19-05 (Date)

NG 142Z Rev. 4

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-021
Linearity Sheet No.: L-004

Procedure No.: ACP 1211.27 Revision: 1

Instrument: Panametrics (Manufacturer) Epoch III (Model No.) 01435501 (Serial No.)

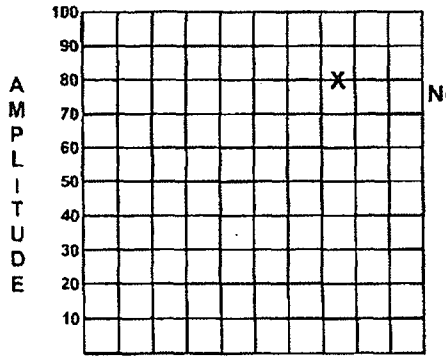
Search Unit: RTD (Manufacturer) TRL2-AUST FS~125 mm (Model) 00-447 (Serial No.) 2(24x42) mm Rec (Size) 2.0 MHz (Freq.) 60° / Long. (Angle / Mode) 1.05" (Incident to wedge front)

Cable: 2 (RG-174) (Type) 12' (Length) 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) Carbon Steel (Material) NA / 5.25" (Size / Thickness) 65 °F (Temp.)

Couplant: Ultragel II (Type) 00325 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 16.27"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	HIGH	Frequency:	FIXED
Pulse Energy:	HIGH	Range:	16.27"
Pulse Width:	N/A	Velocity:	.2309
Rep Rate:	AUTO	Delay:	0.000
Damping:	150 OHMs	Zero Offset:	12.38
Display Mode:	Full Wave	Gain - Axial Scan:	73.0 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	OFF	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator: CS ROMPAS S/N LMT-017

Reflector:	ID NOTCH	2" RAD
Max Amplitude:	80%	80%
Sweep:	7.5	1.2
Gain:	73.0 dB	49.1 dB

Calibration Verification

Initial Calibration Time: 07:09	Verification Times:			
Final Calibration Time: 11:49	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
RRG-D001	I05045	Squint Angle 3°
		Configuration of Elements: D-SBS
		ZONE 2 60° RL Cal

Stevermer, A. (Examiner)	II (Level)	04/04/05 (Date)	Dohmen, F. (Level III Review)	4/12/05 (Date)	Bowers, J. (ANII Review)	4-19-05 (Date)

NG 142Z Rev. 4

Nozzle to RPV Coverage Calculation Sheet

Coverage Re-calculated using IWB-2500-7(b) volume 60°
Note: calculations performed using 2D plot only

Nozzle ID N2 RRG-D001

Area required to be examined

Axial scan direction: Height x width

5.25 inches x 8.125 inches equals 42.656 square inches

Parallel scan direction: Height x width

5.25 inches x 8.125 inches equals 42.656 square inches

Total area required to be examined 85.313 square inches required for complete exam

Actual area examined

60° R.L. Axial scan direction: Height x width

5.25 inches x 8.125 inches equals 42.656 square inches

Triangular area not examined (if applies) 2.7 base x 4.66 height equals 6.291 square inches A=bh/2
1.218 base x 2.125 height equals 1.2941 square inches
Axial scan direction area examined 35.071 square inches

60° R.L. Parallel scan direction: Height x width

5.25 inches x 8.125 inches equals 42.656 square inches

Area not examined (if applicable) 5.25 height x 3.6 width equals 18.9 square inches
5.25 height x 2.125 width equals 11.156 square inches
42.656 inches minus area not examined 30.056 inches equals 12.6 square inches

Combining all scan directions: 47.671 square inches for total exam

Divide area examined by required area: equals coverage achieved 55.88 % coverage for total exam

				55.88	60°
Calculations performed by:	Frank Dohmen	Level	III	51.63	40°
				53.85	45°
				161.36	
DAEC Review	Gary Park			53.73	

Nozzle to RPV Coverage Calculation Sheet

Coverage Re-calculated using IWB-2500-7(b) volume 40 degree for Inner 15%
Note: calculations performed using 2D plot only

Nozzle ID N2 RRG-D001

Area required to be examined

Axial scan direction: Height x width

0.7875 inches x 8.125 inches equals 6.39844 square inches

Parallel scan direction: Height x width

0.7875 inches x 8.125 inches equals 6.39844 square inches

Total area required to be examined 12.7969 square inches required for complete exam

Actual area examined

40 degree Axial scan direction: Height x width

0.7875 inches x 8.125 inches equals 6.39844 square inches

Triangular area not examined(1) (if applies)	0.72	1/2 base	x	0.7875	height	equals	0.2835	square inches
Rect. area not examined(1) (if applies)	0	x	0.7875	equals	0			
Triangular area not examined(2) (if applies)	0.76	1/2 base	x	0.7875	height	equals	0.29925	square inches
Rect. area not examined(2) (if applies)	1.37	x	0.7875	equals	1.07888			
Axial scan direction area examined	4.73681	square inches						

40 degree shear Parallel scan direction: Height x width

0.7875 inches	x	8.125	inches	equals	6.39844	square inches		
Area not examined (if applies)		3.625	base	x	0.7875	height	equals	2.85469 square inches
Area not examined (if applies)		2.125	base	x	0.7875	height	equals	1.67344
Parallel scan direction area examined		1.87031	square inches					

Combining all scan directions: 6.60713 square inches for total exam

Divide area examined by required area: equals coverage achieved 51.63 % coverage for total exam

Calculations performed by: Frank Dohmen Level III

DAEC Review Gary Park

ANII Review

Nozzle to RPV Coverage Calculation Sheet

Coverage Re-calculated using IWB-2500-7(b) volume 45 degree for Inner 15%
Note: calculations performed using 2D plot only

Nozzle ID N2 RRG-D001

Area required to be examined

Axial scan direction: Height x width

0.7875 inches x 8.125 inches equals 6.39844 square inches

Parallel scan direction: Height x width

0.7875 inches x 8.125 inches equals 6.39844 square inches

Total area required to be examined 12.7969 square inches required for complete exam

Actual area examined

45 degree Axial scan direction: Height x width

0.7875 inches x 8.125 inches equals 6.39844 square inches

Triangular area not examined (if applies) 0.75 1/2 base x 0.7875 height equals 0.295 square inches
Rect. area not examined (if applies) 1.375 x 0.7875 equals 1.08281
Axial scan direction area examined 5.02031 square inches

45 degree shear Parallel scan direction: Height x width

0.7875 inches x 8.125 inches equals 6.39844 square inches
Area not examined (if applies) 3.625 base x 0.7875 height equals 2.855 square inches
Area not examined (if applies) 2.125 base x 0.7875 height equals 1.673 square inches
Parallel scan direction area examined 1.87031 square inches

0 inches x 0 inches equals 0 square inches

Combining all scan directions: 6.89063 square inches for total exam

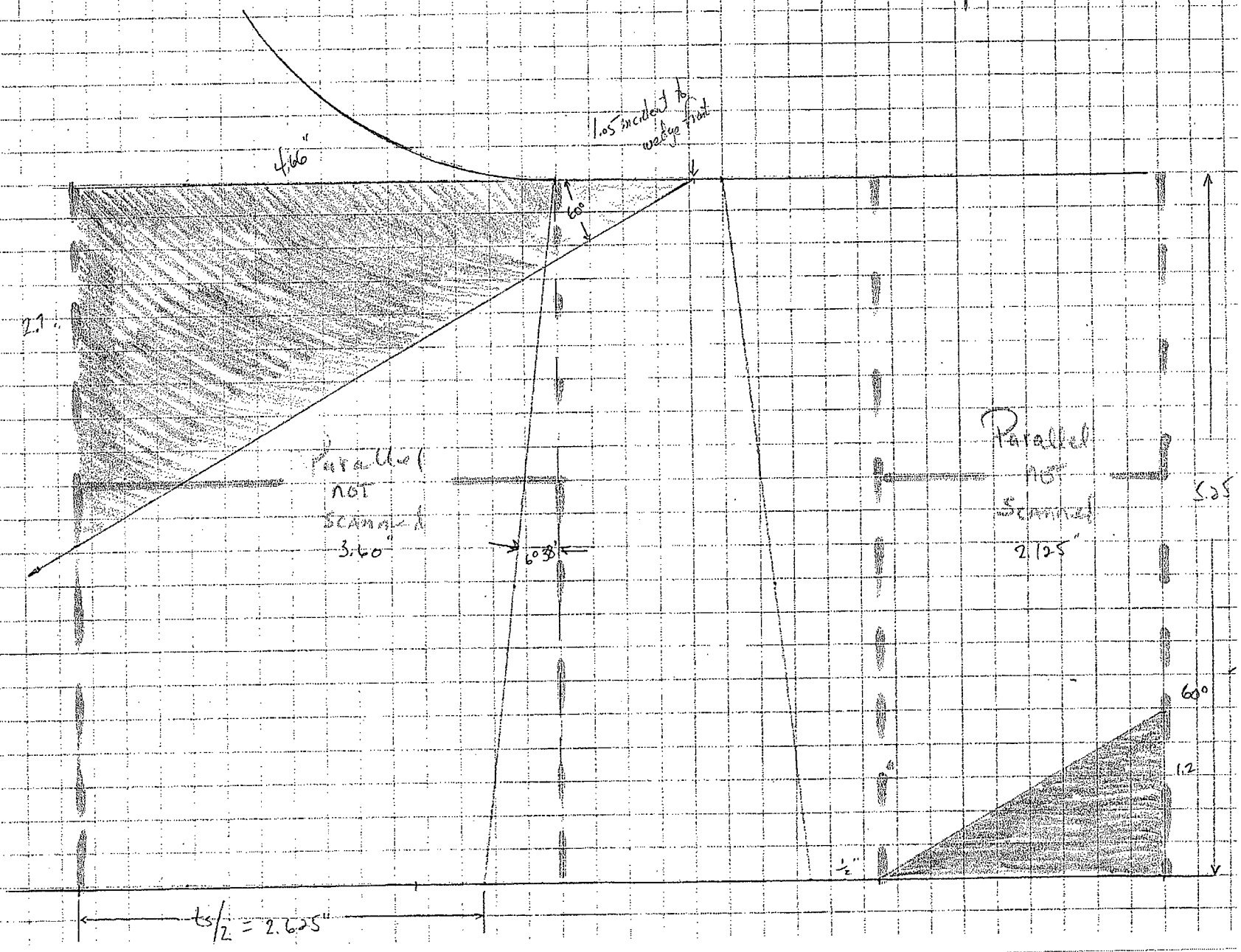
Divide area examined by required area: equals coverage achieved 53.85 % coverage for total exam

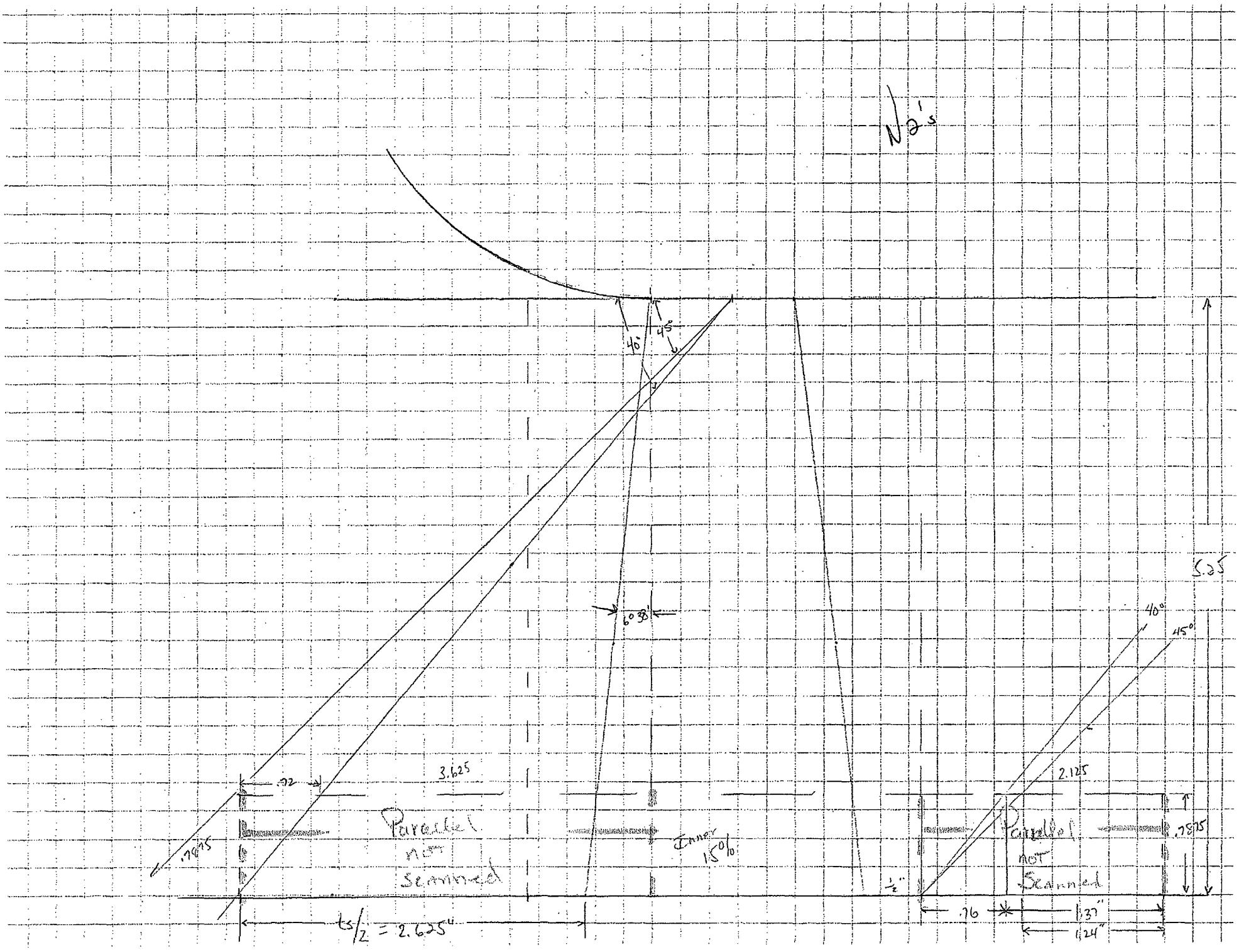
Calculations performed by: Frank Dohmen Level III

DAEC Review Gary Park

ANII Review

N2's


4.66"
1.05 incident to wedge front
60°
2.1"
Parallel
NOT
Scanned
3.60"
60°
Parallel
NOT
Scanned
2.125"
5.25
60°
1.2
½"
ts/2 = 2.625"


No's
40°
45°
6°38'
.92
3.625
.7875
Parallel
not
Scanned
Inner
15%
ts/2 = 2.625"
5.25
40°
45°
2.125
.7875
Parallel
not
Scanned
½"
.76
1.37"
1.24"

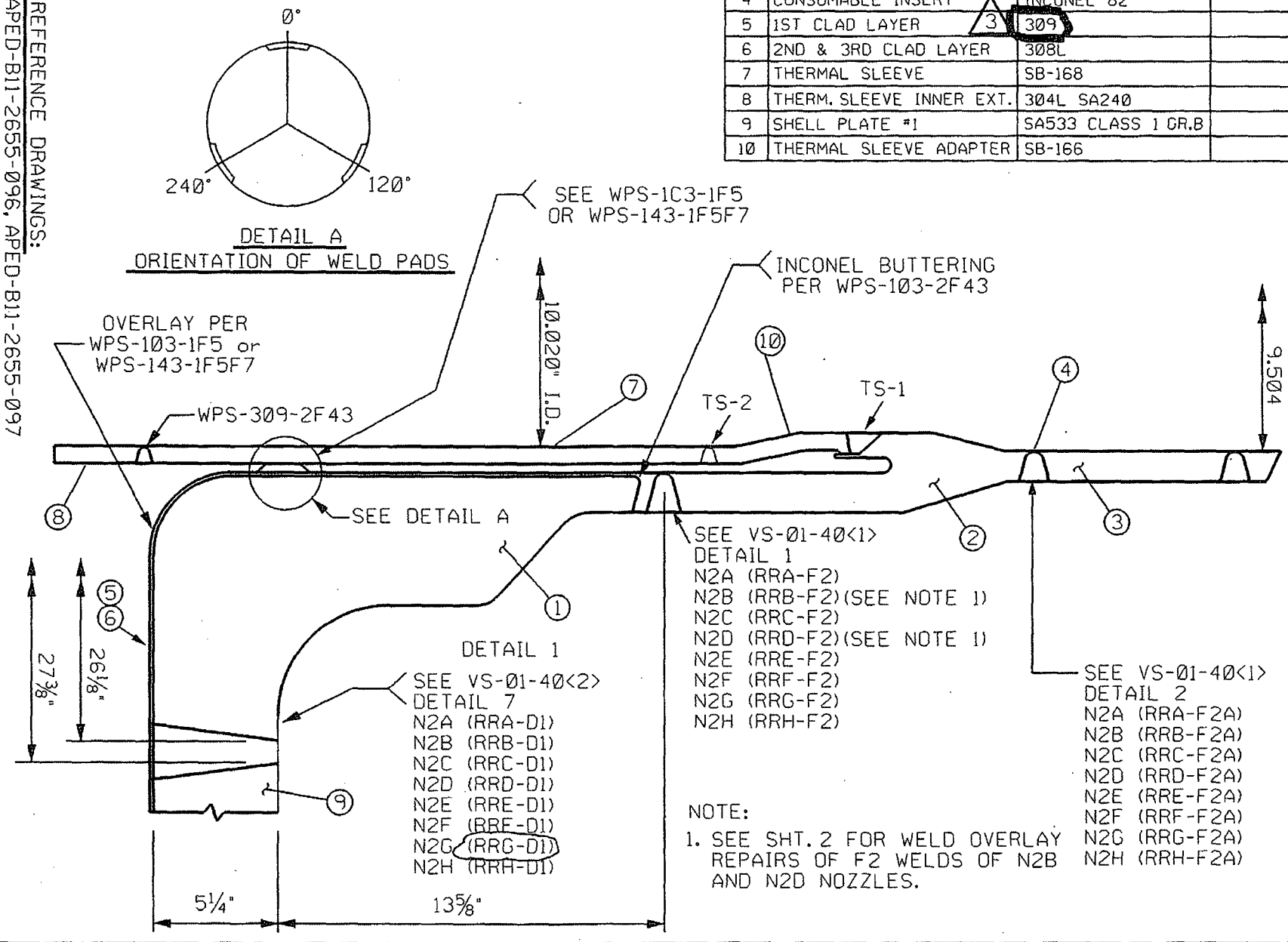
DATE	REVISION	DRFTR.	CHK'D.	ENGR.	VER.
8/22/07	REVISED PER DURF-U0191	TAK	DA	ALT	RS
10/24/00	REVISED PER DURF-0146	DA	JAH	GP	FED
12/17/99	ISSUED PER DURF-U0133 FOR ECP-1627	JW	TAK	LAL	CEZ

