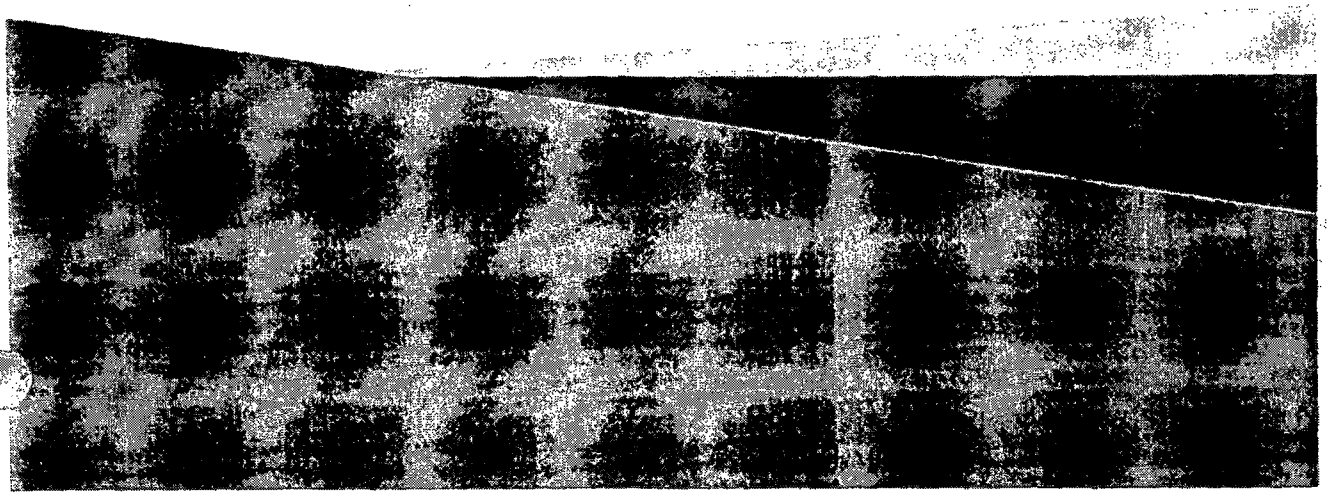
Attachment B

to Relief Request
15-ON-002

UT Detail Data sheets from

2EOC-26

Limited Exam Coverage



OCONEE - UNIT 2
EXAMINATION COVERAGE FOR WELD: W02
UPPER NOZZLE BELT TO UPPER SHELL WELD

Summary Number: O2.B1.11.0003
Component ID: 2-RPV-WR18
Scan Plan Drawing Number: 8066245D Sheets 7 & 10

WELD VOLUME COVERAGE OBTAINED: 79%

Zone Coverage Obtained

Inner 15%T: 83.2% Outer 85%T: 77.8% Aggregate: 78.6%

Examination Volume Definition

Weld Length: 252.17 in.

Area Measurement (axial plane)		Volume Calculation	
Inner 15%T	27.63 sq. in.	Inner 15%T	6987.32 cu. in.
Outer 85%T	157.30 sq. in.	Outer 85%T	39665.58 cu. in.

Limitations	Limits scan by:	Compensation(s)
Outlet nozzle boss	Slight reduction in axial and circ scan direction adjacent to outlet nozles due to nozle boss interference with tooling configuration.	None

Examination Coverage Calculations

INNER 15%T

Axial Beam Direction Coverages

Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined	Limited	Comment
1	70L/45L	Up/Down	27.63	222.84	6157.17	6157.17	100.0%	No	None
2	70L/45L	Up/Down	6.35	29.32	186.34	810.15	23.0%	Yes	Outlet Nozzle Boss limits scan
		Total Axial Coverage		252.17	6343.51	6967.32	91.0%		

Circumferential Beam Direction Coverages

Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Circ Extent Examined (%)	Axial Extent Examined (%)	Percent Examined	Limited	Comment
3	70L/45L	CW/CCW	198.00	88.6%	100.0%	88.6%	Yes	Coverage between Inlet/Outlet Nozzles
4	70L/45L	CW/CCW	148.20	88.6%	100.0%	88.6%	Yes	Coverage between Inlet Nozzles
				Total Circ. Beam Direction Coverage:		76.3%		
					Inner 15% coverage:	83.2%		

OUTER 85%T

Axial Beam Direction Coverages

Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined	Limited	Comment
1	45L/45S	Up/Dn	157.30	222.84	35052.73	35052.73	100.0%	No	None
2	45L/45S	Up/Dn	36.18	29.32	1060.77	4612.04	23.0%	Yes	Outlet Nozzle Boss limits scan
		Total Axial Coverage		252.18	36113.50	39664.77	91.0%		

Circumferential Beam Direction Coverages

Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Circ Extent Examined (%)	Axial Extent Examined (%)	Percent Examined	Limited	Comment
3	45L/45S	CW/CCW	1054.80	60.2%	100.0%	60.2%	Yes	Coverage between Inlet/Outlet Nozzles
4	45L/45S	CW/CCW	744.60	71.7%	100.0%	71.7%	Yes	Coverage between Inlet Nozzles
				Total Circ. Beam Direction Coverage:		64.5%		
					Outer 85% coverage:	77.8%		

ATTACHMENT B
Pg 1 of 80

RPV Weld UT Data Sheet

Utility:	Duke Energy	Plant:	Oconee	Unit:	2	Outage:	02EOC26
TWS Weld Number:	W02	Component ID:	2-RPV-WR18			Summary No.:	O2.B1.11.0003
Description:	UPPER NOZZLE BELT TO UPPER SHELL WELD						
Examination Procedure:	54-ISI-801-02, Automated UT of PWR Vessel Shell Welds. (with SDCNs #30-9188581-000 & 30-9211408-000)						

Essential Equipment Description

Manufacturer	Model	VH#	Serial Number	Cal. Due Date
Zetec	µTomoscan	8167	63591	9/25/2014
Zetec	16-Ch P/R	7796	0371	n/a

UT Cable Type / Length:	Montrose CBL-9847 / 28'	RG-174 / 126'		No. of Connectors:	4
UT Calibration/Acquisition Software Version:	Accusonex 6.6.1	UT Data Analysis / Version:		Accusonex	3.18.1

Calibration Information

Cal. Sheet:	CDS-4	Cal Block ID:	Vessel: RPV-95001

Equipment Settings

See the above listed Calibration Data Sheet (CDS) and applicable channel for a listing of the equipment settings used for examination.

Scan Speed:	<18 IPS	Sync. Interval:	0.08"	Index Value:	0.5"	Couplant:	Water	Vessel Temp:	76 F

Transducers

Transducer Manufacturer:	Sigma/GEIT	UT Head:	RED Head #3	Shell Scans RED TWS

Channel	Angle	Mode	Beam Direction	Freq.	Serial Number	Model	Focal Depth	Size	Exit Point
1/7	45°	S	Axial / Circ.	1.0 MHz	8011	Sigma: 5508	Flat	1.2"x.75" (x2)	1.15"
2	46°	S	Axial / Circ.	1.0 MHz	08012	Sigma: 5508	Flat	1.2"x.75" (x2)	1.20"
3	73°	L	Axial / Circ.	1.3 MHz	0251MK	GEIT: 389-042-010	.5"	1.5"x.375" (x2), 1.5"x.75" (x1)	1.00"
4	73°	L	Axial / Circ.	1.3 MHz	0251ML	GEIT: 389-042-010	.5"	1.5"x.375" (x2), 1.5"x.75" (x1)	1.05"
5	47°	L	Axial / Circ.	2.7 MHz	01T3FL	GEIT: 389-038-010	4"	1.1"x.75" (x2)	1.00"
6	47°	L	Axial / Circ.	2.7 MHz	0252DK	GEIT: 389-038-010	4"	1.1"x.75" (x2)	0.90"
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-

Examination Coverage

Ref. Scan Plan 8066245D	Examination Surface: ID
Examination Coverage:	79 %
Examination Limitation:	Clad Patch Weld Beads
Examination Date(s):	From 11/6/2013 to 11/8/2013