NO.	DESCRIPTION	BILL OF MATL.	PROCED.
1	FORGING	SA508 CLASS 2	
2	SAFE END FORGING	SB-166	
3	SAFE END EXT. FORGING	SA336 CLASS F8 S.S.	
4	CONSUMABLE INSERT	INCONEL 82	
5	1ST CLAD LAYER	309	
6	2ND & 3RD CLAD LAYER	308L	
7	THERMAL SLEEVE	SB-168	
8	THERM. SLEEVE INNER EXT.	304L SA240	
9	SHELL PLATE #1	SA533 CLASS 1 GR.B	
10	THERMAL SLEEVE ADAPTER	SB-166	

FPL: Inservice Inspection Program

REFERENCE DRAWINGS:
APED-B11-2655-096, APED-B11-2655-097

RECIRCULATION INLET NOZZLE MK N2A/H



NOTE:

1. SEE SHT. 2 FOR WELD OVERLAY REPAIRS OF F2 WELDS OF N2B AND N2D NOZZLES.

ULTRASONIC EXAMINATION DATA SHEET
REACTOR PRESSURE VESSEL WELDS

Site: DAEC

Report No.: I05061

Calibration Sheet No.: C-089 THRU C-090

Data Sheet No.: N/A

Procedure No.: ACP 1211.27 Rev. 1

15

System:	Reactor Vessel	Exam Surface Temp.:	88 °F	Couplant:	Humex
Weld ID:	JPB-D001	Thermometer S/N:	3991	Batch No.:	98165

Examination Surface: ID☐ OD☒		Material Type: CS ☒ SS ☐		Exam Date:	04/14/05
L_o Reference	TDC	R_o Reference:	WCL	Exam Start:	14:40
				Exam End:	15:20

Scan Surface	Exam Number
Perpendicular UpStream	1
Perpendicular DownStream	2
Parallel CW	3
Parallel CCW	4

Search Unit Angle	Scan Sensitivity	Exam Number
60° RL ZONE 1	76.7 dB	1, 3, 4
60° RL ZONE 2	74.7 dB	1, 3, 4

INDICATIONS

Indication No.	L (In) From Ref			W (In) From Ref			Sweep Reading ☒MP or ☐ Depth			Max Amp % Dac	Examination (1 - 4)
	L-1	L-Max	L-2	W-1	W-Max	W-2	SW-1 ☐ M1 ☐	SW-Max	SW-2 ☐ M2 ☐		
NRI	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

REMARKS/LIMITATIONS

WO:1129013
Limitation: 5" x 3" insulation bracket located 12" below nozzle. Obtained 77.86% coverage of required volume. See attached coverage plot.

☒ Previous Examination Data Reviewed

Stevermer, A. Examiner (s)	II Level	04/14/05 Date	Dohmen, F. Level III Review	4/19/05 Date	Bowers, J. ANII Review	4-20-05 Date

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-089
Linearity Sheet No.: L-002

Procedure No.: ACP 1211.27 Revision: 1

Instrument: Panametrics (Manufacturer) Epoch III (Model No.) 01448103 (Serial No.)

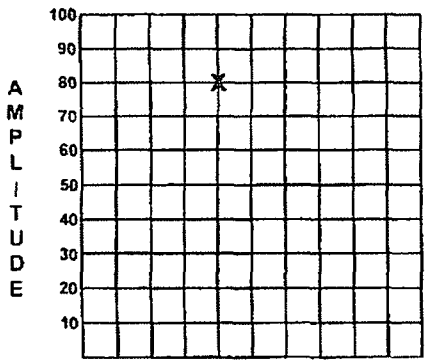
Search Unit: RTD (Manufacturer) TRL2-ST FS~125 mm (Model) 02-102 (Serial No.) 2 (24X42) mm Rectangular (Size) 2.0 MHz (Freq.) 60° / RL (Angle / Mode) 1.05 " (Incident to wedge front)

Cable: 2 (RG-174) (Type) 12 ' (Length) 0 (No. of Connectors)

Calibration Standard: 1E-30 (Serial No.) Carbon Steel (Material) NA / 5.25" (Size / Thickness) 66 °F (Temp.)

Couplant: Humex (Type) 98165 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 6.329"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	6.329"
Pulse Width:	N/A	Velocity:	.2332
Rep Rate:	Auto	Delay:	0.0
Damping:	150 ohms	Zero Offset:	12.98
Display Mode:	Full Wave	Gain - Axial Scan:	62.7 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator CS Rompas S/N LMT-17

Reflector:	1/4T SDH	2" RAD.
Max Amplitude:	80%	80%
Sweep:	4.0	3.2
Gain:	62.7dB	47.6 dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	08:56				
Final Calibration Time:	16:02	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
JPB-D001	I05061	Work Order: 1129013
		Squint Angle 5°
		Configuration of Elements: D-SBS
		ZONE1

Examiner	Level	Date	Level III Review	Date	ANII Review	Date
Stevermer, A.	II	04/14/05	Dohmen, F.	4/19/05	Bowers, J.	4-20-05

NG 142Z Rev. 4

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-090
Linearity Sheet No.: L-002

Procedure No.: ACP 1211.27 Revision: 1

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01448103 (Serial No.)

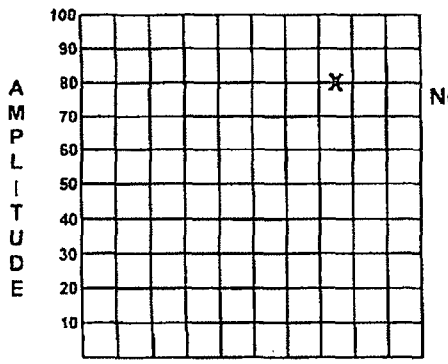
Search Unit: RTD (Manufacturer) | TRL2-ST FS~125 mm (Model) | 02-102 (Serial No.) | 2 (24X42) mm Rectangular (Size) | 2.0 MHz (Freq.) | 60° / RL (Angle / Mode) | 1.05 " (Incident to wedge front)

Cable: 2 (RG-174) (Type) | 12 ' (Length) | 0 (No. of Connectors)

Calibration Standard: 1E-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 66 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 14.45"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	14.45"
Pulse Width:	N/A	Velocity:	.2332
Rep Rate:	Auto	Delay:	12.98
Damping:	150 ohms	Zero Offset:	0.0
Display Mode:	Full Wave	Gain - Axial Scan:	71.0 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator CS Rompas S/N LMT-17

Reflector:	ID Notch	2" RAD.
Max Amplitude:	80%	80%
Sweep:	7.5	1.2
Gain:	71.0 dB	47.2 dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	09:04				
Final Calibration Time:	16:03	N/A	N/A	N/A	N/A

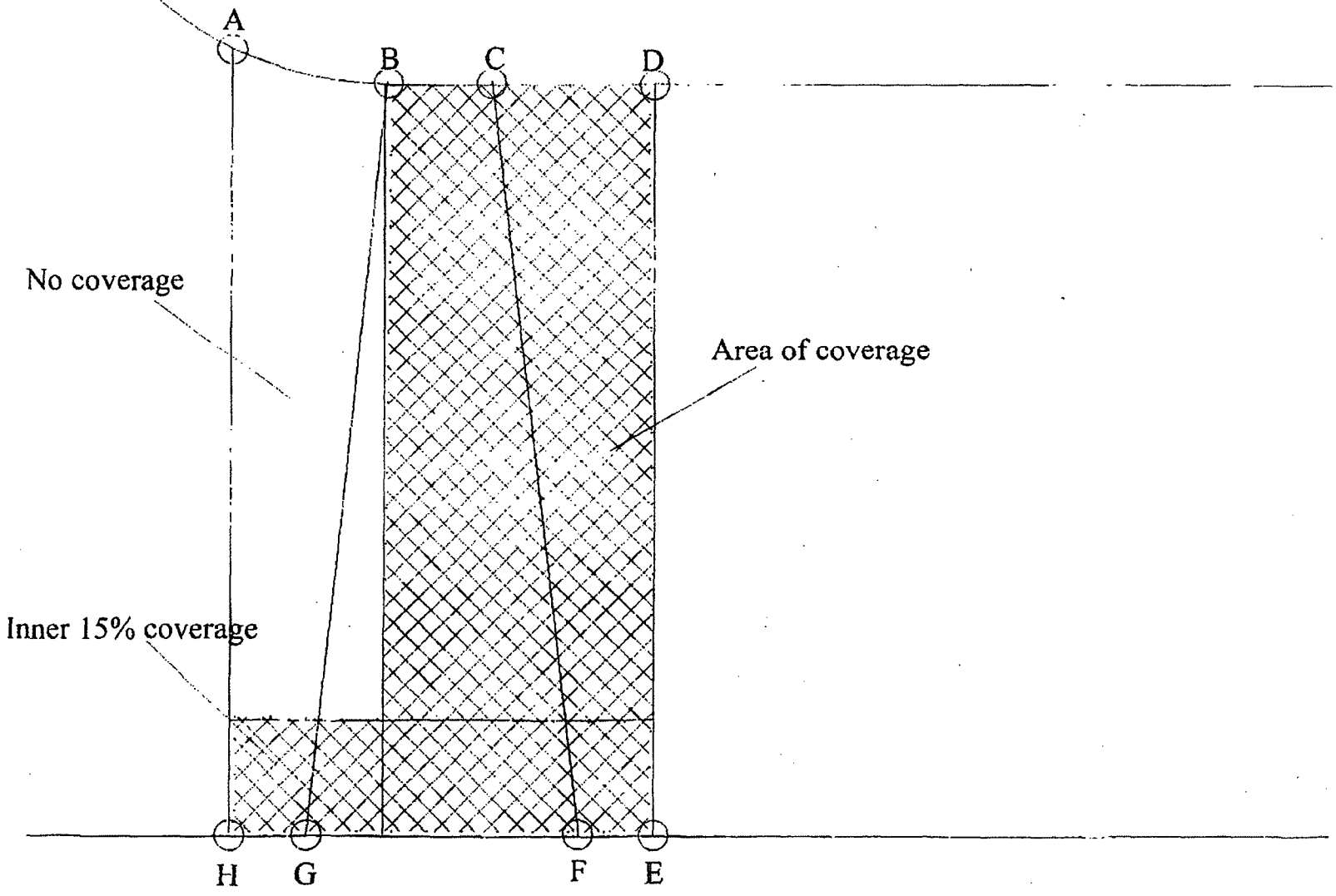
Welds Examined	Report No.	Comments
JPB-D001	I05061	Work Order: 1129013
		Squint Angle 5°
		Configuration of Elements: D-SBS
		ZONE2

Stevermer, A. (Examiner)	II (Level)	04/14/05 (Date)	Dohmen, F. (Level III Review)	4/19/05 (Date)	Bowers, J. (ANII Review)	4-20-05 (Date)

NG 142Z Rev. 4

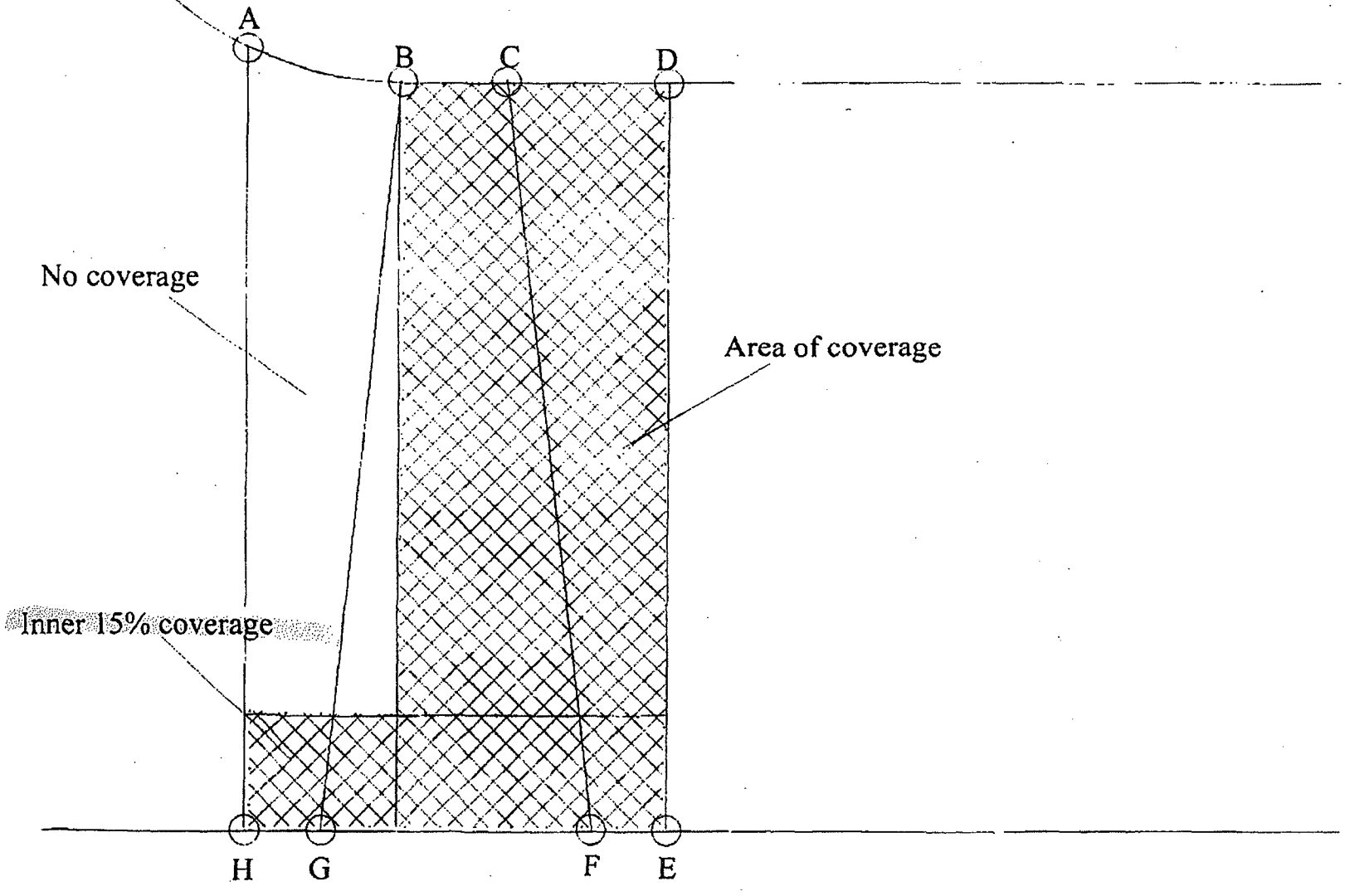
DAEC N8 Coverage Plot
Parallel scan direction

Examiner [signature]
Review
Report # 105061
Page ___ of ___



DAEC N8 Coverage Plot
Parallel scan direction

Examiner [signature]
Review
Report # I05061
Page ___ of ___



Nozzle to RPV Coverage Calculation Sheet

Coverage calculated to requirements of Code Case N-613-1
Note: calculations performed using 2D plot only

Nozzle ID N8

Area required to be examined

Axial scan direction: Height x width

5.25 inches x 3.008 inches equals 15.792 square inches

Parallel scan direction: Height x width

5.25 inches x 3.008 inches equals 15.792 square inches

Total area required to be examined 31.584 square inches required for complete exam

Actual area examined

60 degree R.L. Axial scan direction: Height x width

5.25 inches x 3.008 inches equals 14.9803 square inches
Note: Only 94.86% of axial scan surface area examined due to insulation bracket interference

Triangular area not examined (if applies) 1.29 1/2 base x 2.14 height equals 1.3803 square inches

Axial scan direction area examined 13.6 square inches

60 degree R.L. Parallel scan direction: Height x width

5.25 inches x 1.93 inches equals 10.1325 square inches

Additional inner 15% area achieved using 45 degree shear technique: Height x width

0.7875 inches x 1.09 inches equals 0.85838 square inches

Combining all scan directions: 24.5909 square inches for total exam

Divide area examined by required area: equals coverage achieved 77.86 % coverage for total exam

Calculations performed by: Todd Blechinger Level III

DAEC Review Frank Dohmen 4/19/05 Level III

ANII Review Jeremy Bowers 4-20-05

Nozzle to RPV Coverage Calculation Sheet

Coverage Re-calculated using IWB-2500-7(b) volume 60°
Note: calculations performed using 2D plot only

Nozzle ID N8 JPB-D001

Area required to be examined

Axial scan direction: Height x width

5.25 inches x 8.187 inches equals 42.982 square inches

Parallel scan direction: Height x width

5.25 inches x 8.187 inches equals 42.982 square inches

Total area required to be examined 85.964 square inches required for complete exam

Actual area examined

60° R.L. Axial scan direction: Height x width

5.25 inches x 8.187 inches equals 42.982 square inches

Triangular area not examined (if applies) 2.52 base x 4.82 height equals 6.073 square inches A=bh/2
1.24 base x 2.12 height equals 1.314 square inches
Axial scan direction area examined 35.594 square inches 0.828 29.476 sq in x 94.86% due to bracket 27.961