Examination Results

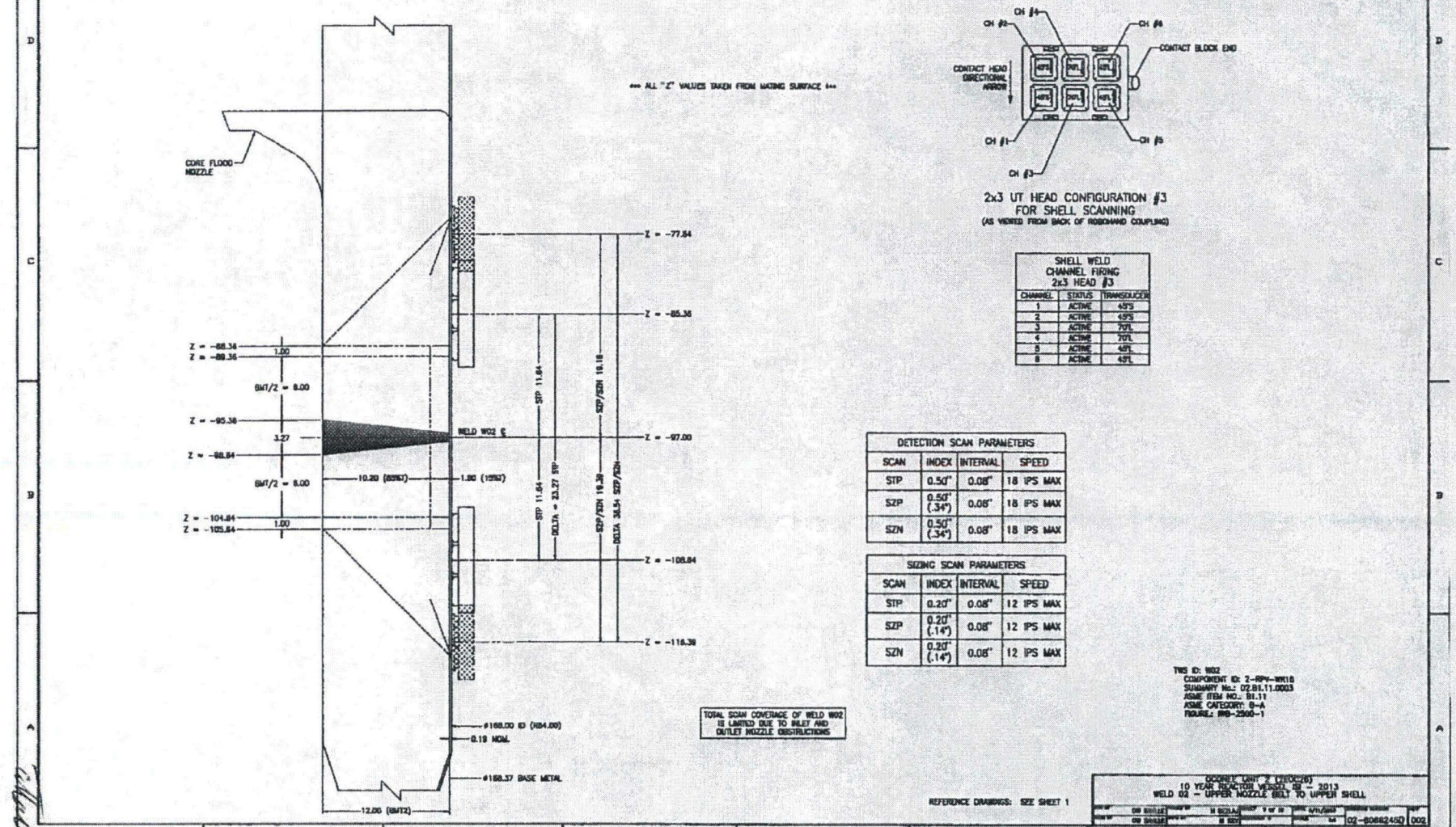
☐ No Recordable Indications	☑ Recordable Indications
☑ Evaluation Acceptable	☐ Evaluation Unacceptable
☑ See Attached Flaw Evaluation Summary Sheet(s)	
Names of data analysts for this weld are included on the attached sheets:	

Remarks: See attached "Weld Acquisition Data" and "TWS Scan plan by Frame" pages for additional information.

Reviewed by:	Mike Hacker	Level: III	Date: 12/13/2013
Reviewed by:			
Reviewed by:			

ATTACHMENT B

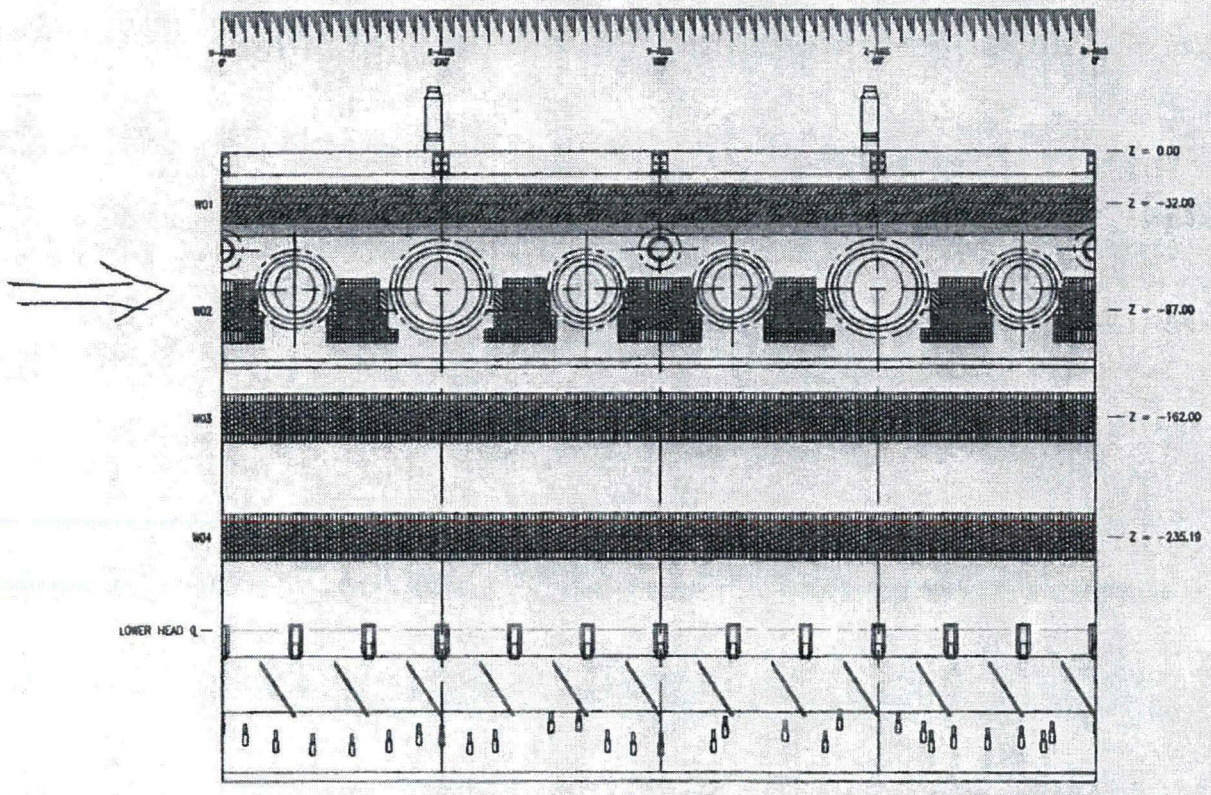
20f80



SHELL WELD CHANNEL FIRING 2x3 HEAD #3		
CHANNEL	STATUS	TRANSDUCER
1	ACTIVE	45°S
2	ACTIVE	45°S
3	ACTIVE	70°L
4	ACTIVE	70°L
5	ACTIVE	45°L
6	ACTIVE	45°L

DETECTION SCAN PARAMETERS			
SCAN	INDEX	INTERVAL	SPEED
STP	0.50"	0.08"	18 IPS MAX
SZP	0.50" (.34")	0.08"	18 IPS MAX
SZN	0.50" (.34")	0.08"	18 IPS MAX

SIZING SCAN PARAMETERS			
SCAN	INDEX	INTERVAL	SPEED
STP	0.20"	0.08"	12 IPS MAX
SZP	0.20" (.14")	0.08"	12 IPS MAX
SZN	0.20" (.14")	0.08"	12 IPS MAX



STC SCAN
SZP SCAN
STP SCAN
SZH SCAN
STH SCAN

SCAN AREA - WELDS W01, W02, W03, AND W04

10 YEAR REACTOR VESSEL ISI - 2013
SCAN AREA - WELDS W01, W02, W03, AND W04

51-5213066-000

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OCONEE - UNIT 2
EXAMINATION COVERAGE FOR WELD: W05
LOWER SHELL TO LOWER HEAD WELD

Summary Number: O2.B1.11.0004
Component ID: 2-RPV-WR34
Scan Plan Drawing Number: 8068245D Sheets 11, 12, & 14

WELD VOLUME COVERAGE OBTAINED: 43%

Zone Coverage Obtained

Inner 15%T: 35.0% Outer 85%T: 44.0% Aggregate: 42.7%

Examination Volume Definition

Weld Length: 538.406 in.

Area Measurement (axial plane)		Volume Calculation	
Inner 15%T	10.54 sq. in.	Inner 15%T	5674.80 cu. in.
Outer 85%T	44.46 sq. in.	Outer 85%T	23937.54 cu. in.

Limitations	Limits scan by:	Compensation(s)
Core Guide Lugs	Guide Lugs and Flow Stabilizers restrict UT head movement	None
Flow Stabilizers	Guide Lugs and Flow Stabilizers restrict UT head movement	None

Examination Coverage Calculations

INNER 15%T

Axial Beam Direction Coverages

Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined	Limited	Comment
1	70L/45L	Up/Dn	10.54	64.30	677.72	677.72	100.0%	No	Coverage between lugs and stabilizers
2	70L/45L	Up/Dn	6.95	193.40	1344.13	2038.44	65.9%	Yes	Coverage above stabilizers
3	70L/45L	Up/Dn	0.00	280.71	0.00	2958.64	0.0%	Yes	Obstructed
		Total Axial Coverage		538.41	2021.85	5674.80	35.6%		

Circumferential Beam Direction Coverages

Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Circ Extent Examined (%)	Axial Extent Examined (%)	Percent Examined	Limited	Comment
4	70L/45L	CW/CCW	88.44	20.1%	43.0%	8.6%	Yes	Coverage between lugs and stabilizers
5	70L/45L	CW/CCW	345.72	44.5%	57.0%	25.4%	Yes	Coverage above stabilizers
				Total Circ. Beam Direction Coverage:		34.0%		
					Inner 15% coverage:	35.0%		