60° R.L. Parallel scan direction: Height x width

5.25 inches x 8.187 inches equals 42.982 square inches

Area not examined (if applicable) 5.25 height x 3.4 width equals 17.85 square inches
5.25 height x 2.12 width equals 11.13 square inches
42.982 inches minus area not examined 28.98 inches equals 14.0018 square inches

Combining all scan directions: 41.963 square inches for total exam

Divide area examined by required area: equals coverage achieved 48.81 % coverage for total exam

Calculations performed by: Frank Dohmen Level III

48.81 60°
55.58 40°
56.24 45°
160.63
53.49

DAEC Review Gary Park

Nozzle to RPV Coverage Calculation Sheet

Coverage Re-calculated using IWB-2500-7(b) volume 40 degree for Inner 15%
Note: calculations performed using 2D plot only

Nozzle ID N8 JPB-D001

Area required to be examined

Axial scan direction: Height x width

0.7875 inches x 8.187 inches equals 6.44726 square inches

Parallel scan direction: Height x width

0.7875 inches x 8.187 inches equals 6.44726 square inches

Total area required to be examined 12.8945 square inches required for complete exam

Actual area examined

40 degree Axial scan direction: Height x width

0.7875 inches x 8.187 inches equals 6.44726 square inches

Triangular area not examined(1) (if applies)	0.26	1/2 base	x	0.22	height	equals	0.0286	square inches
Rect. area not examined(1) (if applies)	0	x	0	equals	0			
Triangular area not examined(2) (if applies)	0.645	1/2 base	x	0.7875	height	equals	0.25397	square inches
Rect. area not examined(2) (if applies)	1.49	x	0.7875	equals	1.17338			
Axial scan direction area examined	4.99132	square inches						

40 degree shear Parallel scan direction: Height x width

0.7875 inches	x	8.187	inches	equals	6.44726	square inches		
Area not examined (if applies)		3.3	base	x	0.7875	height	equals	2.599 square inches
Area not examined (if applies)		2.125	base	x	0.7875	height	equals	1.673
Parallel scan direction area examined		2.175	square inches					

Combining all scan directions: 7.16639 square inches for total exam

Divide area examined by required area: equals coverage achieved 55.58 % coverage for total exam

Calculations performed by: Frank Dohmen Level III

DAEC Review Gary Park

ANII Review

Nozzle to RPV Coverage Calculation Sheet

Coverage Re-calculated using IWB-2500-7(b) volume 45 degree for Inner 15%
Note: calculations performed using 2D plot only

Nozzle ID N8 JPB-D001

Area required to be examined

Axial scan direction: Height x width

0.7875 inches x 8.187 inches equals 6.44726 square inches

Parallel scan direction: Height x width

0.7875 inches x 8.187 inches equals 6.44726 square inches

Total area required to be examined 12.8945 square inches required for complete exam

Actual area examined

45 degree Axial scan direction: Height x width

0.7875 inches x 8.187 inches equals 6.44726 square inches

Triangular area not examined (if applies) 0.75 1/2 base x 0.7875 height equals 0.295 square inches
Rect. area not examined (if applies) 1.365 x 0.7875 equals 1.075
Axial scan direction area examined 5.07701 square inches

45 degree shear Parallel scan direction: Height x width

0.7875 inches x 8.187 inches equals 6.44726 square inches
Area not examined (if applies) 3.3 base x 0.7875 height equals 2.599 square inches
Area not examined (if applies) 2.125 base x 0.7875 height equals 1.673 square inches
Parallel scan direction area examined 2.17508 square inches

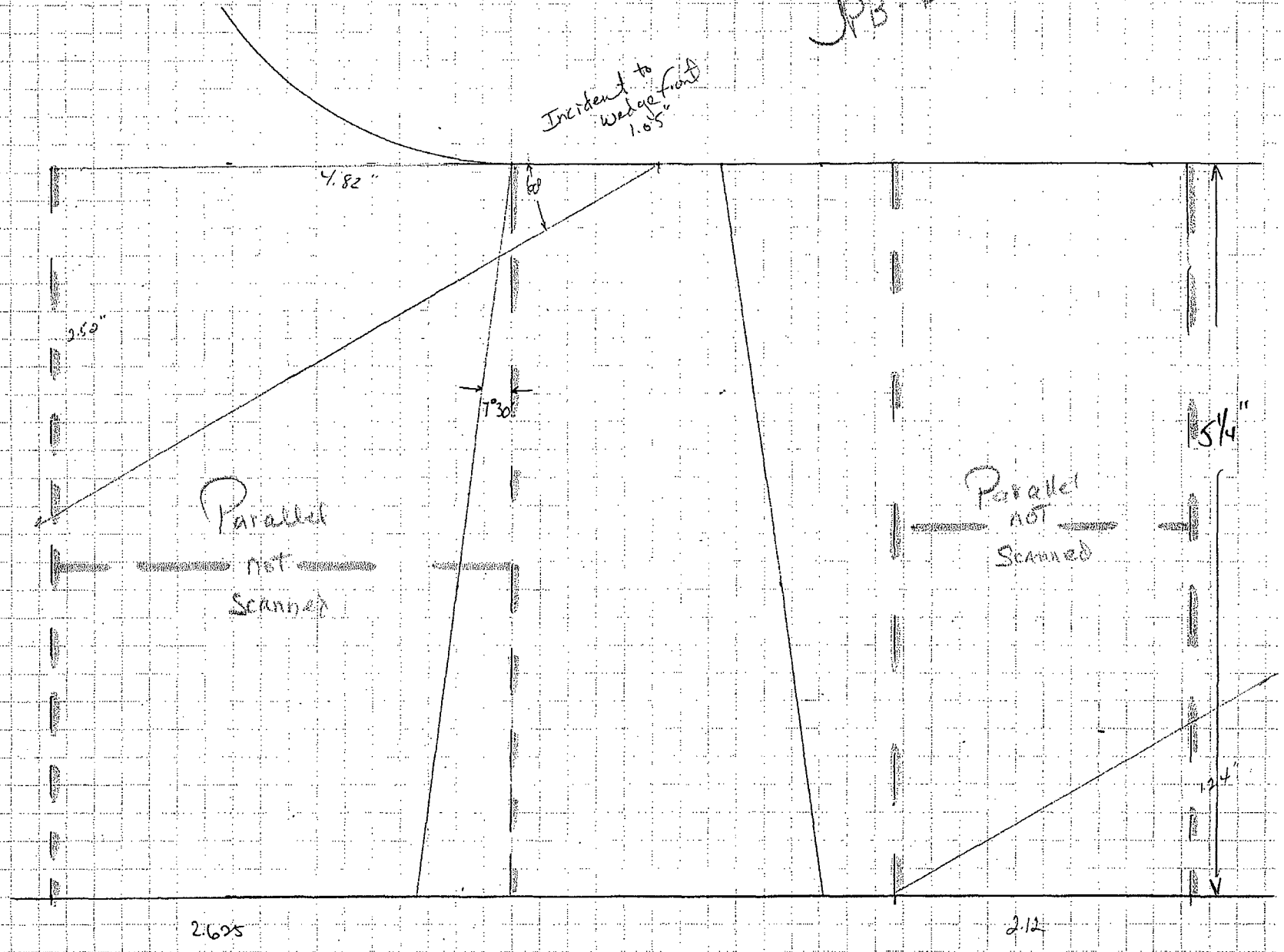
Combining all scan directions: 7.25209 square inches for total exam

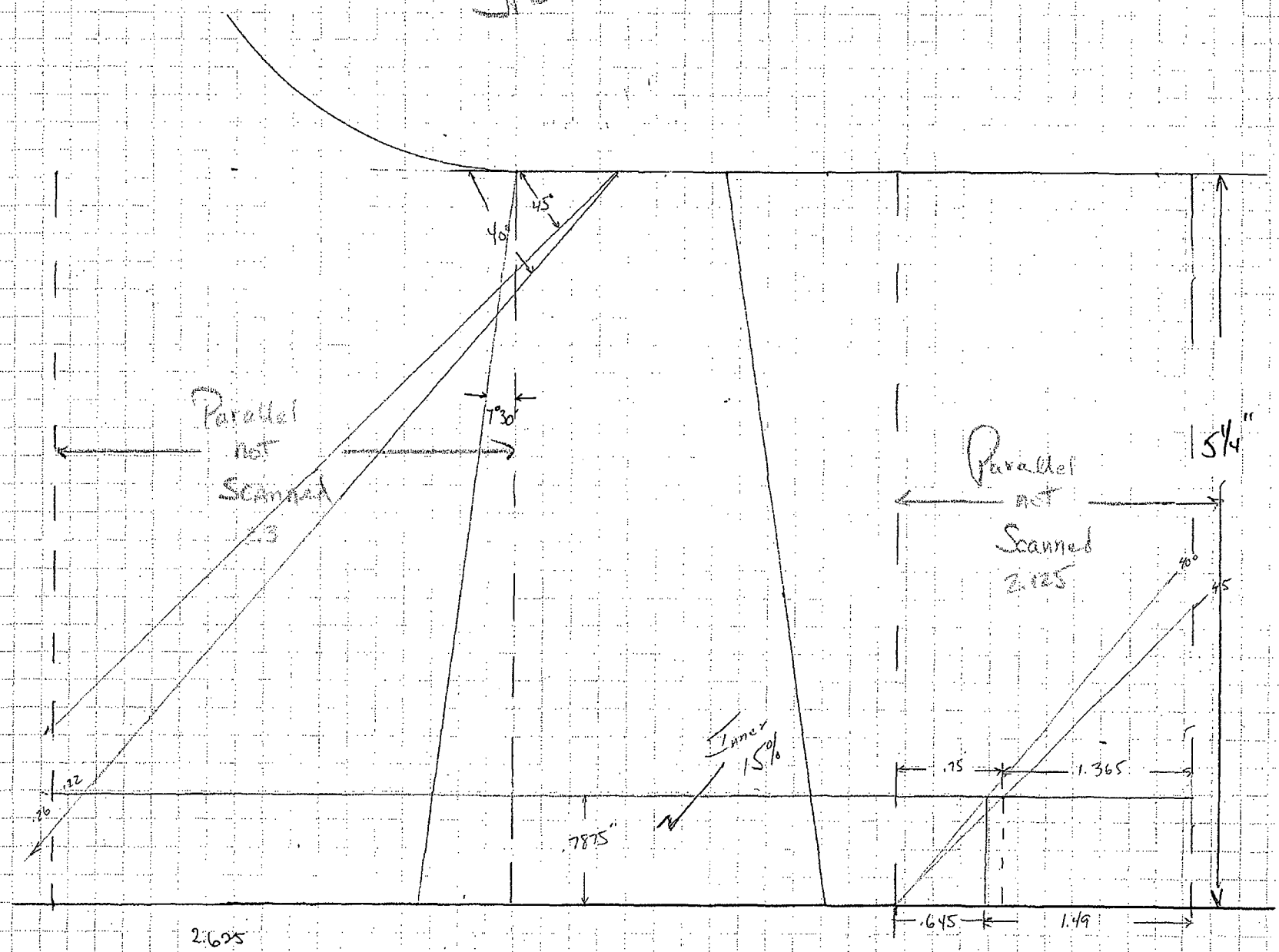
Divide area examined by required area: equals coverage achieved 56.24 % coverage for total exam

Calculations performed by: Frank Dohmen Level III

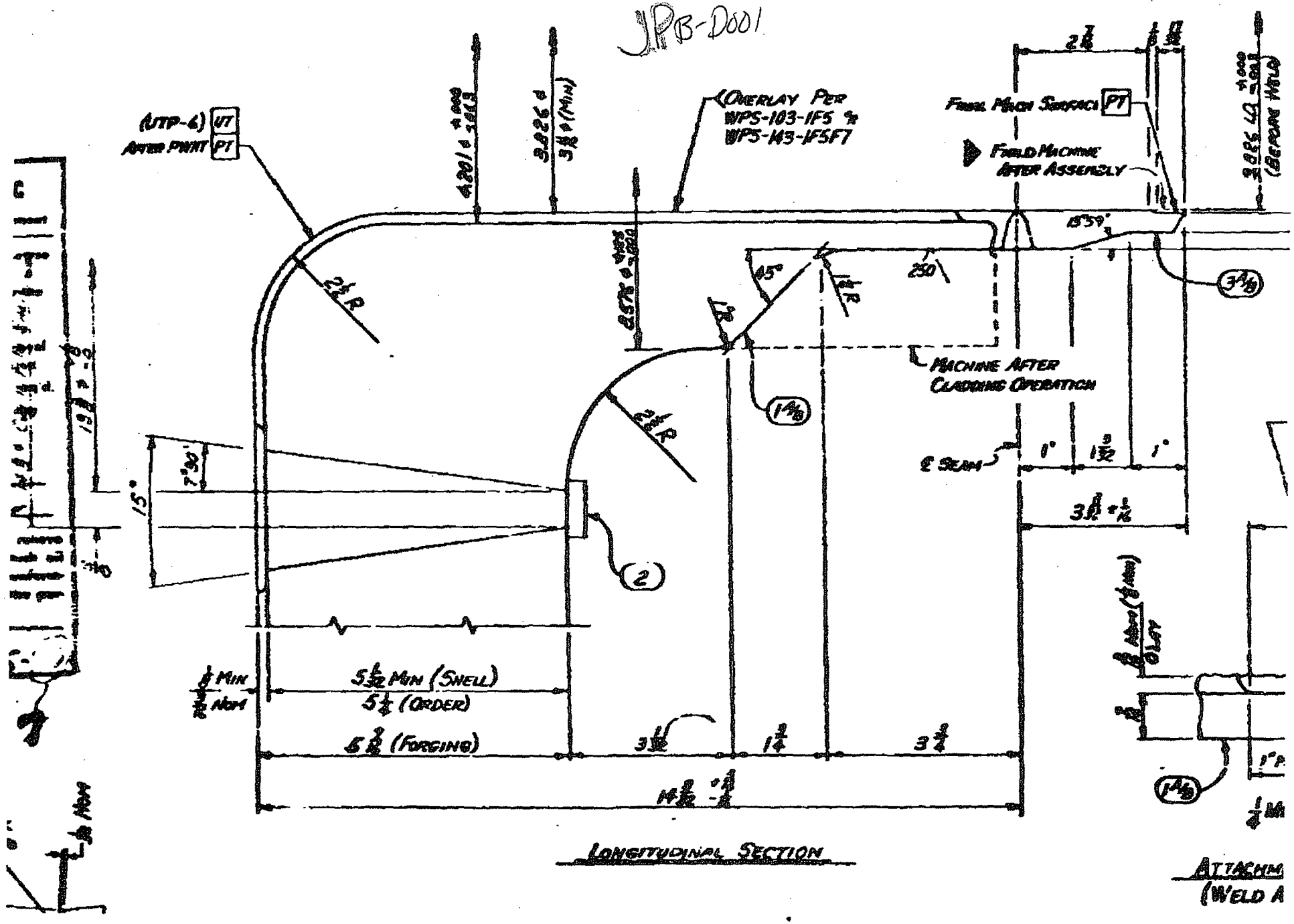
DAEC Review Gary Park

ANII Review


JPB D.01
Incident to wedge front
1.05"
4.82"
2.50"
7°30'
Parallel not Scanned
Parallel not Scanned
5 1/4"
2.625
2.12


JFB
N8
40°
45°
7°30'
Parallel
not
Scanned
2.3
.22
.36
.7875"
Inner
15%
2.625
Parallel
not
Scanned
2.125
5¼"
40°
45
.75
1.365
.645
1.49

JPB-D001


(UTP-6) UT
AFTER PWHT PT
OVERLAY PER
WPS-103-IF5 &
WPS-143-IF5F7
FINAL MACH SURFACE PT
FIELD MACHINE
AFTER ASSEMBLY
MACHINE AFTER
CLADDING OPERATION
℄ SEAM
15°
7°30'
45°
250
18°59'
5 5/32 MIN (SHELL)
5 1/4 (ORDER)
6 3/8 (FORGING)
14 3/8
LONGITUDINAL SECTION
ATTACHM
(WELD A

ULTRASONIC EXAMINATION DATA SHEET
REACTOR PRESSURE VESSEL WELDS

Site: DAEC | Report No.: I05065 | Calibration Sheet No.: C-104, C-105 | Data Sheet No.: N/A

Procedure No.: ACP 1211.27 Rev. 1

17

System:	Reactor Vessel	Exam Surface Temp.:	99 °F	Couplant:	Humex
Weld ID:	V/B-D001	Thermometer S/N:	3991	Batch No.:	98165

Examination Surface: ID☐ OD☒		Material Type: CS ☒ SS ☐		Exam Date:	04/12/05
L_o Reference	TDC	R_o Reference:	WCL	Exam Start:	12:30
				Exam End:	13:10

Scan Surface	Exam Number
Perpendicular UpStream	1
Perpendicular DownStream	2
Parallel CW	3
Parallel CCW	4

Search Unit Angle	Scan Sensitivity	Exam Number
60° RL Zone 1	76.4 dB	1, 3, 4
60° RL Zone 2	87.6 dB	1, 3, 4
N/A	N/A	N/A
N/A	N/A	N/A

INDICATIONS

Indication No.	L (In) From Ref			W (In) From Ref			Sweep Reading ☒MP or ☐ Depth			Max Amp % Dac	Examination (1 - 4)
	L-1	L-Max	L-2	W-1	W-Max	W-2	SW-1 ☐ M1 ☐	SW-Max	SW-2 ☐ M2 ☐		
NRI	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

REMARKS/LIMITATIONS

WO: 1129015
Single side access due to configuration. Reference EPRI modeling report No. IR-2004-62 for inner 15% examination. Obtained 82.4% coverage of required volume. See attached coverage plot.

☒ Previous Examination Data Reviewed

Stevermer, A. Examiner (s)	II Level	04/12/05 Date	Dohmen, F. Level III Review	4/19/05 Date	Bowers, J. ANII Review	4-20-05 Date

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site:	DAEC	Calibration Sheet No.:	C-104
		Linearity Sheet No.:	L-004

Procedure No.: ACP 1211.27 Revision: 1

Instrument:	Manufacturer	Model No.	Serial No.
	Panametrics	Epoch III	01435501

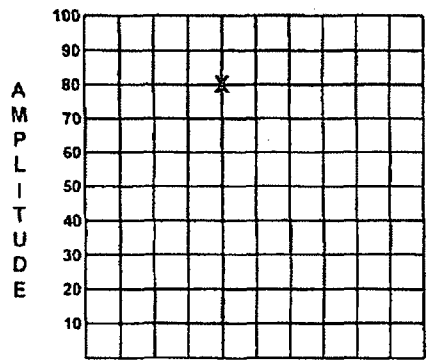
Search Unit:	Manufacturer	Model	Serial No.	Size	Freq.	Angle / Mode	Incident to wedge front
	RTD	TRL2-Aust FS~125 mm	00-447	2 (24X42) mm Rectangular	2.0 MHz	60° / Long.	1.05"

Cable:	Type	Length	No. of Connectors
	2 (RG-174)	12'	0

Calibration Standard:	Serial No.	Material	Size / Thickness	Temp.
	IE-30	Carbon Steel	NA / 5.25"	67 °F

Couplant:	Type	Batch No.	Thermometer:	Serial No.
	Humex	98165		3991

DAC



Sweep: 0 - 10 = 8.003"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	8.003"
Pulse Width:	N/A	Velocity:	.2309
Rep Rate:	Auto	Delay:	0.00
Damping:	150 Ohms	Zero Offset:	12.38
Display Mode:	Fullwave	Gain - Axial Scan:	62.4 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator CS Rompas S/N LMT-17

Reflector:	1/4T SDH	2" RAD
Max Amplitude:	80%	80%
Sweep:	4.0	2.4
Gain:	62.4 dB	47.4 dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	09:17				
Final Calibration Time:	15:25	N/A	N/A	N/A	N/A

Welds Examined	Report No.
VIB-D001	I05065

Comments

Work Order: 1129015
Squint Angle 5°
Configuration of Elements: D-SBS
Zone 1 60° RL Cal.

Examiner	Level	Date	Level III Review	Date	ANII Review	Date
Stevermer, A.	II	04/12/05	Dohmen, F.	4/19/05	Bowers, J.	4-20-05

NG 142Z Rev. 4

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-105
Linearity Sheet No.: L-004

Procedure No.: ACP 1211.27 **Revision:** 1

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01435501 (Serial No.)

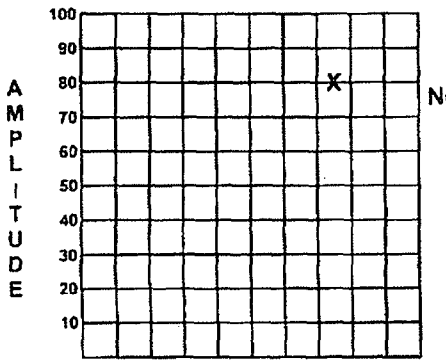
Search Unit: RTD (Manufacturer) | TRL2-Aust FS~125 mm (Model) | 00-447 (Serial No.) | 2 (24X42) mm Rectangular (Size) | 2.0 MHz (Freq.) | 60° / Long. (Angle / Mode) | 1.05" (Incident to wedge front)

Cable: 2 (RG-174) (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 67 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) **Thermometer:** 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 16.27"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	16.27"
Pulse Width:	N/A	Velocity:	.2309
Rep Rate:	Auto	Delay:	0.00
Damping:	150 Ohms	Zero Offset:	12.38
Display Mode:	Fullwave	Gain - Axial Scan:	75.6 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator: CS Rompas S/N: LMT-17

Reflector:	ID Notch	.2" RAD
Max Amplitude:	80%	80%
Sweep:	7.5	1.2
Gain:	75.6 dB	49.1 dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	09:15				
Final Calibration Time:	15:26	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
VIB-D001	I05065	Work Order: 1129015
		Squint Angle 5°
		Configuration of Elements: D-SBS
		Zone 2 60° RL Cal.

Examiner	Level	Date	Level III Review	Date	ANII Review	Date
Stevermer, A.	II	04/12/05	TPB Dohmen, F.	4/19/05	JB Bowers, J.	4-22-05

NG 142Z Rev. 4

Nozzle to RPV Coverage Calculation Sheet

Coverage calculated to requirements of Code Case N-613-1
Note: calculations performed using 2D plot only

Nozzle ID N11

Area required to be examined

Axial scan direction: Height x width

5.25 inches x 2.859 inches equals 15.0098 square inches

Parallel scan direction: Height x width

5.25 inches x 2.859 inches equals 15.0098 square inches

Total area required to be examined 30.0195 square inches required for complete exam

Actual area examined

60 degree R.L. Axial scan direction: Height x width

5.25 inches x 2.859 inches equals 15.0098 square inches

Triangular area not examined (if applies) 1.33 1/2 base x 2.15 height equals 1.42975 square inches

Axial scan direction area examined 13.58 square inches

60 degree R.L. Parallel scan direction: Height x width

5.25 inches x 1.96 inches equals 10.29 square inches

Additional Inner 15% area achieved using 45 degree shear technique: Height x width

0.7875 inches x 1.1 inches equals 0.86625 square inches

Combining all scan directions: 24.7363 square inches for total exam

Divide area examined by required area: equals coverage achieved 82.4 % coverage for total exam

Calculations performed by: Todd Blechinger Level III

DAEC Review Frank Dohmen 4/19/05 Level III

ANII Review Jeremy Bowers 4-20-05

DAEC N11 Coverage Plot
Parallel scan direction

Examiner
Review
Report # I05065
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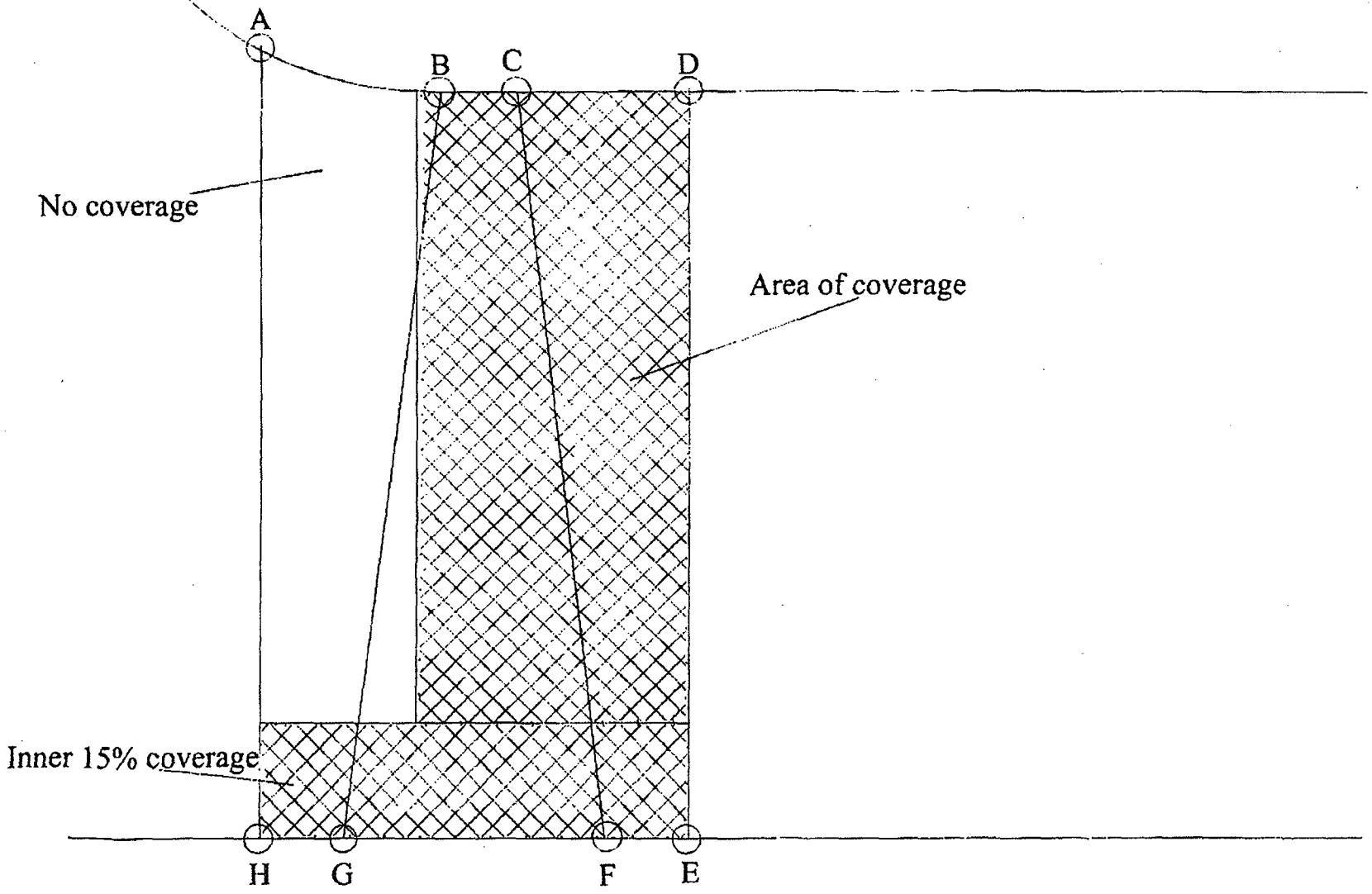

DAEC N11 Coverage Plot
Parallel scan direction

Examiner
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Report # 105065
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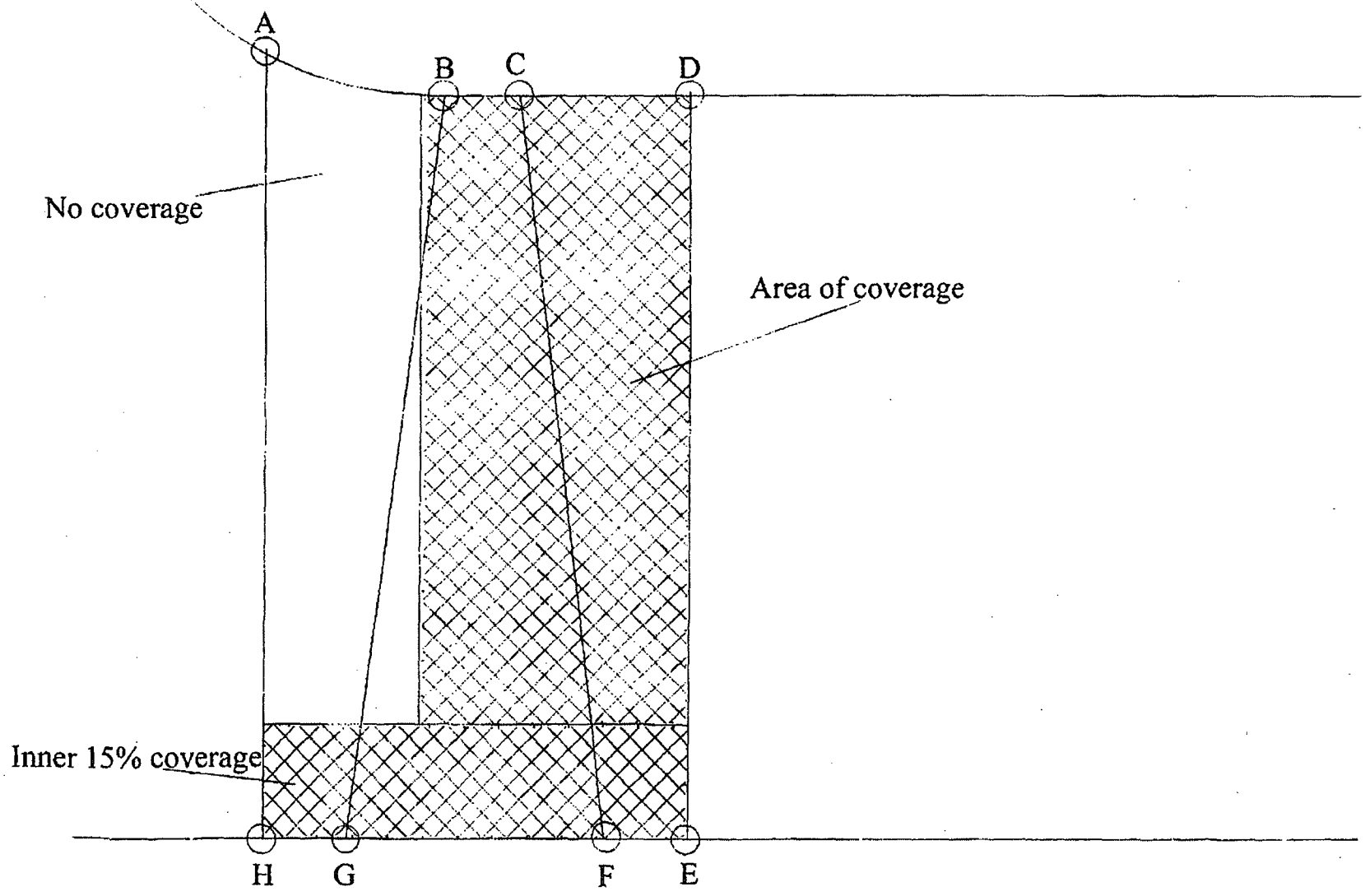


Nozzle to RPV Coverage Calculation Sheet

Coverage Re-calculated using IWB-2500-7(b) volume 45 degree for Inner 15%
Note: calculations performed using 2D plot only

Nozzle ID N11 VIB-D001

Area required to be examined

Axial scan direction: Height x width

0.703 inches x 7.187 inches equals 5.05246 square inches

Parallel scan direction: Height x width

0.703 inches x 7.187 inches equals 5.05246 square inches

Total area required to be examined 10.1049 square inches required for complete exam

Actual area examined

45 degree Axial scan direction: Height x width

0.703 inches x 7.187 inches equals 5.05246 square inches

Triangular area not examined (if applies) 0.703 1/2 base x 0.703 height equals 0.2471 square inches
Rect. area not examined (if applies) 1.127 x 0.703 equals 0.79228
Axial scan direction area examined 4.01308 square inches

45 degree shear Parallel scan direction: Height x width

0.703 inches x 7.187 inches equals 5.05246 square inches
Area not examined (if applies) 2.95 base x 0.703 height equals 2.074 square inches
Area not examined (if applies) 1.830 base x 0.703 height equals 1.286 square inches
Parallel scan direction area examined 1.69212 square inches

Combining all scan directions: 5.7052 square inches for total exam

Divide area examined by required area: equals coverage achieved 56.46 % coverage for total exam

Calculations performed by: Frank Dohmen Level III

DAEC Review Gary Park

ANII Review

Nozzle to RPV Coverage Calculation Sheet

Coverage Re-calculated using IWB-2500-7(b) volume 60°
Note: calculations performed using 2D plot only

Nozzle ID N11 VIB-D001

Area required to be examined

Axial scan direction: Height x width

4.687 inches x 7.187 inches equals 33.685 square inches

Parallel scan direction: Height x width

4.687 inches x 7.187 inches equals 33.685 square inches

Total area required to be examined 67.371 square inches required for complete exam

Actual area examined

60° R.L. Axial scan direction: Height x width

4.687 inches x 7.187 inches equals 33.685 square inches

Triangular area not examined (if applies) 2.3 base x 3.94 height equals 4.531 square inches A=bh/2
1.06 base x 1.85 height equals 0.9805 square inches
Axial scan direction area examined 28.174 square inches

60° R.L. Parallel scan direction: Height x width

4.687 inches x 7.187 inches equals 33.685 square inches

Area not examined (if applicable) 4.687 height x 2.95 width equals 13.827 square inches
4.687 height x 1.85 width equals 8.671 square inches
33.685 inches minus area not examined 22.498 inches equals 11.188 square inches

Combining all scan directions: 39.362 square inches for total exam

Divide area examined by required area: equals coverage achieved 58.43 % coverage for total exam