OUTER 85%T

Axial Beam Direction Coverages

Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined	Limited	Comment
1	45L/45S	Up/Dn	44.46	64.30	2858.78	2858.78	100.0%	No	Coverage between lugs and stabilizers
2	45L/45S	Up/Dn	28.28	193.40	5469.35	8598.56	63.6%	Yes	Coverage above stabilizers
3	45L/45S	Up/Dn	0.00	280.71	0.00	12480.20	0.0%	Yes	Obstructed
		Total Axial Coverage		538.41	8328.13	23937.54	34.8%		

Circumferential Beam Direction Coverages

Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Circ Extent Examined (%)	Axial Extent Examined (%)	Percent Examined	Limited	Comment
4	45L/45S	CW/CCW	1462.80	31.3%	43.0%	13.5%	Yes	Coverage between lugs and stabilizers
5	45L/45S	CW/CCW	3250.44	69.5%	57.0%	39.6%	Yes	Coverage above stabilizers
				Total Circ. Beam Direction Coverage:		53.1%		
					Outer 85% coverage:	44.0%		

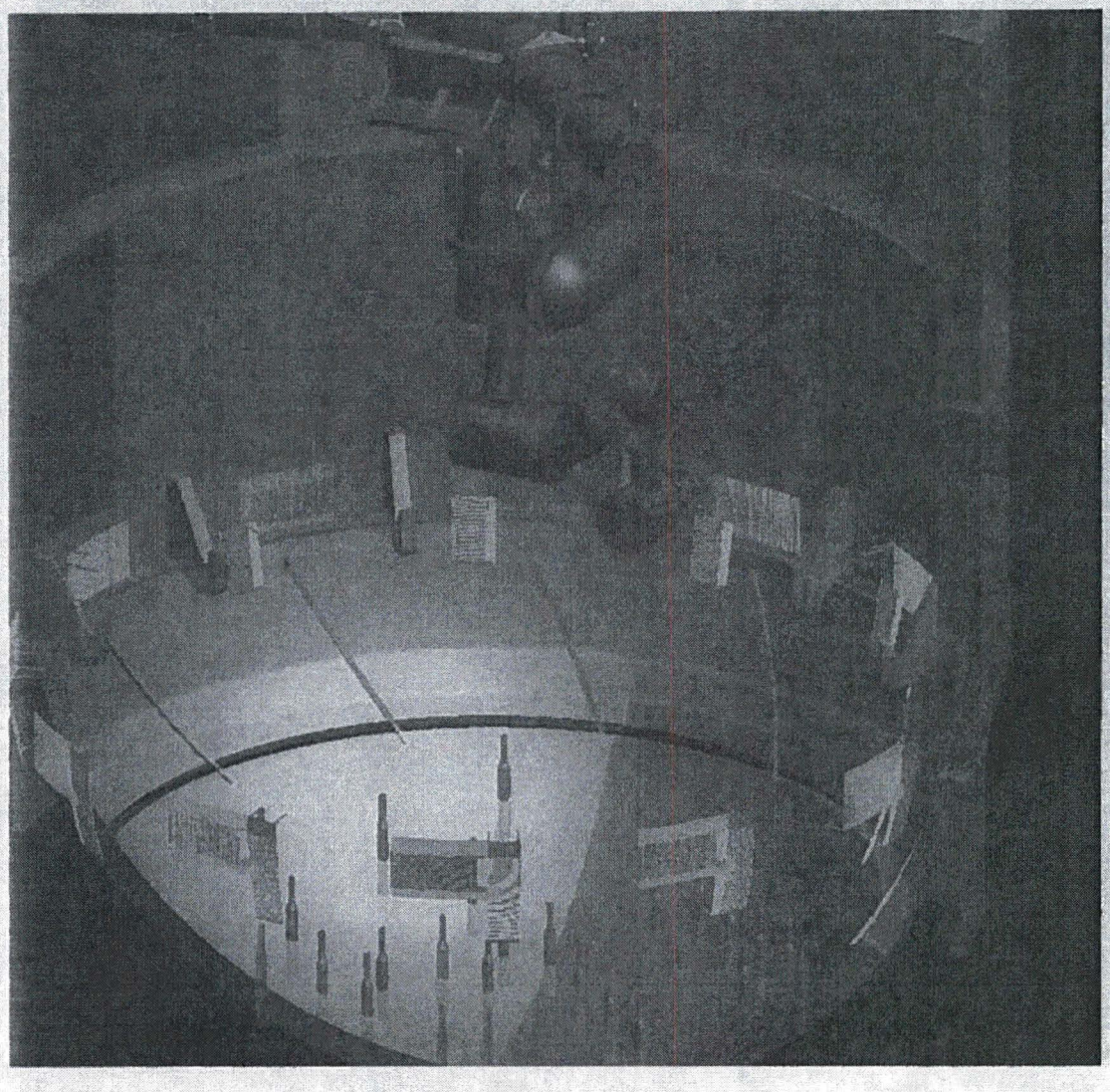

Figure 1-2: TWS Weld W05 – Lower shell to Lower Head Weld

View of TWS robot in vessel lower head region showing scan limitations caused by the Core Guide Lugs and Flow Stabilizers. The weld is partially covered by the Core Guide Lugs. Flow Stabilizers welded to the head below the weld and the Core Guide Lugs restrict the UT head from scanning the entire weld. These limitations occur between each lug set. Single sided scan parameters are used near obstructions to improve examination coverage. Coverage obtained on this weld is 43%.

[redacted]

RPV Weld UT Data Sheet

Utility:	Duke Energy	Plant:	Oconee	Unit:	2	Outage:	02EOC26
TWS Weld Number:	W05	Component ID:	2-RPV-WR34			Summary No.:	O2.B1.11.0004
Description:	LOWER SHELL TO LOWER HEAD TORUS WELD						
Examination Procedure:	54-ISI-801-02, Automated UT of PWR Vessel Shell Welds. (with SDCNs #30-9188581-000 & 30-9211408-000)						

Essential Equipment Description

Manufacturer	Model	VH#	Serial Number	Cal. Due Date
Zetec	µTomoscan	8167	63591	9/25/2014
Zetec	16-Ch P/R	7796	0371	n/a

UT Cable Type / Length:	Montrose CBL-9847 / 26'	RG-174 / 126'		No. of Connectors:	4
UT Calibration/Acquisition Software Version:	Accusonex 6.6.1	UT Data Analysis / Version:		Accusonex	3.18.1

Calibration Information

Cal. Sheet:	CDS-4	Cal Block ID:	Vessel: RPV-95001

Equipment Settings

See the above listed Calibration Data Sheet (CDS) and applicable channel for a listing of the equipment settings used for examination.

Scan Speed:	<12 IPS	Sync. Interval:	0.08"	Index Value:	0.2"	Couplant:	Water	Vessel Temp:	76 F

Transducers

Transducer Manufacturer: Sigma/GEIT — UT Head: RED Head #3 — Shell Scans RED TWS

Channel	Angle	Mode	Beam Direction	Freq.	Serial Number	Model	Focal Depth	Size	Exit Point
1/7	45°	S	Axial / Circ.	1.0 MHz	8011	Sigma: 5508	Flat	1.2"x.75" (x2)	1.15"
2	48°	S	Axial / Circ.	1.0 MHz	08012	Sigma: 5508	Flat	1.2"x.75" (x2)	1.20"
3	73°	L	Axial / Circ.	1.3 MHz	0251MK	GEIT: 389-042-010	.5"	1.5"x.375" (x2), 1.5"x.75" (x1)	1.00"
4	73°	L	Axial / Circ.	1.3 MHz	0251ML	GEIT: 389-042-010	.5"	1.5"x.375" (x2), 1.5"x.75" (x1)	1.05"
5	47°	L	Axial / Circ.	2.7 MHz	01T3FL	GEIT: 389-038-010	4"	1.1"x.75" (x2)	1.00"
6	47°	L	Axial / Circ.	2.7 MHz	0252DK	GEIT: 389-038-010	4"	1.1"x.75" (x2)	0.90"
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-

Examination Coverage

Ref. Scan Plan 8068245D — Examination Surface: ID

Examination Coverage: 43 %

Examination Limitation: Core Guide Lugs and Flow Stabilizers

Examination Date(s): From 11/7/2013 to 11/8/2013

Examination Results

☐ No Recordable Indications ☑ Recordable Indications

☑ Evaluation Acceptable ☐ Evaluation Unacceptable

☑ See Attached Flaw Evaluation Summary Sheet(s)

Names of data analysts for this weld are included on the attached sheets.

Remarks: See attached "Weld Acquisition Data" and "TWS Scan plan by Frame" pages for additional information.