Calculations performed by: Frank Dohmen Level III

DAEC Review Gary Park

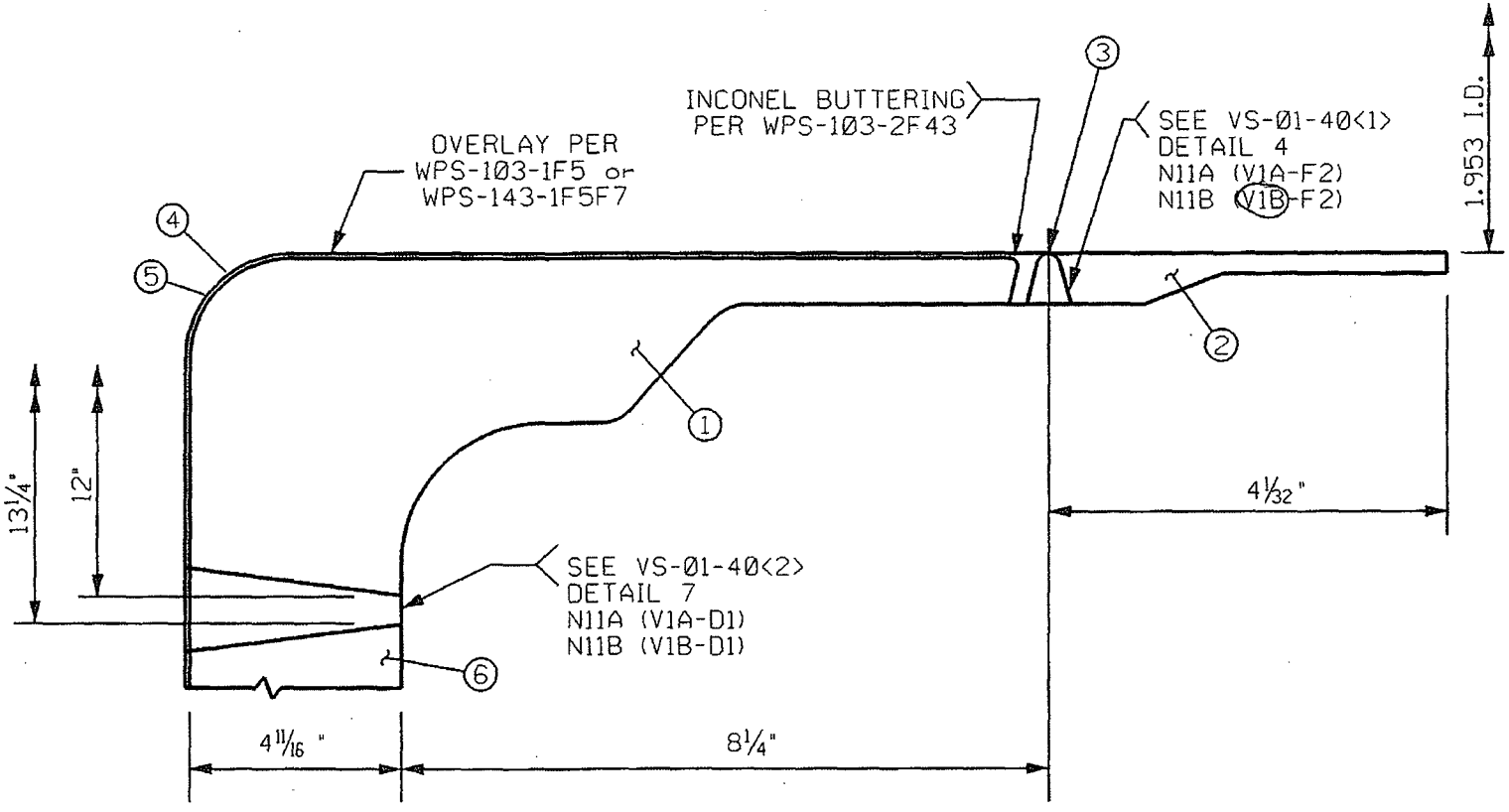
58.43 60°
56.46 45°
114.89
57.45

NO.	DATE	REVISION	DRFTR.	CHK'D.	ENGR.	VER.
3	8/22/07	REVISED PER DURF-U0191	TAK	DA	ALT	RS
2	8/8/95	REVISED PER DURF-0011	DA	GD	SS	SS
1	12-08-94	DRAFTED FOR VESSEL INSPECTION PROGRAM	MS	DF	GP	SS

NO.	DESCRIPTION	BILL OF MATL.	PROCED.
1	FORGING	SA508 CLASS 2	
2	SAFE END FORGING	SA336 CLASS F8	
3	INSERT	INCONEL 82	
4	1ST CLAD LAYER	3 309	
5	2ND & 3RD CLAD LAYER	308L	
6	SHELL PLATE #3	SA533 CLASS 1 GR.B	

FPL:
Inservice Inspection Program
Reactor Pressure Vessel Sketch

REFERENCE DRAWING:
APED-B11-2655-109



DWG. NO.
VS-01-20

INSTRUMENTATION
NOZZLE MK N11A/B

REV. 3

ULTRASONIC EXAMINATION DATA SHEET
REACTOR PRESSURE VESSEL WELDS

Site: DAEC	Report No.: I05064	Calibration Sheet No.:	C-117, C-118
		Data Sheet No.:	N/A

Procedure No.: ACP 1211.27 Rev. 1

16

System:	Reactor Vessel	Exam Surface Temp.:	88 °F	Couplant:	Humex
Weld ID:	LCA-D001	Thermometer S/N:	3991	Batch No.:	98165

Examination Surface: ID☐ OD☒		Material Type:	CS ☒ SS ☐	Exam Date:	04/12/05
L_o Reference	TDC	R_o Reference:	WCL	Exam Start:	13:20
				Exam End:	14:15

Scan Surface	Exam Number
Perpendicular UpStream	1
Perpendicular DownStream	2
Parallel CW	3
Parallel CCW	4

Search Unit Angle	Scan Sensitivity	Exam Number
60° RL Zone 1	76.7 dB	1, 3, 4
60° RL Zone 2	83.0 dB	1, 3, 4
N/A	N/A	N/A
N/A	N/A	N/A

INDICATIONS

Indication No.	L (in) From Ref			W (in) From Ref			Sweep Reading ☒MP or ☐ Depth			Max Amp % Dac	Examination (1 - 4)
	L-1	L-Max	L-2	W-1	W-Max	W-2	SW-1 ☐ M1 ☐	SW-Max	SW-2 ☐ M2 ☐		
NRI	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

REMARKS/LIMITATIONS

WO: 1129014

Single side access due to configuration.
Reference EPRI modeling report no: IR-2004-62 for inner 15% examination.
Obtained 63.71% coverage of required volume due to proximity of skirt weld.
See attached coverage plot.

☒ Previous Examination Data Reviewed

Stevermer, A. Examiner (s)	II Level	04/12/05 Date	Dohmen, F. Level III Review	4/19/05 Date	Bowers, J. ANII Review	4-20-05 Date

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-117
Linearity Sheet No.: L-002

Procedure No.: ACP 1211.27 Revision: 1

Instrument: Panametrics (Manufacturer) Epoch III (Model No.) 01448103 (Serial No.)

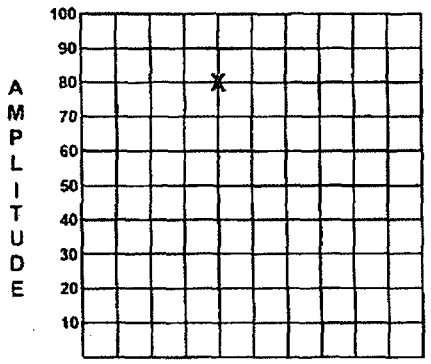
Search Unit: RTD (Manufacturer) TRL2-ST FS~125 mm (Model) 02-102 (Serial No.) 2 (24X42) mm Rectangular (Size) 2.0 MHz (Freq.) 60° / RL (Angle / Mode) 1.05" (Incident to wedge front)

Cable: 2 (RG-174) (Type) 12' (Length) 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) Carbon Steel (Material) NA / 5.25" (Size / Thickness) 67 °F (Temp.)

Couplant: Humex (Type) 98165 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 6.329"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	6.329"
Pulse Width:	N/A	Velocity:	.2332
Rep Rate:	Auto	Delay:	0.00
Damping:	150 Ohms	Zero Offset:	12.98
Display Mode:	Fullwave	Gain - Axial Scan:	62.7 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator CS Rompas S/N LMT-17

Reflector:	1/4T SDH	2" RAD
Max Amplitude:	80%	80%
Sweep:	4.0	3.2
Gain:	62.7 dB	47.6 dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	09:17				
Final Calibration Time:	15:25	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
LCA-D001	I05064	Work Order: 1129014
		Squint Angle 5°
		Configuration of Elements: D-SBS
		Zone 1

Stevermer, A.	II	04/12/05	FTD	Dohmen, F.	4/19/05	Bowers, J.	4-20-05
Examiner	Level	Date		Level III Review	Date	ANII Review	Date

NG 142Z Rev. 4

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-118
Linearity Sheet No.: L-002

Procedure No.: ACP 1211.27 Revision: 1

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01448103 (Serial No.)

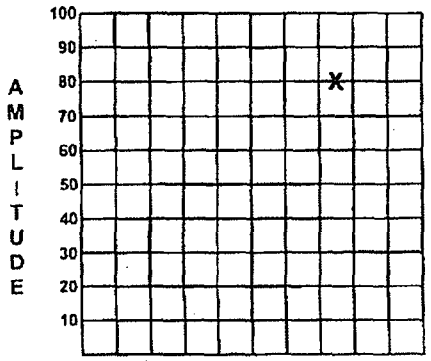
Search Unit: RTD (Manufacturer) | TRL2-ST FS~125 mm (Model) | 02-102 (Serial No.) | 2 (24X42) mm Rectangular (Size) | 2.0 MHz (Freq.) | 60° / RL (Angle / Mode) | 1.05" (Incident to wedge front)

Cable: 2 (RG-174) (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 67 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) Thermometer: 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 14.45"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	14.45"
Pulse Width:	N/A	Velocity:	.2332
Rep Rate:	Auto	Delay:	12.98
Damping:	150 Ohms	Zero Offset:	0.0
Display Mode:	Fullwave	Gain - Axial Scan:	71.0 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☐ Pulse Echo	☒ Dual
Pulse Amplitude:	Fixed		

Field Simulator CS Rompas S/N LMT-17

Reflector:	1/4T SDH	2" RAD
Max Amplitude:	80%	80%
Sweep:	7.5	1.2
Gain:	71.0 dB	47.2 dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	09:15				
Final Calibration Time:	15:26	N/A	N/A	N/A	N/A

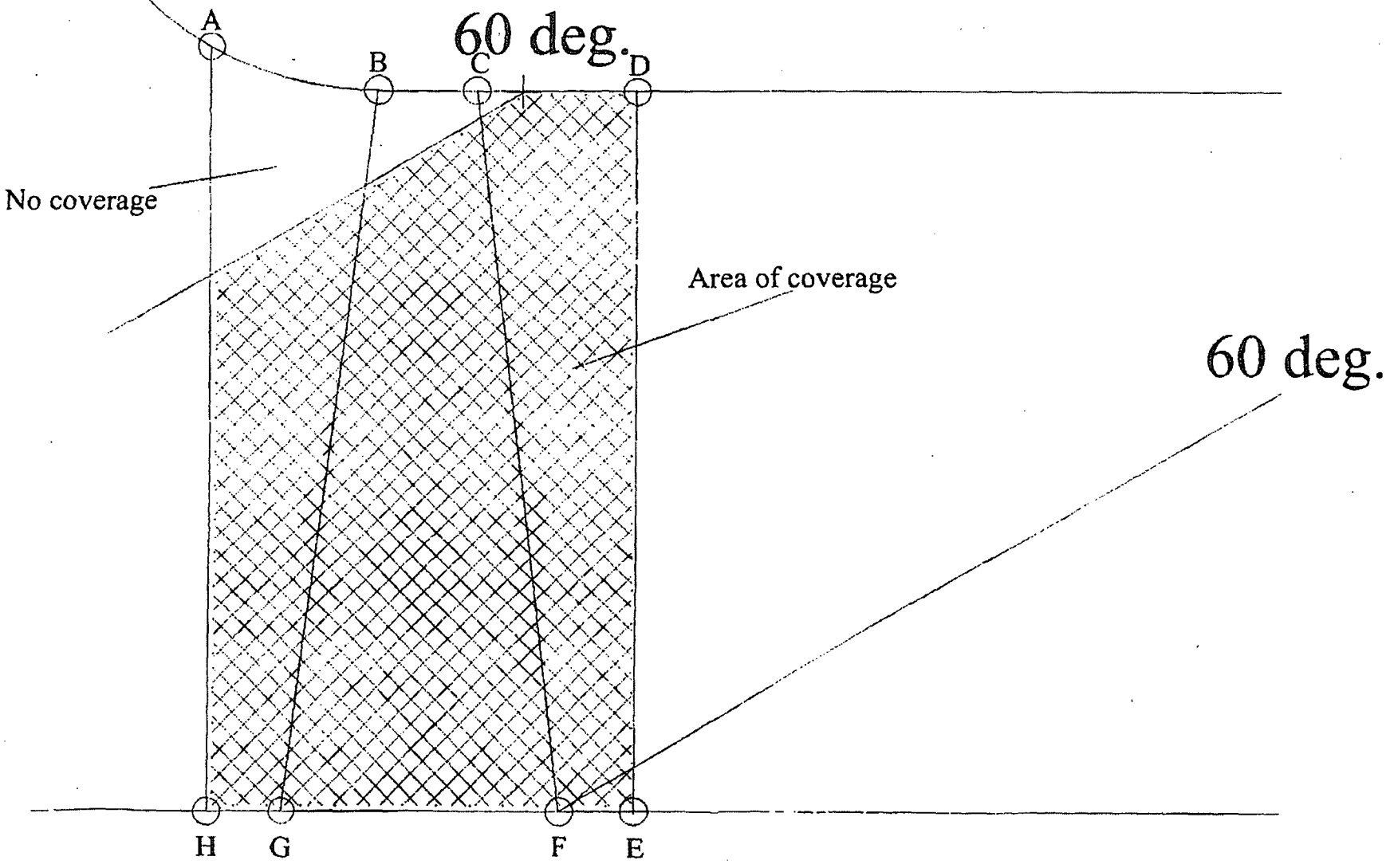
Welds Examined	Report No.	Comments
LCA-D001	I05064	Work Order: 1129014
		Squint Angle 5°
		Configuration of Elements: D-SBS
		Zone 2

Stevermer, A. (Examiner)	Level II	Date 04/12/05	Dohmen, F. (Level III Review)	Date 4/19/05	Bowers, J. (ANII Review)	Date 4-20-05

NG 142Z Rev. 4

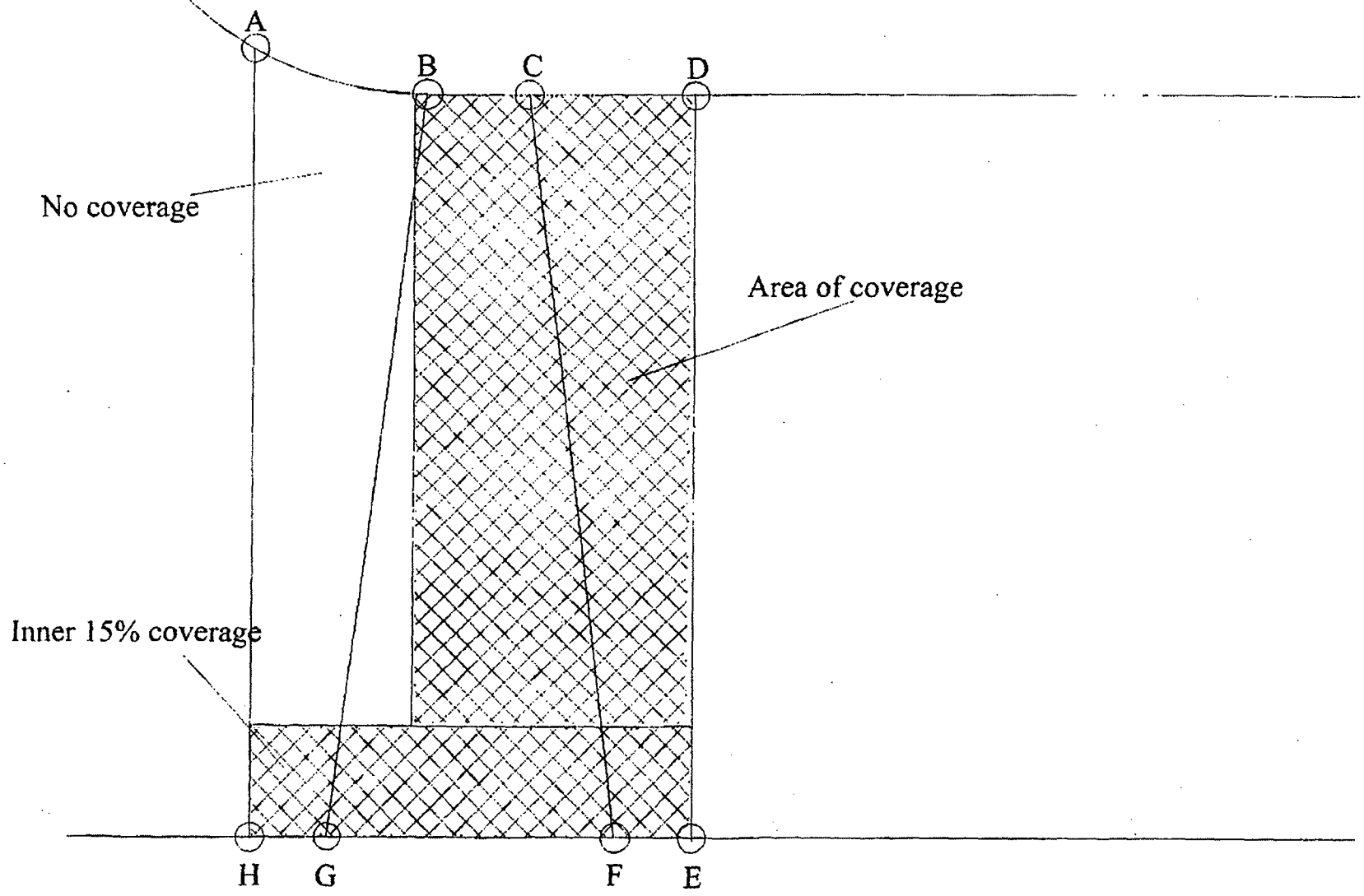
DAEC N10 Coverage Plot
Axial scan direction

Examiner
Review
Report # 105064
Page of



DAEC N10 Coverage Plot
Parallell scan direction

Examiner
Review
Report # 505064
Page ___ of ___



Nozzle to RPV Coverage Calculation Sheet

Coverage Re-calculated using IWB-2500-7(b) volume 60°
Note: calculations performed using 2D plot only

Nozzle ID N10 LCA-D001

Area required to be examined

Axial scan direction: Height x width

5.25 inches x 8.187 inches equals 42.982 square inches

Parallel scan direction: Height x width

5.25 inches x 8.187 inches equals 42.982 square inches

Total area required to be examined 85.964 square inches required for complete exam

Actual area examined

60° R.L. Axial scan direction: Height x width

5.25 inches x 8.187 inches equals 42.982 square inches

Triangular area not examined (if applies) 1.46 base x 3.37 height equals 2.460 square inches A=bh/2
1.26 base x 2.125 height equals 1.339 square inches
Axial scan direction area examined 39.183 square inches x 62% due to skirt = 24.2934