Reviewed by:	Mike Hacker	Level: III	Date: 12/13/2013
Reviewed by:			
Reviewed by:			

ATTACHMENT B
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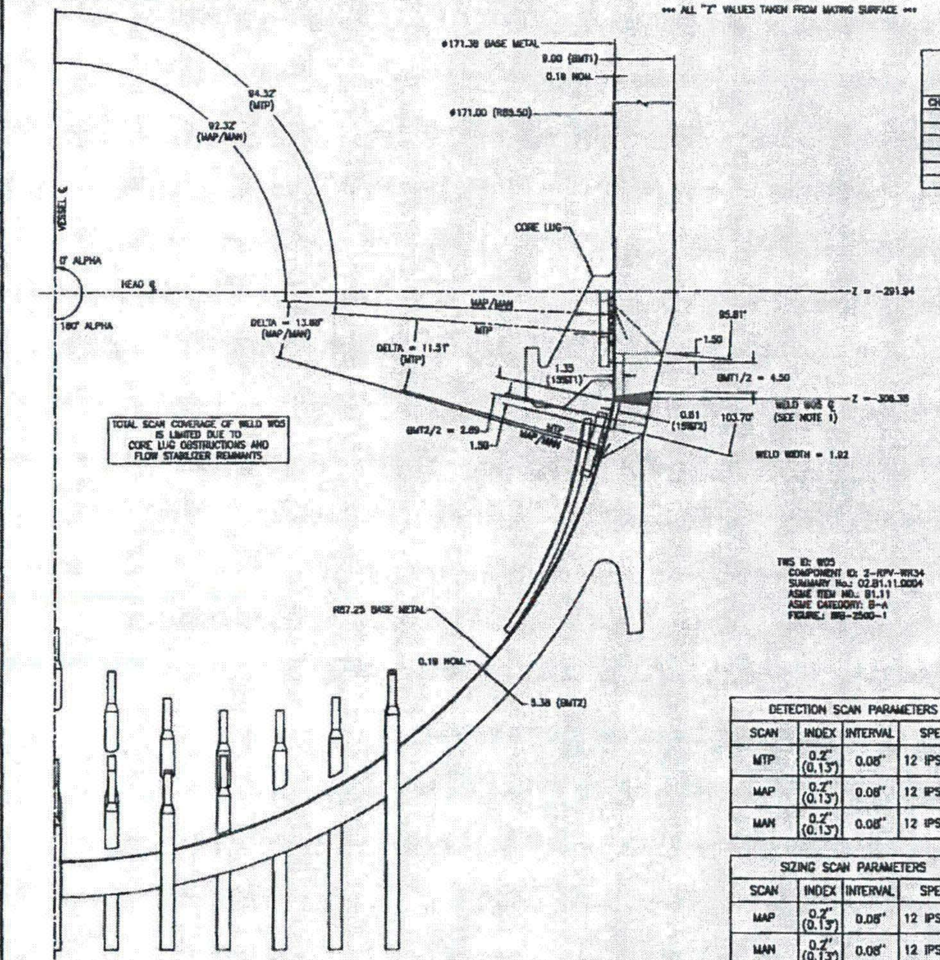
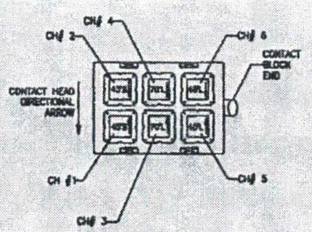
AREVA

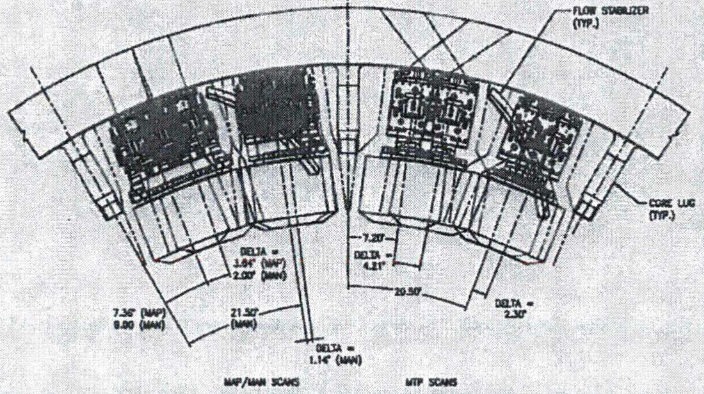
*** ALL "Z" VALUES TAKEN FROM MATING SURFACE ***



SHELL WELD CHANNEL FIRING 2x3 HEAD #3		
CHANNEL	STATUS	TRANSDUCER
1	ACTIVE	45°S
2	ACTIVE	45°S
3	ACTIVE	70°L
4	ACTIVE	70°L
5	ACTIVE	45°L
6	ACTIVE	45°L



2x3 UT HEAD CONFIGURATION #3 FOR SHELL SCANNING
(AS VIEWED FROM BACK OF ROBOHAND COUPLING)



TWS ID: W05
COMPONENT ID: 2-RPV-WR34
SUMMARY No.: 02.B1.11.0004
ASME ITEM NO.: B1.11
ASME CATEGORY: B-A
FIGURE: IWB-2500-1

SCANNING BETWEEN CORE LUGS
FLOW STABILIZER REMNANT OBSTRUCTION

DETECTION SCAN PARAMETERS			
SCAN	INDEX	INTERVAL	SPEED
MTP	0.2" (0.13")	0.08"	12 IPS MAX
MAP	0.2" (0.13")	0.08"	12 IPS MAX
MAN	0.2" (0.13")	0.08"	12 IPS MAX

SIZING SCAN PARAMETERS			
SCAN	INDEX	INTERVAL	SPEED
MAP	0.2" (0.13")	0.08"	12 IPS MAX
MAN	0.2" (0.13")	0.08"	12 IPS MAX

NOTE:

1) DUE TO THE NUMBER OF SCANS PATCHES REQUIRED TO SCAN AROUND THE OBSTRUCTIONS FOR WELD W05 AND A MAXIMUM OF 99 PATCHES PER WELD AVAILABLE FOR USE IN THE DATABASE, THE WELD NAME PORTION OF THE SCAN IDENTIFICATION NUMBER (SIN) WILL BE AS FOLLOWS:
W5a – FOR ALL SHELL RELATED SCANS
W5b – FOR ALL MERIDIONAL RELATED SCANS

REFERENCE DRAWINGS: SEE SHEET 1

OCONEE UNIT 2 (2EOC26)
10 YEAR REACTOR VESSEL ISI – 2013
WELD W05 – LOWER SHELL TO LOWER HEAD TORUS
(LIMITED COVERAGE)

02-8066245 D 002

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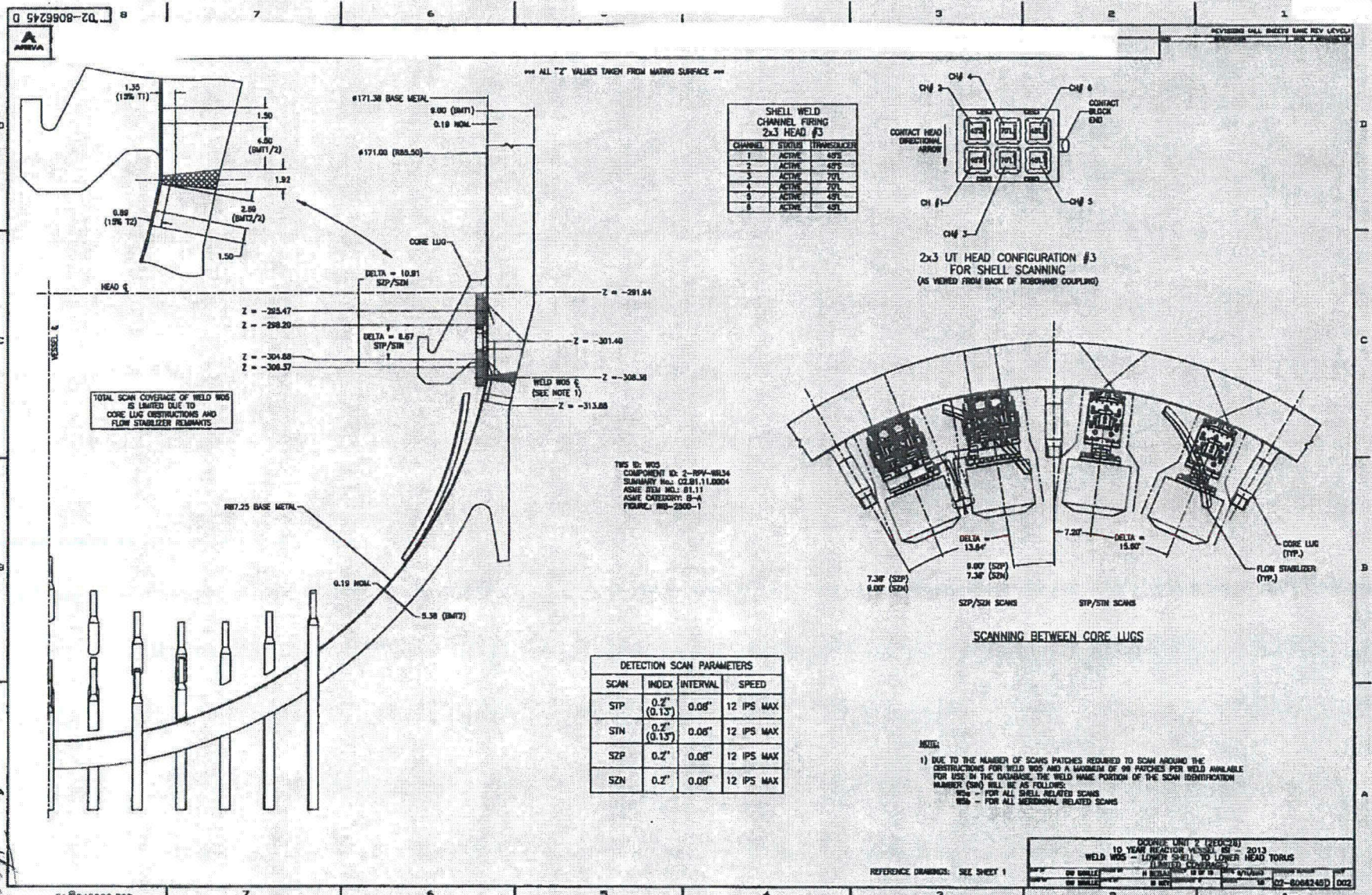
*** ALL "Z" VALUES TAKEN FROM MATING SURFACE ***
1.35 (15% T1)
1.50
4.50 (BMT1/2)
1.92
0.89 (15% T2)
2.89 (BMT2/2)
1.50
#171.38 BASE METAL
9.00 (BMT1)
0.19 NOM.
#171.00 (R85.50)
CORE LUG
HEAD ℄
DELTA = 10.81 SZP/SZN
DELTA = 8.67 STP/STN
Z = -291.94
Z = -295.47
Z = -298.20
Z = -301.40
Z = -304.88
Z = -306.37
Z = -308.38
Z = -313.88
WELD W05 ℄ (SEE NOTE 1)
TOTAL SCAN COVERAGE OF WELD W05 IS LIMITED DUE TO CORE LUG OBSTRUCTIONS AND FLOW STABILIZER REMNANTS
R87.25 BASE METAL
0.19 NOM.
5.38 (BMT2)
TWS ID: W05
COMPONENT ID: 2-RPV-WELD4
SUMMARY No.: CE.B1.11.0004
ASME ITEM NO.: B1.11
ASME CATEGORY: B-A
FIGURE: IWB-2500-1
SHELL WELD CHANNEL FIRING 2x3 HEAD #3
CHANNEL | STATUS | TRANSDUCER
1 | ACTIVE | 45°S
2 | ACTIVE | 45°S
3 | ACTIVE | 70°L
4 | ACTIVE | 70°L
5 | ACTIVE | 45°L
6 | ACTIVE | 45°L
CH # 4
CH # 2
CH # 6
CONTACT BLOCK END
CONTACT HEAD DIRECTIONAL ARROW
CH # 1
CH # 5
CH # 3
2x3 UT HEAD CONFIGURATION #3 FOR SHELL SCANNING
(AS VIEWED FROM BACK OF ROBOHAND COUPLING)
DELTA = 13.84°
7.20°
DELTA = 15.00°
CORE LUG (TYP.)
FLOW STABILIZER (TYP.)
9.00° (SZP)
7.38° (SZN)
7.38° (SZP)
9.00° (SZN)
SZP/SZN SCANS
STP/STN SCANS
SCANNING BETWEEN CORE LUGS
DETECTION SCAN PARAMETERS
SCAN | INDEX | INTERVAL | SPEED
STP | 0.2" (0.13") | 0.08" | 12 IPS MAX
STN | 0.2" (0.13") | 0.08" | 12 IPS MAX
SZP | 0.2" | 0.08" | 12 IPS MAX
SZN | 0.2" | 0.08" | 12 IPS MAX
NOTE:
1) DUE TO THE NUMBER OF SCANS PATCHES REQUIRED TO SCAN AROUND THE OBSTRUCTIONS FOR WELD W05 AND A MAXIMUM OF 99 PATCHES PER WELD AVAILABLE FOR USE IN THE DATABASE, THE WELD NAME POSITION OF THE SCAN IDENTIFICATION NUMBER (SIN) WILL BE AS FOLLOWS:
W05a - FOR ALL SHELL RELATED SCANS
W05b - FOR ALL MERIDIONAL RELATED SCANS
REFERENCE DRAWINGS: SEE SHEET 1
DOMINION UNIT 2 (DEDC2B)
10 YEAR REACTOR VESSEL ISI - 2013
WELD W05 - LOWER SHELL TO LOWER HEAD TORUS
FLANGED CONFIGURATION
02-8068245D 002
51-9213066-000
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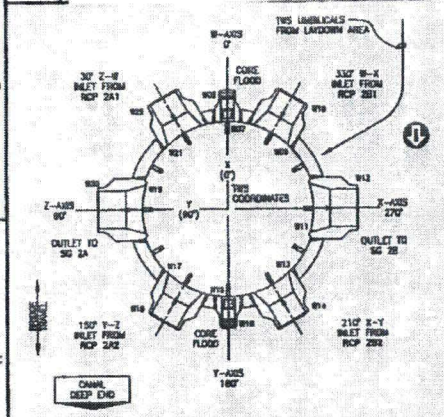
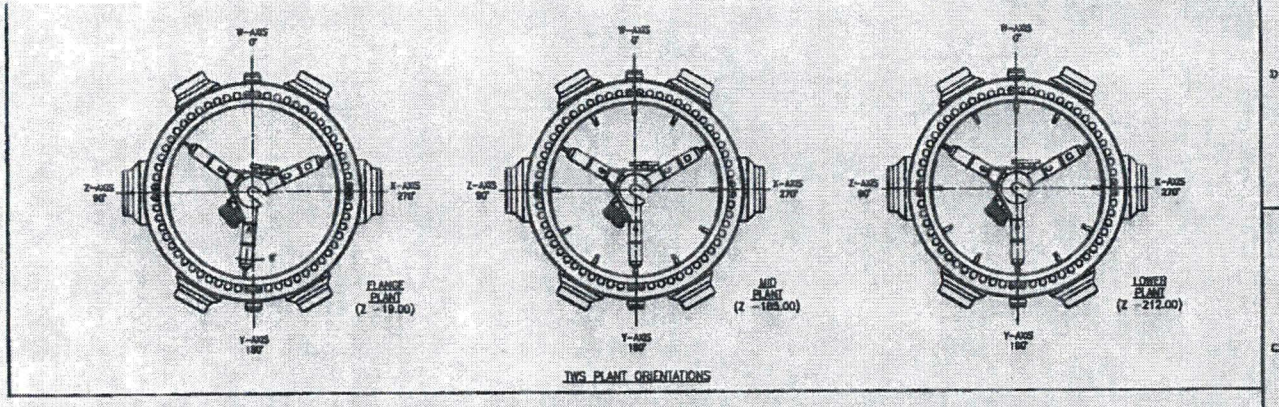


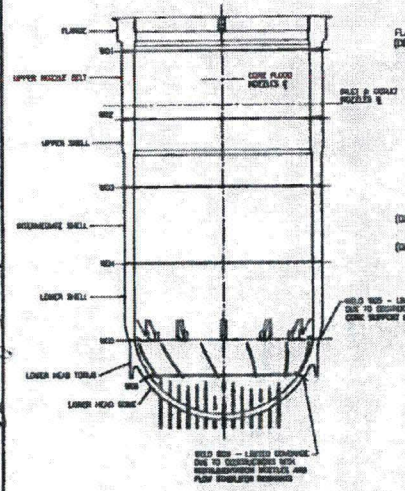
CONTAINMENT LAYOUT

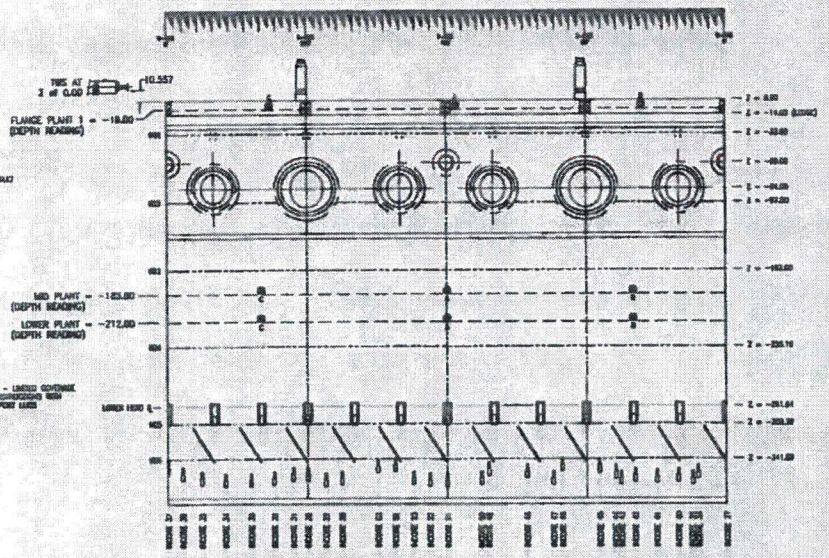
NOMENCLATURE LEGEND
(USED THROUGHOUT SCAN PLAN)

W - SITE VESSEL AXIS (W, X, Y, or Z)
0° - TWS ANGULAR LAYOUT - RIGHT HAND RULE (CCW DIRECTION)