60° R.L. Parallel scan direction: Height x width

5.25 inches x 8.187 inches equals 42.982 square inches

Area not examined (if applicable) 5.25 height x 3.3 width equals 17.325 square inches
5.25 height x 2.125 width equals 11.1563 square inches
42.982 inches minus area not examined 28.481 inches equals 14.5005 square inches

Combining all scan directions: 38.794 square inches for total exam

Divide area examined by required area: equals coverage achieved 45.13 % coverage for total exam

Calculations performed by: Frank Dohmen Level III

DAEC Review Gary Park

45.13 60
56.3 46
101.43
50.72

Nozzle to RPV Coverage Calculation Sheet

Coverage Re-calculated using IWB-2500-7(b) volume 45 degree for Inner 15%
Note: calculations performed using 2D plot only

Nozzle ID N10 LCA-D001

Area required to be examined

Axial scan direction: Height x width

0.7875 inches x 8.187 inches equals 6.44726 square inches

Parallel scan direction: Height x width

0.7875 inches x 8.187 inches equals 6.44726 square inches

Total area required to be examined 12.8945 square inches required for complete exam

Actual area examined

45 degree Axial scan direction: Height x width

0.7875 inches x 8.187 inches equals 6.44726 square inches

Triangular area not examined (if applies) 0.7875 1/2 base x 0.7875 height equals 0.310 square inches
Rect. area not examined (if applies) 1.3375 x 0.7875 equals 1.053
Axial scan direction area examined 5.0839 square inches

45 degree shear Parallel scan direction: Height x width

0.7875 inches x 8.187 inches equals 6.44726 square inches
Area not examined (if applies) 3.3 base x 0.7875 height equals 2.599 square inches
Area not examined (if applies) 2.125 base x 0.7875 height equals 1.673 square inches
Parallel scan direction area examined 2.17508 square inches

0 inches x 0 inches equals 0 square inches

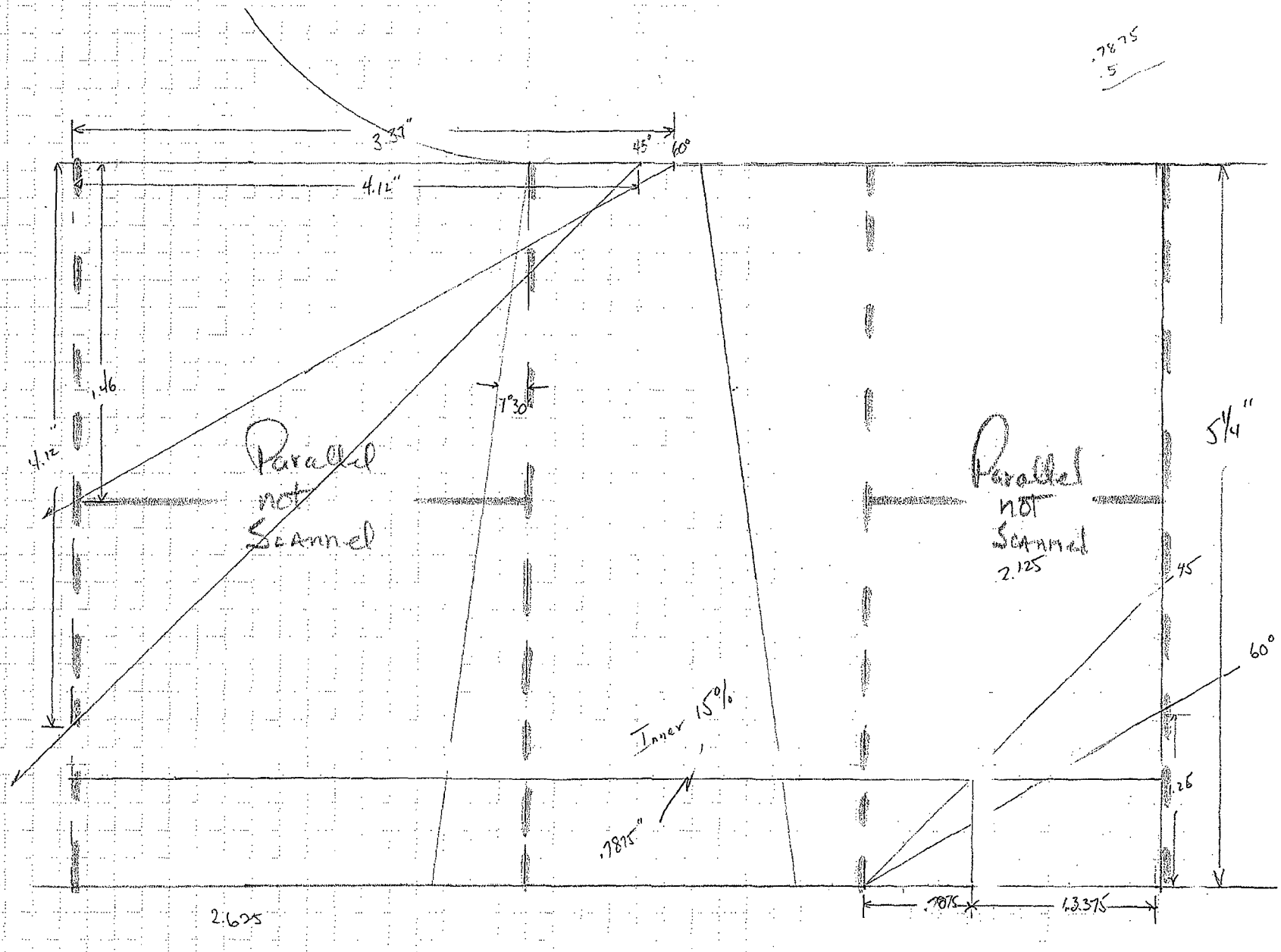
Combining all scan directions: 7.25898 square inches for total exam

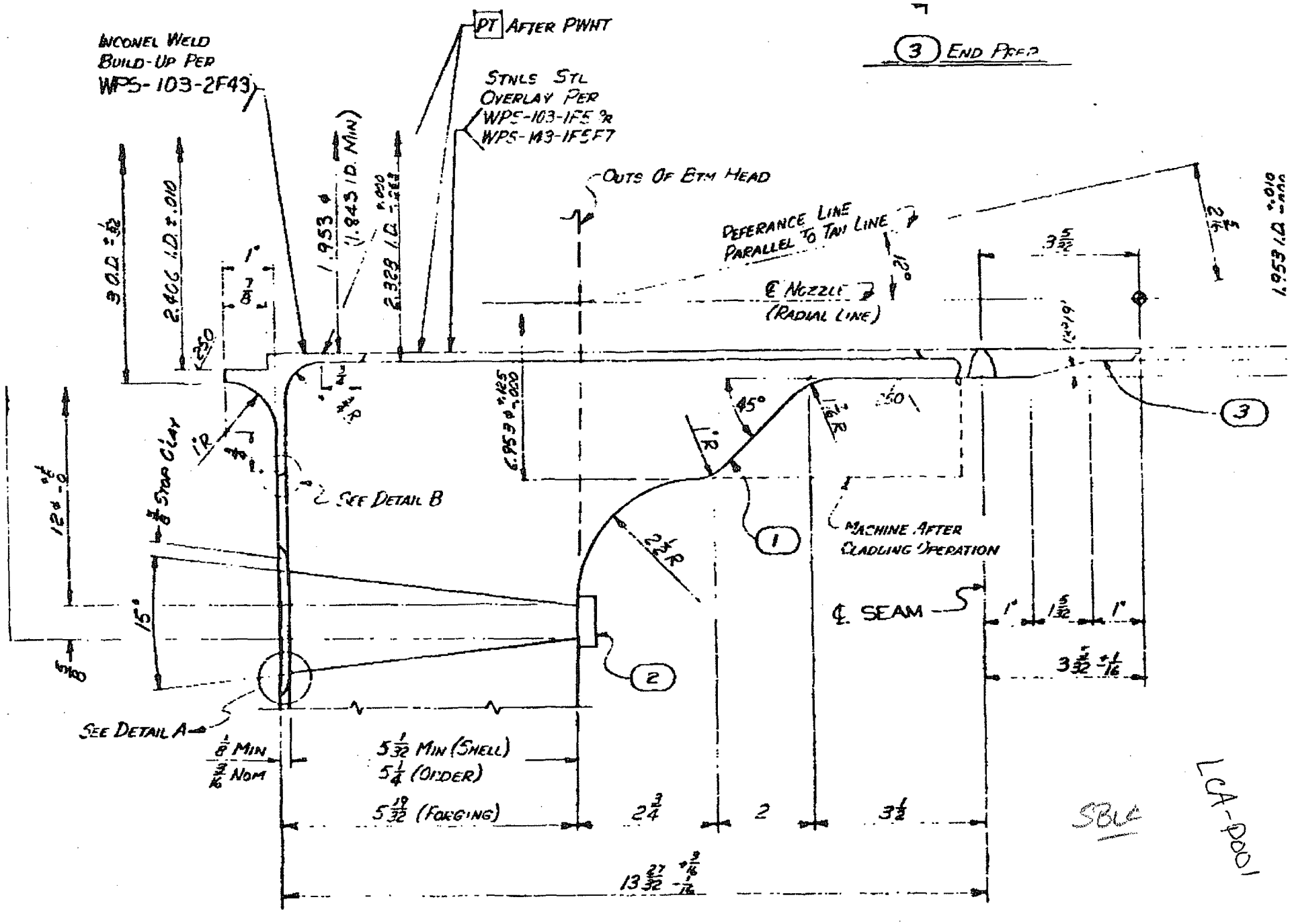
Divide area examined by required area: equals coverage achieved 56.3 % coverage for total exam

Calculations performed by: Frank Dohmen Level III

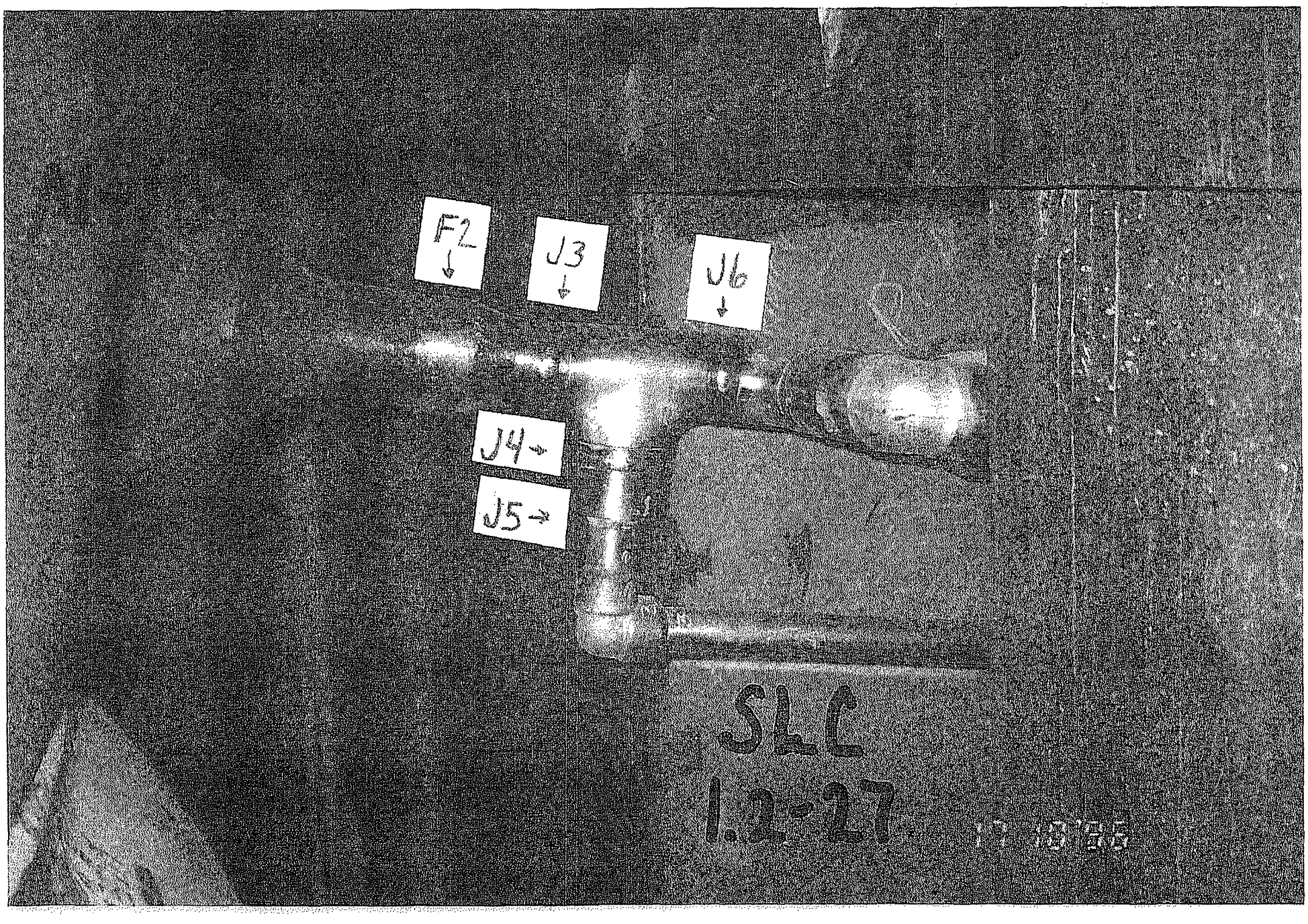
DAEC Review Gary Park

ANII Review


.7875
.5
3.37"
45°
60°
4.12"
1.46
7°30'
4.12"
Parallel
not
Scanned
Parallel
not
Scanned
2.125
5¼"
45
60°
Inner 15%
.7875"
1.26
2.625
.7875
1.3375



LONGITUDINAL SECTION


F2
J3
J6
J4
J5

Enclosure 3

Description of Examination Limitations for Nozzle LCA-D001

ULTRASONIC EXAMINATION DATA SHEET
NOZZLE TO SHELL WELD AND INNER RADIUS

Site: DAEC

Report No.: I05064

Calibration Sheet No.: C-119 THROUGH C-122

Data Sheet No.: N/A

Procedure No.: ACP 1211.44 Rev. 0

System:	Reactor Vessel	Exam Surface Temp.:	88 °F	Couplant:	Humex
Nozzle ID:	LCA-D001 IR	Thermometer S/N:	3991	Batch No.:	98165

Examination Surface:	ID☐ OD☒	Material Type:	CS ☒ SS ☐	Exam Date:	04/12/05
L_o Reference	TDC	R_o Reference:	WCL	Exam Start:	13:20
				Exam End:	14:15

Scan Surface	Exam Number
Vessel CW	1
Vessel CCW	2
Blend CW	3
Blend CCW	4
Nozzle Boss CW	5
Nozzle Boss CCW	6

Search Unit Angle / Skew	Scan Sensitivity	Exam Number
70° (+- 12°)	73.1 dB	3, 4
70° (+- 1° to +- 11°)	73.1dB	1, 2
45° (+- 43° to +- 64°)	54.5 dB	1, 2
N/A	N/A	N/A
N/A	N/A	N/A

Ind. #	Transducer Azimuth Location	Indication Metal Path	Transducer 'R' Location	Transducer Skew	Scan Sensitivity	Exam Number
NRI	N/A	N/A	N/A	N/A	N/A	N/A

REMARKS/LIMITATIONS

WO: 1129014
100% coverage based on modeling program for nozzle examinations.
Reference EPRI report no. IR-2004-62.
70° (+- 1° to 11°)
Exam obtained 71.69% of required volume due to proximity of skirt weld.
See attached.

☒ Previous Examination Data Reviewed

Stevermer, A. Examiner	II Level	04/12/05 Date	Dohmen, F. Level III Review	4/19/05 Date	Bowers, J. ANII Review	4-20-05 Date

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-120
Linearity Sheet No.: L-004

Procedure No.: ACP 1211.44 **Revision:** 0

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01435501 (Serial No.)

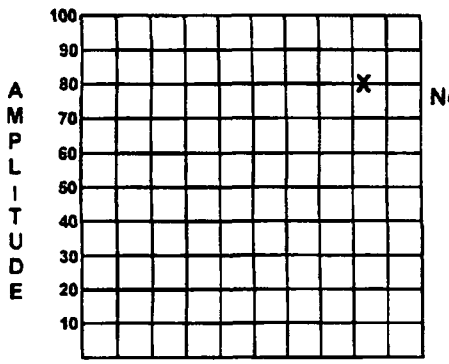
Search Unit: Krautkramer (Manufacturer) | Comp G 389-055-750 (Model) | 014XX9 (Serial No.) | .75" Round (Size) | 2.25 MHz (Freq.) | 70° / Shear (Angle / Mode) | 0.9" (Incident to wedge front)

Cable: RG-174 (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 67 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) **Thermometer:** 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 23.34"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	23.34"
Pulse Width:	N/A	Velocity:	.1228
Rep Rate:	Auto	Delay:	0.0
Damping:	150 Ohms	Zero Offset:	23.52
Display Mode:	Fullwave	Gain - Axial Scan:	67.1 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☒ Pulse Echo	☐ Dual
Pulse Amplitude:	Fixed		

Field Simulator: CS Rompas S/N: LMT-17

Reflector:	ID Notch	2" RAD
Max Amplitude:	80%	80%
Sweep:	8.1	0.9
Gain:	67.1 dB	19.8 dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	08:30				
Final Calibration Time:	15:29	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
LCA-D001 IR	I05064	Work Order: 1129014
		Wedge S/N: 366-001-206
		Configuration of Elements: Single

Stevermer, A. (Examiner)	II (Level)	04/12/05 (Date)	Dohmen, F. (Level III Review)	4/19/05 (Date)	Bowers, J. (ANII Review)	4-20-05 (Date)

NG 142Z Rev. 4

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-119
Linearity Sheet No.: L-004

Procedure No.: ACP 1211.44 **Revision:** 0

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01435501 (Serial No.)