TWS PLANT ORIENTATIONS



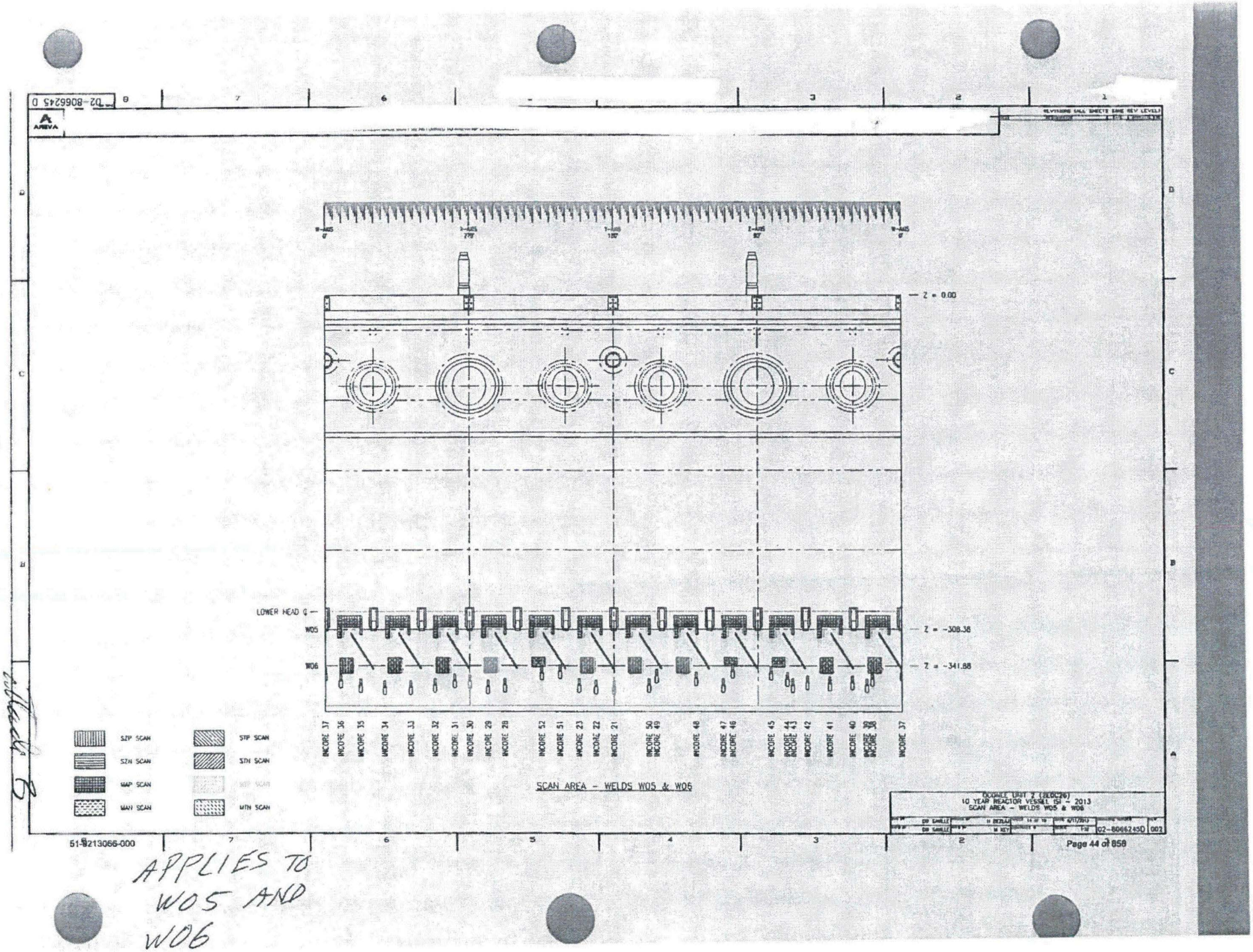


TWS WELD WORK SCOPE

TWS WELD NO.	DESCRIPTION	ISI DRAWING No.	ISI COMPONENT ID
1001	FLANGE TO UPPER NOZZLE BELT WELD	03.01.20.0001	2-RPV-1001
1002	UPPER NOZZLE BELT TO UPPER SHELL WELD	03.01.21.0002	2-RPV-1002
1003	UPPER SHELL TO INTERMEDIATE SHELL WELD	03.01.21.0003	2-RPV-1003
1004	INTERMEDIATE SHELL TO LOWER SHELL WELD	03.01.21.0004	2-RPV-1004
1005	LOWER SHELL TO LOWER HEAD TORUS WELD	03.01.21.0005	2-RPV-1005
1006	LOWER HEAD TORUS TO LOWER HEAD SKIRT WELD	03.01.21.0006	2-RPV-1006
1007	CORE FLOOD NOZZLE TO SHELL WELD AT 60° (2A INLET)	03.03.10.0007	2-RPV-1007
1008	TORUS NOZZLE TO SHELL CORE FLOOD WELD AT 60° (2A INLET)	03.03.10.0008	2-RPV-1008
1009	INLET NOZZLE TO SHELL WELD AT 330° (INLET X_Y)	03.03.10.0009	2-RPV-1009
1010	INLET NOZZLE TO PIPE WELD AT 330° (INLET X_Y)	03.03.11.0010	2-RPV-1010
1011	OUTLET NOZZLE TO SHELL WELD AT 30° (2 INLET)	03.03.10.0011	2-RPV-1011
1012	SHIELD NOZZLE TO PIPE WELD AT 30° (2 INLET)	03.03.11.0012	2-RPV-1012
1013	INLET NOZZLE TO SHELL WELD AT 210° (INLET X_Y)	03.03.10.0013	2-RPV-1013
1014	INLET NOZZLE TO PIPE WELD AT 210° (INLET X_Y)	03.03.11.0014	2-RPV-1014
1015	CORE FLOOD NOZZLE TO SHELL WELD AT 180° (2 INLET)	03.03.10.0015	2-RPV-1015
1016	CORE FLOOD NOZZLE TO SHELL CORE TORUS AT 180° (2 INLET)	03.03.10.0016	2-RPV-1016
1017	INLET NOZZLE TO SHELL WELD AT 150° (INLET Y_Z)	03.03.10.0017	2-RPV-1017
1018	INLET NOZZLE TO PIPE WELD AT 150° (INLET Y_Z)	03.03.11.0018	2-RPV-1018
1019	OUTLET NOZZLE TO SHELL WELD AT 90° (2 INLET)	03.03.10.0019	2-RPV-1019
1020	OUTLET NOZZLE TO PIPE WELD AT 90° (2 INLET)	03.03.11.0020	2-RPV-1020
1021	INLET NOZZLE TO SHELL WELD AT 30° (INLET Z_W)	03.03.10.0021	2-RPV-1021
1022	INLET NOZZLE TO PIPE WELD AT 30° (INLET Z_W)	03.03.11.0022	2-RPV-1022

08/04/20 Steve B

APPLIES TO: W05 AND



APPLIES TO W05 AND W06

OCONEE - UNIT 2
EXAMINATION COVERAGE FOR WELD: W06
LOWER HEAD TORUS TO LOWER HEAD DOME WELD

Summary Number: 02.B1.21.0001
Component ID: 2-RPV-WR35
Scan Plan Drawing Number: 8086245D Sheets 13 & 14

WELD VOLUME COVERAGE OBTAINED: 36%

Zone Coverage Obtained

Inner 15%T: 32.7% Outer 85%T: 37.1% Aggregate: 36.4%

Examination Volume Definition

Weld Length: 449.248 in.

Area Measurement (axial plane)		Volume Calculation	
Inner 15%T	5.77 sq. in.	Inner 15%T	2592.16 cu. in.
Outer 85%T	33.04 sq. in.	Outer 85%T	14843.15 cu. in.

Limitations	Limits scan by:	Compensation(s)
Incore Instrumentation Nozzles	Incore Nozzles restrict UT head movement	None
Flow Stabilizers	Flow Stabilizers restrict UT head movement	None

Examination Coverage Calculations

INNER 15%T

Axial Beam Direction Coverages

Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined	Limited	Comment
1	70L/45L	Up/Dn	5.77	160.61	926.70	926.70	100.0%	No	Coverage between nozzles and stabilizers
2	70L/45L	Up/Dn	3.28	34.44	112.97	198.73	56.8%	Yes	Coverage above nozzles 45 and 52
3	70L/45L	Up/Dn	1.07	11.23	12.02	64.80	18.5%	Yes	Coverage above nozzle 46
4	70L/45L	Up/Dn	0.00	242.97	0.00	1401.93	0.0%	Yes	Obstructed
		Total Axial Coverage	**449.25**		**1051.69**	**2592.16**	**40.6%**		

Circumferential Beam Direction Coverages

Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Circ Extent Examined (%)	Axial Extent Examined (%)	Percent Examined	Limited	Comment
5	70L/45L	CW/CCW	90.72	20.3%	100.0%	20.3%	Yes	Coverage between nozzles and stabilizers
6	70L/45L	CW/CCW	20.16	4.5%	80.0%	3.6%	Yes	Coverage above nozzles 45 and 52
7	70L/45L	CW/CCW	10.08	2.3%	42.0%	0.9%	Yes	Coverage above nozzle 46
				Total Circ. Beam Direction Coverage:		**24.8%**		
					Inner 15% coverage:	**32.7%**		

OUTER 85%T

Axial Beam Direction Coverages

Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined	Limited	Comment
1	45L/45S	Up/Dn	33.04	160.61	5306.42	5306.42	100.0%	No	Coverage between nozzles and stabilizers
2	45L/45S	Up/Dn	28.98	34.44	997.45	1137.97	87.7%	Yes	Coverage above nozzles 45 and 52
3	45L/45S	Up/Dn	17.91	11.23	201.15	371.08	54.2%	Yes	Coverage above nozzle 46
4	45L/45S	Up/Dn	0.00	242.97	0.00	8027.67	0.0%	Yes	Obstructed
		Total Axial Coverage	**449.25**		**6505.03**	**14843.15**	**43.8%**		

Circumferential Beam Direction Coverages

Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Circ Extent Examined (%)	Axial Extent Examined (%)	Percent Examined	Limited	Comment
5	45L/45S	CW/CCW	638.28	24.8%	100.0%	24.8%	Yes	Coverage between nozzles and stabilizers
6	45L/45S	CW/CCW	141.84	5.5%	81.0%	4.5%	Yes	Coverage above nozzles 45 and 52
7	45L/45S	CW/CCW	70.92	2.8%	39.0%	1.1%	Yes	Coverage above nozzle 46
				Total Circ. Beam Direction Coverage:		**30.3%**		
					Outer 85% coverage:	**37.1%**		

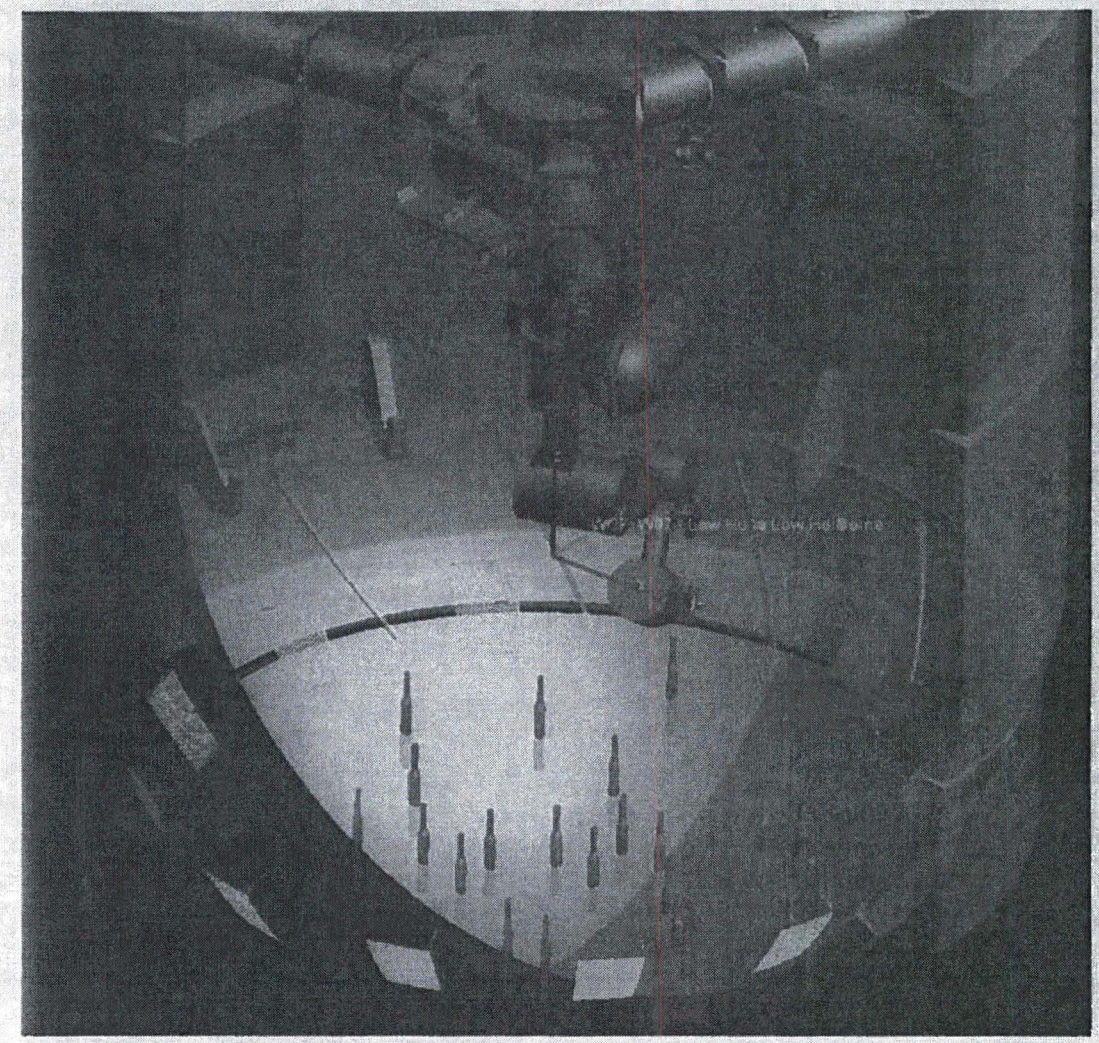


Figure 1-3: TWS Weld W06 – Lower Shell to Lower Head Weld

View of TWS robot in vessel lower head region showing scan limitations caused by the Incore Nozzles and Flow Stabilizers. The weld is partially covered by the Flow Stabilizers. Flow Stabilizers welded to the head above the weld and the Incore Nozzles restrict the UT head from scanning the entire weld. The Core Guide Lugs also provide some interference with robot movement. These limitations occur between each Flow Stabilizer/Core Guide Lug set. Single-sided scan parameters are used near obstructions to improve examination coverage. Coverage obtained on this weld is 36%.

attach B
pg 13 of 80

[redacted]

RPV Weld UT Data Sheet

Utility:	Duke Energy	Plant:	Oconee	Unit: 2	Outage: 02EOC26
TWS Weld Number:	W06	Component ID:	2-RPV-WR35	Summary No.:	O2.B1.21.0001
Description:	LOWER HEAD TORUS TO LOWER HEAD DOME WELD				
Examination Procedure:	54-ISI-891-02, Automated UT of PWR Vessel Shell Welds. (with SDCNs #30-9188581-000 & 30-9211408-000)				

Essential Equipment Description

Manufacturer	Model	VH#	Serial Number	Cal. Due Date
Zetec	µTomoscan	8187	83591	9/25/2014
Zetec	16-Ch P/R	7796	0371	n/a

UT Cable Type / Length:	Montrose CBL-9847 / 28'	RG-174 / 126'		No. of Connectors:	4
UT Calibration/Acquisition Software Version:	Accusonex 6.8.1	UT Data Analysis / Version:		Accusonex	3.18.1

Calibration Information

Cal. Sheet:	CDS-4	Cal Block ID:	Vessel RPV-95001

Equipment Settings

See the above listed Calibration Data Sheet (CDS) and applicable channel for a listing of the equipment settings used for examination.

Scan Speed:	<12 IPS (MTP/ MTN)	Sync. Interval:	0.08"	Index Value:	0.2"	Couplant:	Water	Vessel Temp:	76 F
Scan Speed:	<18 IPS (MAP/ MAN)	Sync. Interval:	0.08"	Index Value:	0.5"				

Transducers

Transducer Manufacturer: Sigma/GEIT — UT Head: RED Head #3 — Shell Scans RED TWS

Channel	Angle	Mode	Beam Direction	Freq.	Serial Number	Model	Focal Depth	Size	Exit Point
1/7	45°	S	Axial / Circ.	1.0 MHz	8011	Sigma: 5508	Flat	1.2"x.75" (x2)	1.15"
2	45°	S	Axial / Circ.	1.0 MHz	08012	Sigma: 5508	Flat	1.2"x.75" (x2)	1.20"
3	73°	L	Axial / Circ.	1.3 MHz	0251MK	GEIT: 389-042-010	.5"	1.5"x.375" (x2), 1.5"x.75" (x1)	1.00"
4	73°	L	Axial / Circ.	1.3 MHz	0251ML	GEIT: 389-042-010	.5"	1.5"x.375" (x2), 1.5"x.75" (x1)	1.05"
5	47°	L	Axial / Circ.	2.7 MHz	01T3FL	GEIT: 389-038-010	4"	1.1"x.75" (x2)	1.00"
6	47°	L	Axial / Circ.	2.7 MHz	0252DK	GEIT: 389-038-010	4"	1.1"x.75" (x2)	0.90"
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-

Examination Coverage

Ref. Scan Plan 8066245D — Examination Surface: ID

Examination Coverage: 36 %

Examination Limitation: Incore Nozzles and Flow Stabilizers

Examination Date(s): 11/6/2013

Examination Results

☐ No Recordable Indications ☑ Recordable Indications

☑ Evaluation Acceptable ☐ Evaluation Unacceptable

☑ See Attached Flaw Evaluation Summary Sheet(s)

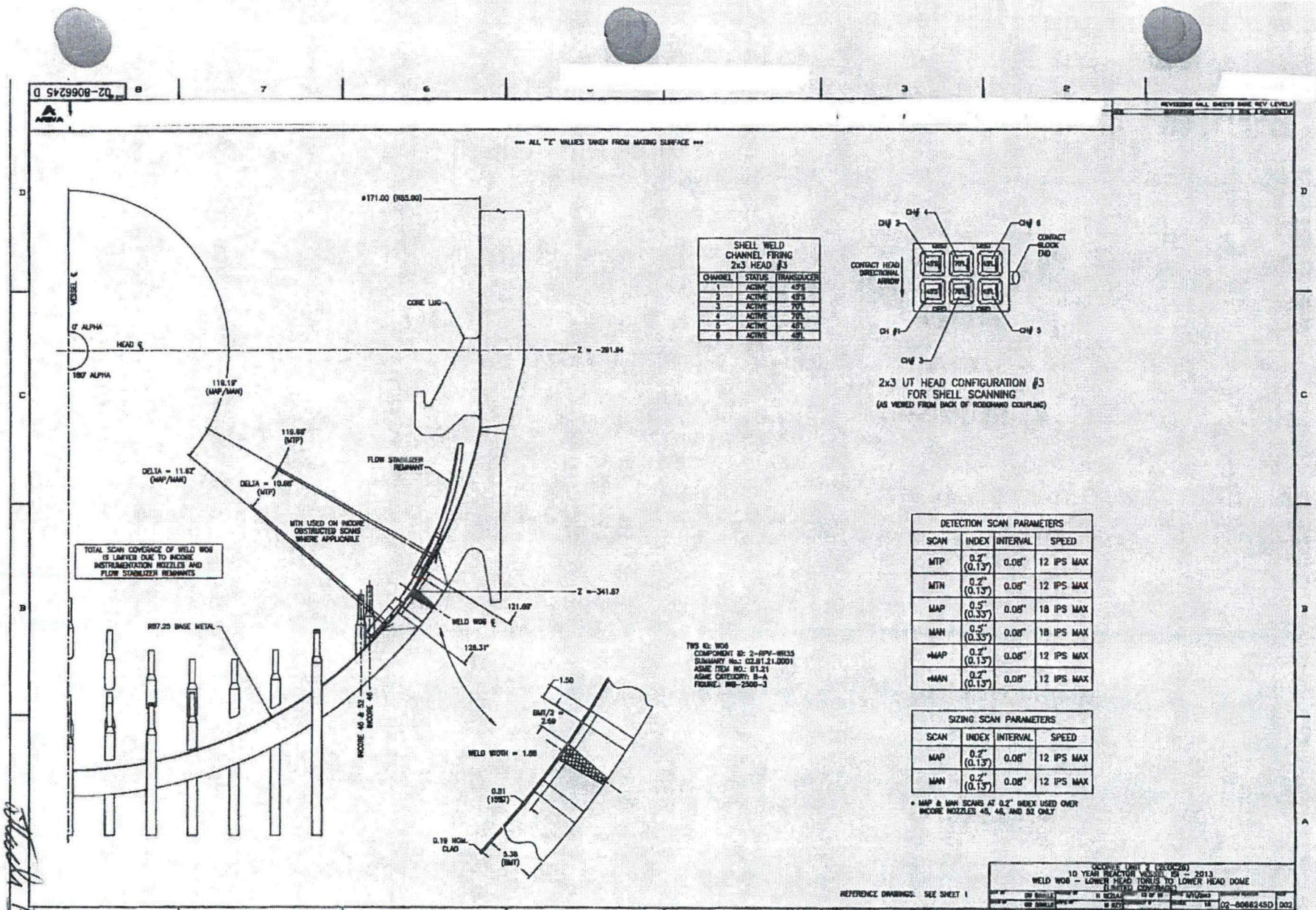
Names of data analysis for this weld are included on the attached sheets.