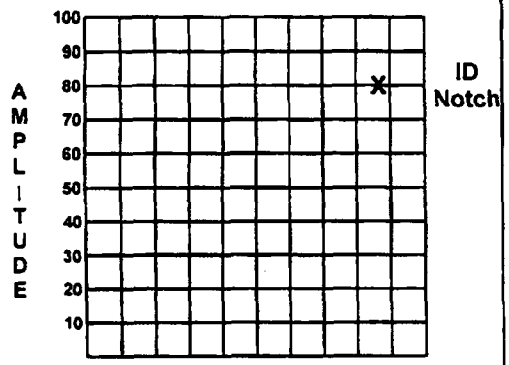
Search Unit: Krautkramer (Manufacturer) | Comp G 389-055-750 (Model) | 014XX8 (Serial No.) | .75" Round (Size) | 2.25 MHz (Freq.) | 45° / Shear (Angle / Mode) | 0.8" (Incident to wedge front)

Cable: RG-174 (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 88 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) **Thermometer:** 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 8.696"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	8.696"
Pulse Width:	N/A	Velocity:	.1228
Rep Rate:	Auto	Delay:	0.0
Damping:	150 Ohms	Zero Offset:	16.92
Display Mode:	Fullwave	Gain - Axial Scan:	47.5 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☒ Pulse Echo	☐ Dual
Pulse Amplitude:	Fixed		

Field Simulator: CS Rompas S/N: LMT-17

Reflector:	ID Notch	2" RAD
Max Amplitude:	80%	80%
Sweep:	8.9	1.2
Gain:	47.5 dB	38.4 dB

Calibration Verification

		Verification Times:			
Initial Calibration Time:	08:49				
Final Calibration Time:	15:33	N/A	N/A	N/A	N/A

Welds Examined	Report No.
LCA-D001 IR	I05064

Comments

Work Order: 1129014
Wedge S/N: 366-001-204
Configuration of Elements: Single

Examiner	Level	Date	Level III Review	Date	ANII Review	Date
Stevermer, A.	II	04/12/05	Dohmen, F.	4/19/05	Bowers, J.	4-20-05

NG 142Z Rev. 4

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-121
Linearity Sheet No.: L-004

Procedure No.: ACP 1211.44 **Revision:** 0

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01435501 (Serial No.)

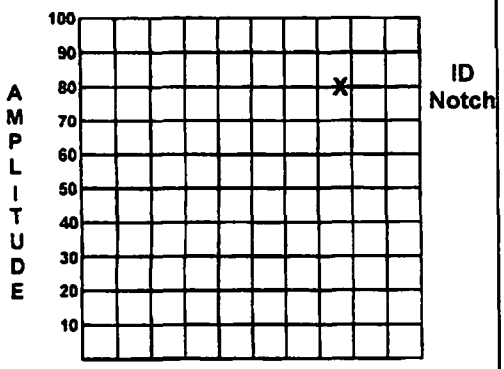
Search Unit: Krautkramer (Manufacturer) | Comp G 389-055-750 (Model) | 014XXB (Serial No.) | .75" Round (Size) | 2.25 MHz (Freq.) | * ° / Shear (Angle / Mode) | 1.0" (Incident to wedge front)

Cable: RG-174 (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 67 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) **Thermometer:** 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 23.34"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	23.34"
Pulse Width:	N/A	Velocity:	.1228
Rep Rate:	Auto	Delay:	0.0
Damping:	150 Ohms	Zero Offset:	23.52
Display Mode:	Fullwave	Gain - Axial Scan:	67.1 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☒ Pulse Echo	☐ Dual
Pulse Amplitude:	Fixed		

Field Simulator N/A S/N N/A

Reflector:	ID Notch	N/A
Max Amplitude:	80%	N/A
Sweep:	8.1	N/A
Gain:	67.1 dB	N/A

Calibration Verification

		Verification Times:			
Initial Calibration Time:	08:30				
Final Calibration Time:	15:29	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
LCA-D001 IR	I05064	Work Order: 1129014
		Wedge S/N: 366-003-097
		Configuration of Elements: Single
		*Angle:70° - 12°

Stevermer, A. (Examiner)	II (Level)	04/12/05 (Date)	Dohmen, F. (Level III Review)	4/19/05 (Date)	Bowers, J. (ANII Review)	4-20-05 (Date)

NG 142Z Rev. 4

ULTRASONIC CALIBRATION DATA SHEET (MANUAL EXAMINATION)

Site: DAEC

Calibration Sheet No.: C-122
Linearity Sheet No.: L-004

Procedure No.: ACP 1211.44 **Revision:** 0

Instrument: Panametrics (Manufacturer) | Epoch III (Model No.) | 01435501 (Serial No.)

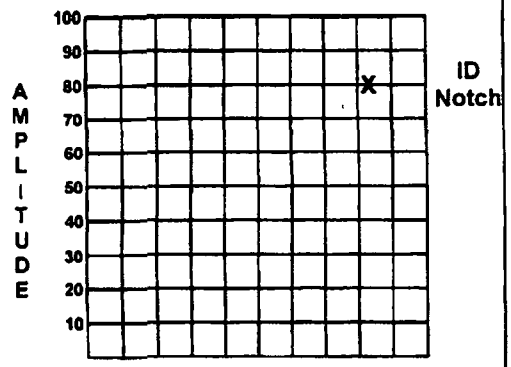
Search Unit: Krautkramer (Manufacturer) | Comp G 389-055-750 (Model) | 014XX1 (Serial No.) | .75" Round (Size) | 2.25 MHz (Freq.) | * ° / Shear (Angle / Mode) | 1.0" (Incident to wedge front)

Cable: RG-174 (Type) | 12' (Length) | 0 (No. of Connectors)

Calibration Standard: IE-30 (Serial No.) | Carbon Steel (Material) | NA / 5.25" (Size / Thickness) | 67 °F (Temp.)

Couplant: Humex (Type) | 98165 (Batch No.) **Thermometer:** 3991 (Serial No.)

DAC



Sweep: 0 - 10 = 23.34"

☐ Depth ☒ Metal Path

Instrument Settings

Pulser:	High	Frequency:	Fixed
Pulse Energy:	High	Range:	23.34"
Pulse Width:	N/A	Velocity:	.1228
Rep Rate:	Auto	Delay:	0.0
Damping:	150 Ohms	Zero Offset:	23.52
Display Mode:	Fullwave	Gain - Axial Scan:	67.1 dB
Filter:	STD	Gain - Circ. Scan:	N/A dB
Reject:	Off	☒ Pulse Echo	☐ Dual
Pulse Amplitude:	Fixed		

Field Simulator N/A S/N N/A

Reflector:	ID Notch	N/A
Max Amplitude:	80%	N/A
Sweep:	8.1	N/A
Gain:	67.1 dB	N/A

Calibration Verification

		Verification Times:			
Initial Calibration Time:	08:30				
Final Calibration Time:	15:29	N/A	N/A	N/A	N/A

Welds Examined	Report No.	Comments
LCA-D001 IR	I05064	Work Order: 1129014
		Wedge S/N: 366-003-096
		Configuration of Elements: Single
		*Angle:70° + 12°

[signature]	II	04/12/05	[signature]	4/19/05	[signature]	4-20-05
Stevermer, A.	Level	Date	Dohmen, F.	Date	Bowers, J.	Date
Examiner			Level III Review		ANII Review	

NG 142Z Rev. 4

N10 Limitation Photo

70° +/- (1° to 11°) exam scan surface area was reduced to 826.15 square inches due to proximity of skirt weld. 1152.36 square inches were required for 100% examination. Due to the scan area limitation, only 71.69% of the required volume was examined.

Examiner _____ 4/12/05

Review Frank Dolinar 4/19/05

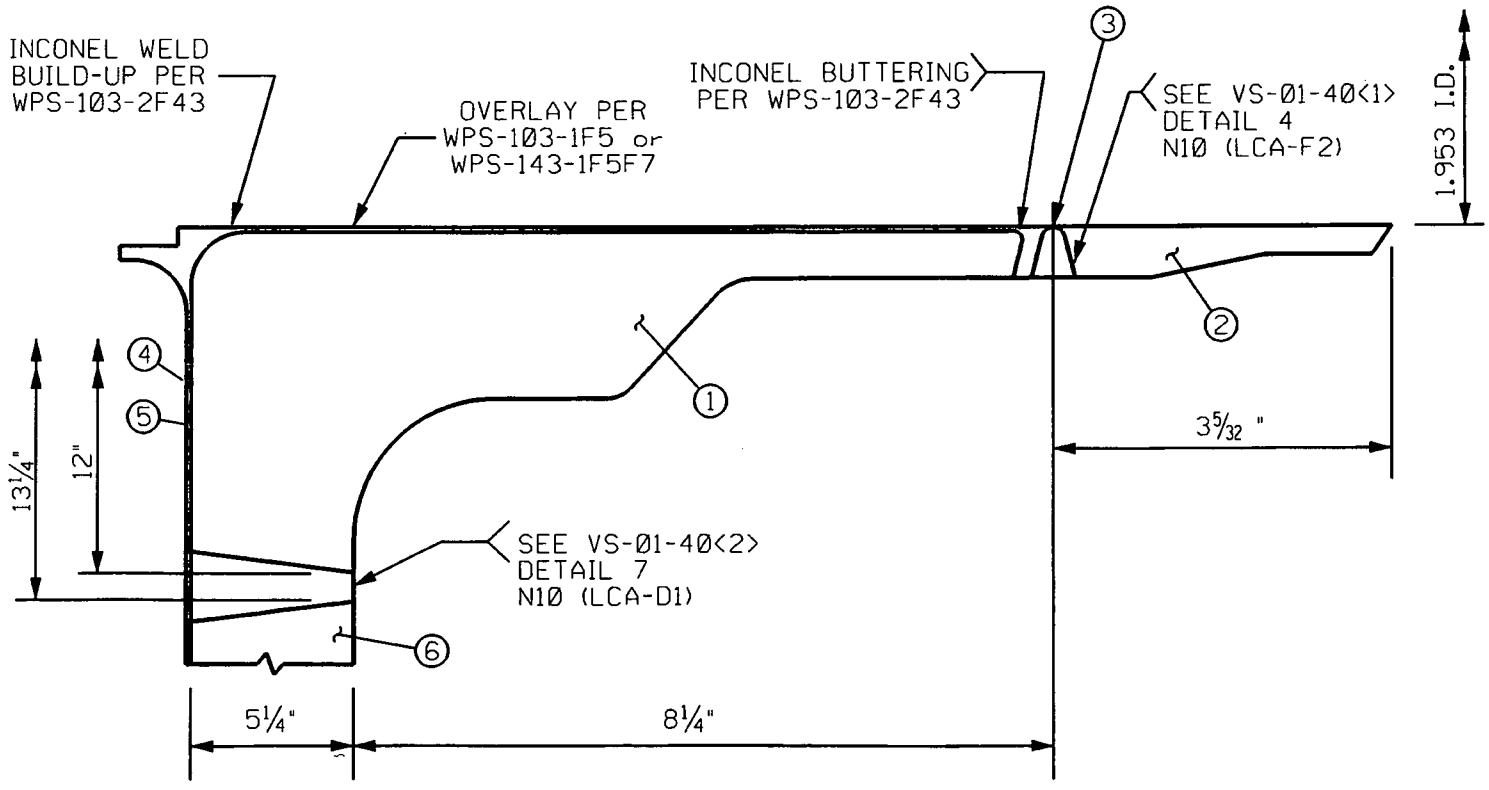
ANII JB 4-20-05

Page___of___

	8/22/07	REVISED PER DURF-00191	TAK	DA	ALT	RS
	8/8/95	REVISED PER DURF-0011	DA	GD	SS	SS
	12-09-94	DRAFTED FOR VESSEL INSPECTION PROGRAM	MS	DF	GP	SS
D.	DATE	REVISION	DRFTR.	CHK'D.	ENGR.	VER.

NO.	DESCRIPTION	BILL OF MATL.	PROCED.
1	FORGING	SA508 CLASS 2	
2	SAFE END FORGING	SB-166	
3	INSERT	INCONEL 82	
4	1ST CLAD LAYER	3 309	
5	2ND & 3RD CLAD LAYER	308L	
6	SIDE PLATE	SA533 CLASS 1 GR.B	

REFERENCE DRAWING:
APED-B11-2655-108



FPL:
Inservice Inspection Program
Reactor Pressure Vessel Sketch

CORE DIFF. PRESSURE & LIQUID CONTROL NOZZLE MK N10

DWG. NO.

REV.

Enclosure 4

Inservice Inspection Report I01070

ULTRASONIC CALIBRATION DATA SHEET
(MANUAL EXAMINATION)

Site.: DUANE ARNOLD

Calibration Sheet No.: C-092
Linearity Sheet No.: L-027

Procedure No.: ACP 1211.20 Revision: 3

Instrument STAVELEY (Manufacturer) SONIC 136 (Model No.) 399G (Serial No.)

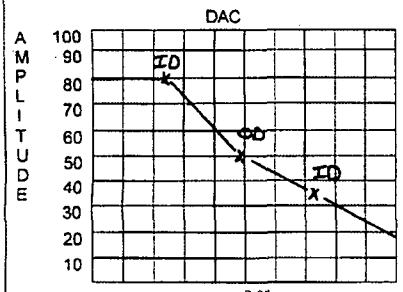
Search Unit KBA (Manufacturer) 24384 (Serial No.) 0.25" (Size) 2.25 MHz (Freq.) 45° / SHR (Angle/Mode) 0.35" (Incident to wedge front)

Cable RG-174 (Type) 6' (Length) 0 (No. of Connectors)

Calibration Standard PIPE SEGMENT (Material) S/S (Size/Thickness) 4.0" / .337" (Temp.) 68 °F

Serial No. IE-18

Couplant HUMEX (Type) 00165 (Batch No.) Thermometer 3471 (Serial No.)



Sweep: 0 - 10 = 2.0"

☐ Depth ☒ Metal Path

INSTRUMENT SETTINGS

DAC Construction		Sensitivity	
Gain-Axial Scan	39.4 dB	Gain-Axial Scan	51.4 dB
Gain-Circ. Scan	44.4 dB	Gain-Circ. Scan	56.4 dB
Pulse	222 ns	Range	2.0"
Damping	500 ohms	Delay	0.176"
Rep Rate	4 kHz	Velocity	0.121 in/us
Filter	2	Sweep	N/A
Frequency	2.25 MHz	Resolution	N/A
Reject	OFF	Jack	R ☐ T ☒

Field Simulator: ROMPAS S/N LMT-032

REFLECTOR:	1.0"	2.0"
MAX AMPLITUDE:	62%	25%
SWEEP:	5.0	10.0
GAIN: (dB)	35.0	35.0

CALIBRATION VERIFICATION

		Verification Times	
Initial Calibration Time	0745	N/A	N/A
Final Verification Time	1511	N/A	N/A

WELDS EXAMINED	REPORT NO.	COMMENTS:
RBB-J001	I01070	NONE
RBB-J002	I01201	
RBB-J003	I01202	

Examiner II 5/1/01 (Level Date)

Level III Review 05/04/01 (Date) 5/4/01

ANII Review 5/5/01 (Date)

Page 1 of 1

NG-142Z Rev. 2

ULTRASONIC EXAMINATION DATA SHEET
(MANUAL PIPING)

Site: DUANE ARNOLD

Report No.: 101070
Calibration Sheet No.: C-092
Data Sheet No.: N/A

Procedure No.: ACP 1211.20 Revision: 3

System: RECIRC Exam Surface Temp: 68 °F Couplant: HUMEX Exam Start: 1255

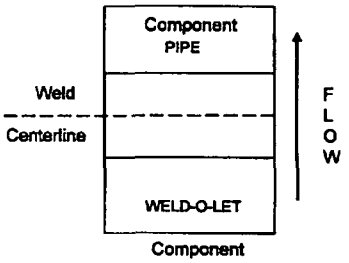
Weld ID: RBB-J001 Thermometer S/N: 3471 Batch No. 00165 Exam End: 1301

Search Unit 45° Examination Surface: ID ☐ OD ☒ Material Type: CS ☐ SS ☒ Other: N/A

Lo Reference: TOP DEAD CENTER Axial Scan Sensitivity (dB) 51.4

Wo Reference: WELD CENTERLINE Circ Scan Sensitivity (dB) 56.4

		Performed Yes	Performed No	Indications Yes	Indications No
Axial:	1 With Flow	☐	☒	☐	☐
	2 Against Flow	☒	☐	☐	☒
Circ CW:	3 Upstream	☐	☒	☐	☐
	4 Downstream	☒	☐	☐	☒
Circ CCW	5 Upstream	☐	☒	☐	☐
	6 Downstream	☒	☐	☐	☒
	7 L-Wave Base Metal	☐	☒	☐	☐
	8 Other N/A	☐	☐	☐	☐



Indication No.	L (In) From Ref L-1	L-Max	L-2	W (In) From Ref W-1	W-Max	W-2	Sweep Reading SW-1	SW-Max	SW-2	Max Amp %DAC	Examination (1 - 8)
NRI											

Remarks:

No Recordable Indications.

Reviewed previous Data Report # 91-234. No changes were observed.

Achieved 35.56% code coverage.

Examiner	Level	Date	Level III Review	Date	ANII Review	Date
[signature]	II	5/1/01	[signature]	05/04/01	[signature]	5/6/01
			[signature]	5/4/01		

Page 1 of 3

NG-143Z Rev. 3

ULTRASONIC CALIBRATION DATA SHEET
(MANUAL EXAMINATION)

Site.: DUANE ARNOLD

Calibration Sheet No.: C-093
Linearity Sheet No.: L-027

Procedure No.: ACP 1211.20 Revision: 3

Instrument STAVELEY (Manufacturer) SONIC 136 (Model No.) 399G (Serial No.)

Search Unit KBA (Manufacturer) 24384 (Serial No.) 0.25" (Size) 2.25 MHz (Freq.) 70° / SHR (Angle/Mode) 0.3" (Incident to wedge front)

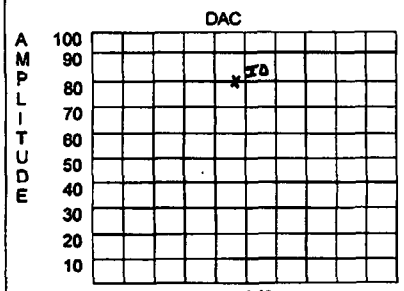
Cable RG-174 (Type) 6' (Length) 0 (No. of Connectors)

Calibration Standard PIPE SEGMENT (Material) S/S (Size/Thickness) 4.0" / .337" (Temp.) 68 °F

Serial No. IE-18

Couplant HUMEX (Type) 00165 (Batch No.) Thermometer 3471 (Serial No.)

DAC



Sweep: 0 - 10 = 2.0"

☐ Depth ☒ Metal Path

INSTRUMENT SETTINGS

DAC Construction		Sensitivity	
Gain-Axial Scan	64.0 dB	Gain-Axial Scan	58.0 dB
Gain-Circ. Scan	N/A	Gain-Circ. Scan	N/A
Pulse	222 ns	Range	2.0"
Damping	500 ohms	Delay	0.340"
Rep Rate	4 kHz	Velocity	0.121 in/us
Filter	2	Sweep	N/A
Frequency	2.25 MHz	Resolution	N/A
Reject	OFF	Jack	R ☐ T ☒

Field Simulator: ROMPAS S/N LMT-032

CALIBRATION VERIFICATION

REFLECTOR:	1.0"	2.0"
MAX AMPLITUDE:	80%	60%
SWEEP:	5.0	10.0
GAIN: (dB)	43.0	43.0

Initial Calibration Time	0800	Verification Times	
Final Verification Time	1518	N/A	N/A
		N/A	N/A

WELDS EXAMINED	REPORT NO.	COMMENTS:
RBB-J001	101070	NONE

Examiner	Level	Date	Level III Review	Date	ANII Review	Date
[signature]	II	5/1/01	[signature]	05/04/01	[signature]	5/5/01
			[signature]	5/4/01		

Page 1 of 1

NG-142Z Rev. 2

ULTRASONIC EXAMINATION DATA SHEET
(MANUAL PIPING)

Site: DUANE ARNOLD

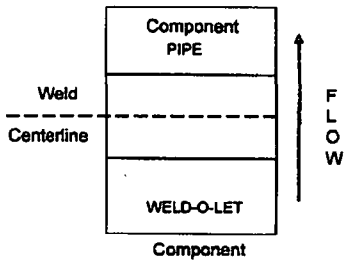
Report No.: 101070
Calibration Sheet No.: C-093
Data Sheet No.: N/A

Procedure No.: ACP 1211.20 Revision: 3

System: RECIRC Exam Surface Temp: 68 °F Couplant: HUMEX Exam Start: 1248
Weld ID: RBB-J001 Thermometer S/N: 3471 Batch No. 00165 Exam End: 1254

Search Unit 70° SHR Examination Surface: ID ☐ OD ☒ Material Type: CS ☐ SS ☒ Other: N/A
Lo Reference: TOP DEAD CENTER Axial Scan Sensitivity (dB) 58.0
Wo Reference: WELD CENTERLINE Circ Scan Sensitivity (dB) N/A

		Performed Yes	Performed No	Indications Yes	Indications No
Axial:	1 With Flow	☐	☒	☐	☐
	2 Against Flow	☒	☐	☐	☒
Circ CW:	3 Upstream	☐	☒	☐	☐
	4 Downstream	☐	☒	☐	☐
Circ CCW	5 Upstream	☐	☒	☐	☐
	6 Downstream	☐	☒	☐	☐
	7 L-Wave Base Metal	☐	☒	☐	☐
	8 Other N/A	☐	☐	☐	☐



Indication No.	L (in) From Ref L-1	L-Max	L-2	W (in) From Ref W-1	W-Max	W-2	Sweep Reading SW-1	SW-Max	SW-2	Max Amp %DAC	Examination (1 - 8)
NRI											

Remarks:

No Recordable Indications.

Reviewed previous Data Report # 91-234. No changes were observed. Scanned 6dB below reference to maintain 5% to 20% ID Roll.

Achieved 35.56% code coverage.

Examiner	Level	Date	Level III Review	Date	ANII Review	Date
[signature]	II	5/1/01	[signature]	05/04/01	[signature]	5/5/01

Page 2 of 3

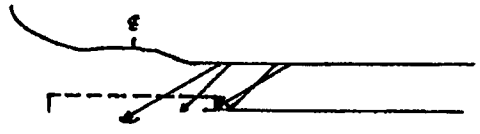
NG-143Z Rev. 3

NMC Committed to Nuclear Excellence	COVERAGE PLOT SHEET	SITE: DUANE ARNOLD UNIT: 1 PROJECT: RF017	REPORT NO.: I01070
SYSTEM: RECIRC	COMPONENT ID NO: RBB-J001	CONFIGURATION: WELD-O-LET	FLOW → PIPE

VAU	2.03	0
VAD	2.03	.858
VACW	2.03	1.015
VACCW	2.03	1.015
	8.12	2.888

8.12) 2.888 = .3556

35.56 %

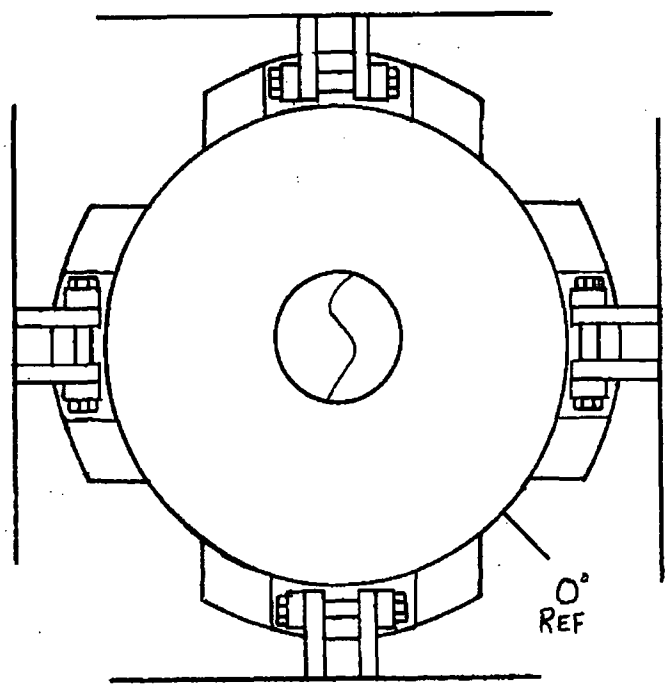


EXAMINER	LEVEL	DATE	LEVEL III REVIEW	DATE	PAGE 3 OF 3
[signature]	II	5/1/01	[signature] III	05/04/01	
			Frank Hoyny 5/4/01	William Mueller 5/5/01 A WII	

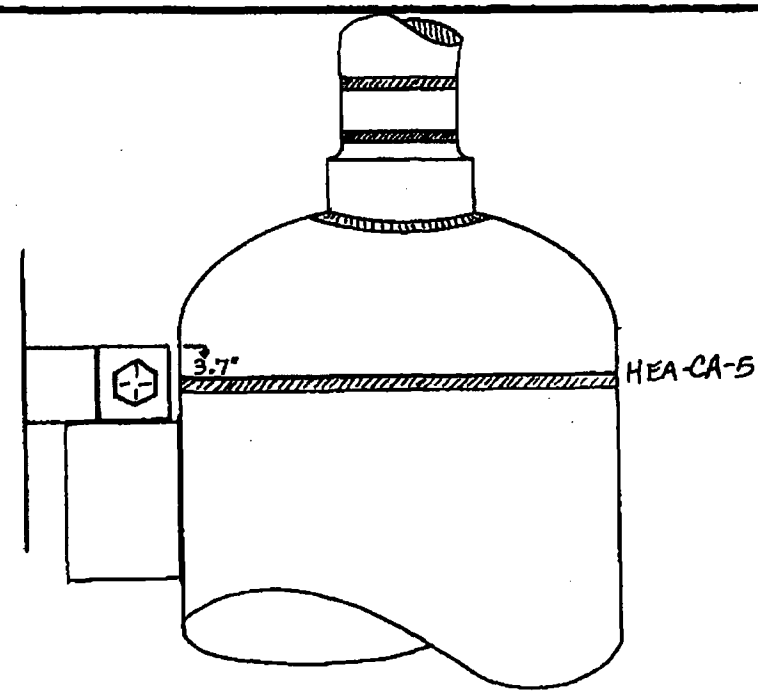
Enclosure 5

Weld HEA-CA-05 Information

NMC Committed to Nuclear Excellence	COVERAGE PLOT SHEET	SITE: DAEC UNIT: 1 PROJECT: NMCDA001	REPORT NO.: T01098
SYSTEM: HEAT EXCHANGER "A"	COMPONENT ID NO: HEA-CA-5	CONFIGURATION: HEAD	FLOW → SHELL



TOP VIEW



STABILIZER BRACKETS
@ 90° INTERVALS

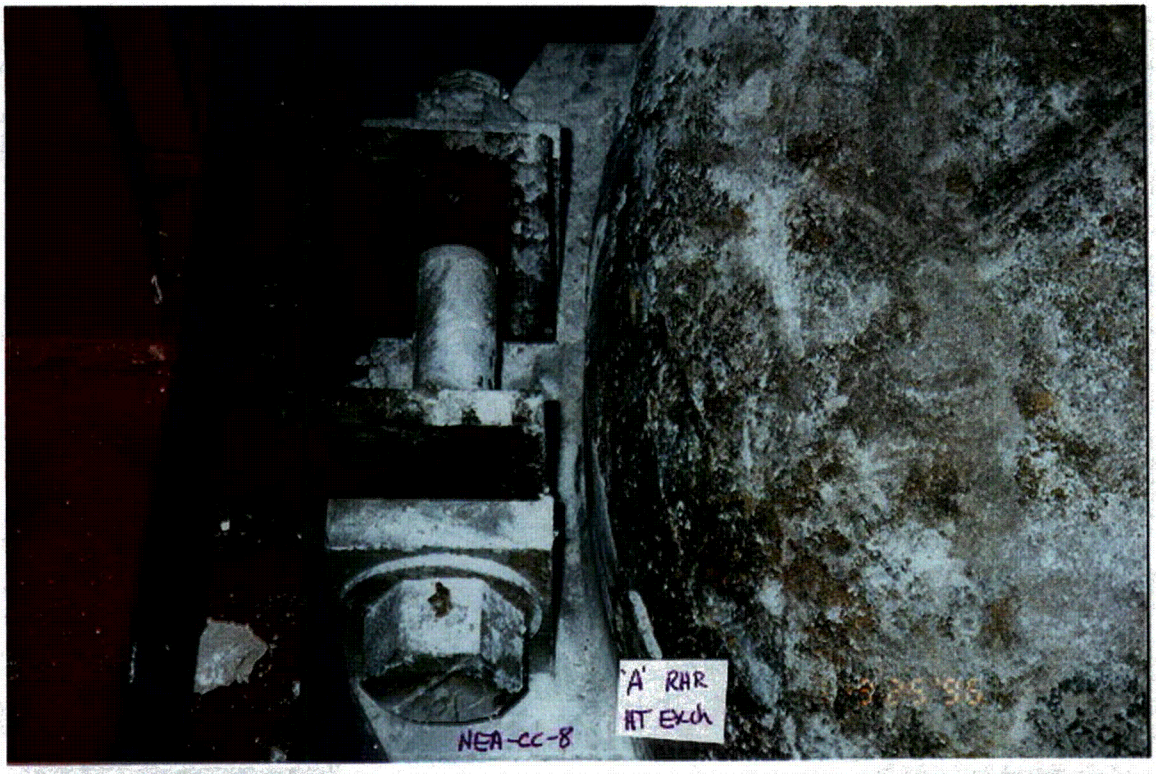
SIDE VIEW

EXAMINER	LEVEL	DATE	LEVEL III REVIEW	DATE	
Brian A. Knott	II	5/3/01	[signature] 5/8/01	05/07/01 William Mueller	PAGE 54 OF 56


Looking UP ↑
'A' RHR HT Exch HEA-CC-8
9 29 96


HEA-CC-8
'A' RHR HT Exch.
9 29 96


HEA-LCF-3
'A' RHR HH Exch
9 25 '96


'A' RHR
HT Exch
NEA-CC-8


'A' RHR HT Exch
9 25 '96

Enclosure 6

Original Form U-1 for Residual Heat Removal Heat Exchanger

FORM U-1 MANUFACTURERS' DATA REPORT FOR PRESSURE VESSELS

As required by the Provisions of the ASME Code Rules, Section VIII, Division 1

1. Manufactured by Berlin Chapman, Division of Perfex Corporation, Berlin, Wisconsin (Name and address of Manufacturer)

2. Manufactured for General Electric Company, San Jose, California (Name and address of Purchaser)

3. Type Vert. (Horiz. or Vert.) Kind Heat Exch. (Tank, Jacketed, Heat Exch.) Vessel No. 721201+2 (Mfrs. Serial) ( ) Natl. Bd. No. 14595 Yr. Built 1971

Items 4–9 incl. to be completed for ~~[illegible]~~ or shells of heat exchangers.

4. SHELL: Material SA-516-70 (Kind and Spec. No.) T.S. 70000 (Flg. or F.B. & Spec. Min. T.S.) Nominal Thickness * In. Corrosion Allowance 10 In. Diam. 3 Ft. 5 3/4 In. Length 21 Ft. 2 3/8 In.

5. SEAMS: Long Dbl. weld butt (Welded, Dbl., Single, Lap, Butt) H.T. No (Yes or No) R.T. Complete (Spot or Complete) Sectioned No (Yes or No) Efficiency 100 %

Girth Dbl. weld butt H.T. No R.T. Complete Sectioned No No. of Courses 3

If riveted describe seams fully on reverse side of form.

6. HEADS (a) Material SA-516-70 T.S. 70000 (b) Material ____ T.S. ____

Location (Top, bottom, ends)	Thickness	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a) End	13/16"			2:1				Concave
(b) Shell flange	SA-105-2	3 3/8" thick						

If removable, bolts used ____ (Material, Spec. No., T.S., Size, Number) Other fastening ____ (Describe or Attach Sketch)

7. STAYBOLTS: ____ (Material) If hollow ____ (Size of Hole) Attachment ____ (Threaded, Welded) Pitch ____ (Horiz.) X ____ (Vert.) Diam. ____ (Nominal)

8. JACKET CLOSURE: ____ (Describe as ogee & weld, bar, etc. If bar, give dimensions, if bolted, describe or sketch)

9. Constructed for max. allowable working press.[2] 450 psi at max. temp. 400° F. Min. temp. (when less than −20°) ____ °F. Hydrostatic Test Press 675 psi.

Items 10 and 11 to be completed for tube sections.

10. TUBE SHEETS: Stationary. Material SA-516-70 FBX (Kind & Spec. No.) Diam. 51 (Subject to Pressure) In. Thickness 5/4 In. Attachment 1" TP-304L overla (Welded, Bolted)

Floating. Material ____ (Kind & Spec. No.) Diam. ____ In. Thickness ____ In. Attachment ____

Integral part of channel

11. TUBES: Material Type 304L SA-249 (Kind & Spec. No.) O.D. 1 In. Thickness **18 BWG or Gage Number 300 Type U (Straight or U)

Items 12–18 incl. to be completed for ~~[illegible]~~ channels of heat exchangers.

12. SHELL Material SA-516-70 (Kind and Spec. No.) T.S. FBX 70000 (Flg. or F.B. & Spec. Min. T.S.) Nominal Thickness 1 In. Corrosion Allowance 10 In. Diam. 2 Ft. 5 3/4 In. Length 2 Ft. 11 7/1 In.

13. SEAMS: Long Dbl. weld butt (Welded, Dbl., Single, Lap, Butt) H.T. No (Yes or No) R.T. Complete (Spot or Complete) Sectioned No (Yes or No) Efficiency 100%

Girth Dbl. weld butt H.T. No R.T. Complete Sectioned No No. of co[illegible] 1

If riveted describe seams fully on reverse side of form.

14. HEADS (a) Material ____ T.S. ____ (b) Material SA-516-70 T.S. 70000 (c) Material ____ T.S. ____

Location	Thickness	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a) Top, bottom, ends								
(b) Channel	5/8"						49 3/8"	
(c) Floating								

If removable, bolts used (a) ____ (Material, Spec. No., T.S., Size, Number) (b) (64) 1" SA-193 B7 [illegible]

(c) ____ Other fastening ____ (Describe or Attach Sketch)

15. Constructed for max. allowable working press.[2] 450 psi at max. temp. 400° F. Min. temp. (when less than −20°) ____ °F. Hydrostatic Test Press ____ psi.

Items 16 thru 18 to be completed for all vessels where applicable.

16. SAFETY VALVE OUTLETS: Number 2 Size 3/4" Location [illegible] (

17. NOZZLES In channel (2)

Purpose (Inlet, Outlet, Drain)	Number	Diam. or Size	Type	Material	Thickness	Reinforcement Material	How Attached
Inlet	1	16"	Weld end	SA-105-2	1 7/16"		Welded
Outlet	1	16"	Weld end	SA-105-2	1"		Welded
Vent - Drain	2	1"	S.W. Cplg.	SA-105-2			Welded
[illegible]	1	1"	S.W. Cplg.	SA-105-2			Welded
Level Ind.	2	3/4"	S.W. Cplg.	SA-105-2			Welded

* " to be stamped heat-treated.

[2] List under remarks other internal or external pressures with coincident temperature which applicable.

(Over)