Remarks: See attached "Weld Acquisition Data" and "TWS Scan plan by Frame" pages for additional information.

Reviewed by:	Mike Hacker	Level: III	Date: 12/13/2013
Reviewed by:			
Reviewed by:			

ATTACHMENT B

03/14/80



SHELL WELD CHANNEL FIRING 2x3 HEAD #3		
CHANNEL	STATUS	TRANSDUCER
1	ACTIVE	45°S
2	ACTIVE	45°S
3	ACTIVE	70°L
4	ACTIVE	70°L
5	ACTIVE	45°L
6	ACTIVE	45°L

DETECTION SCAN PARAMETERS			
SCAN	INDEX	INTERVAL	SPEED
MTP	0.2" (0.13")	0.08"	12 IPS MAX
MTH	0.2" (0.13")	0.08"	12 IPS MAX
MAP	0.5" (0.33")	0.08"	18 IPS MAX
MAN	0.5" (0.33")	0.08"	18 IPS MAX
*MAP	0.2" (0.13")	0.08"	12 IPS MAX
*MAN	0.2" (0.13")	0.08"	12 IPS MAX

SIZING SCAN PARAMETERS			
SCAN	INDEX	INTERVAL	SPEED
MAP	0.2" (0.13")	0.08"	12 IPS MAX
MAN	0.2" (0.13")	0.08"	12 IPS MAX

* MAP & MAN SCANS AT 0.2" INDEX USED OVER INCORE NOZZLES 45, 46, AND 52 ONLY

UT Calibration / Examination

Duke Energy

Site/Unit:	Oconee / 2	Procedure:	NDE-640	Outage No.:	O2-26
Summary No.:	O2.B3.110.0009	Procedure Rev.:	5	Report No.:	UT-13-1169
Workscope:	ISI	Work Order No.:	2025416	Page:	1 of 1

Code: 1998/2000A | Cat./Item: B-D /B3.110 | Location:

Drawing No.: ISI-OCN2-002 | Description: Nozzle to Shell

System ID: 50

Component ID: 2-PZR-WP26-1 | Size/Length: N/A | Thickness/Diameter: CS / 6.187 / N/A

Limitations: Yes - See attached sheet | Start Time: 1006 | Finish Time: 1134

Instrument Settings

Serial No.:	13G00172		
Manufacturer:	GE		
Model:	USN 60 SW		
Delay:	1.2778	Range:	10"
M'll Cal/Vel:	.2319	Pulser:	Square
Damping:	500	Reject:	0%
Rep. Rate:	Autohigh	Freq.:	2.25 MHz
Filter:	Fixed	Mode:	PE
Voltage:	450	Other:	Fullwave
Ax. Gain (dB):	9.5	Circ. Gain (dB):	N/A

1 Screen Div. = 1.0 in. of Depth

Linearity Report No.: L-13-271

Calibration Block

Cal. Block No.	40338		
Thickness	7	Dia.:	Flat
Cal. Blk. Temp.	72	Temp. Tool:	MCNDE40198
Comp. Temp.	90	Temp. Tool:	MCNDE40198

Search Unit

Serial No.:	006D7N		
Manufacturer:	KBA		
Size:	.75"	Shape:	Round
Freq.:	2.25 MHz	Style:	Gamma
Exam Angle:	0	# of Elements:	Single
Mode:	Long.		
Measured Angle:	N/A		
Wedge Style:	N/A		

Search Unit Cable

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

Scan Coverage

Upstream ☑ Downstream ☐ Scan dB: 23.5

CW ☐ CCW ☐ Scan dB: N/A

Exam Surface: O.D.

Surface Condition: Machined

Cal. Checks	Time	Date
Initial Cal.	1057	10/24/2013
Inter. Cal.		
Inter. Cal.	1128	10/24/2013
Inter. Cal.		
Final Cal.	1215	10/24/2013

Couplant

Cal. Batch:	12125
Type:	ULTRAGEL II
Mfg.:	MAGNAFLUX
Exam Batch:	12125
Type:	ULTRAGEL II
Mfg.:	MAGNAFLUX

Reference Block

Serial No.:	97-5588
Type:	ROMPAS

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Depth
1/4T SDH	80	1.5	1.51"
1/2T SDH	45	3.3	3.29"
3/4T SDH	22	5.0	5.04"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Depth
N/A			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Depth
1.3	1" Side	80	1.0	1.00"

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

Results: Accept ☑ Reject ☐ Info ☐

Comments: Reference Report # UT-13-1170 for additional information.

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

Examiner	Level	Signature	Date	Reviewer		Signature	Date
Tucker, David K.	II-N		10/24/2013	ROD SHEFFIELD		Rod Sheffield	10-30-13
Examiner	Level	Signature	Date	Site Review		Signature	Date
Bull, W. Keith	II-N		10/24/2013				
Other	Level	Signature	Date	ANII Review		Signature	Date
N/A	N/A			MARK E. ZURBUCH			11/5/13

ATTACHMENT 8

DUKE ENERGY COMPANY

ISI LIMITATION REPORT

Summary #: 2-PZR-WP26-1 **Component ID** O2.B3.110.0009

remarks:
Due to nozzle configuration

☒ NO SCAN — SURFACE — BEAM DIRECTION
☐ LIMITED SCAN — ☐ 1 ☒ 2 — ☒ 1 ☐ 2 ☒ cw ☒ ccw
FROM L N/A to L N/A INCHES FROM W0 Toe to Beyond
ANGLE: ☒ 0 ☒ 45 ☒ 60 other 70 FROM 0 DEG to 360 DEG

☐ NO SCAN — SURFACE — BEAM DIRECTION
☐ LIMITED SCAN — ☐ 1 ☐ 2 — ☐ 1 ☐ 2 ☐ cw ☐ ccw
FROM L ____ to L ____ INCHES FROM W0 ____ to ____
ANGLE: ☐ 0 ☐ 45 ☐ 60 other ____ FROM ____ DEG to ____ DEG

☐ NO SCAN — SURFACE — BEAM DIRECTION
☐ LIMITED SCAN — ☐ 1 ☐ 2 — ☐ 1 ☐ 2 ☐ cw ☐ ccw
FROM L ____ to L ____ INCHES FROM W0 ____ to ____
ANGLE: ☐ 0 ☐ 45 ☐ 60 other ____ FROM ____ DEG to ____ DEG

☐ NO SCAN — SURFACE — BEAM DIRECTION
☐ LIMITED SCAN — ☐ 1 ☐ 2 — ☐ 1 ☐ 2 ☐ cw ☐ ccw
FROM L ____ to L ____ INCHES FROM W0 ____ to ____
ANGLE: ☐ 0 ☐ 45 ☐ 60 other ____ FROM ____ DEG to ____ DEG

UT-13-1170

Sketch(s) attached
☒ yes ☐ No

Prepared By: Steven Dean [signature] Level: II Date: 10/24/13 Sheet 5 of 10

Reviewed By: Rod Sheffield Date: 10-30-13 Authorized Inspector: MARK E. ZURBUCH [signature] Date: 11/5/13

ATTACHMENT 13
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PZR Sampling Nozzle to Shell % of Coverage

Item No. : 02.B3.110.0009 **Weld No. :** WP26-1

Weld Coverage

Scan	Angle	% Coverage Obtained
S1	45° & 60°	39.52 +
S1	60° & 70°	9.48 =
S1	Aggregate	49
S2	45° & 60°	0
CW	45° & 60°	0
CCW	45° & 60°	0
	Total	49

49 ÷ 4 = **12.3** % Coverage

Base Material Coverage

S1	45° & 60°	43.21%
S1	60° & 70°	18.87
CW & CCW	on taper	9.23
CW & CCW	on flat	27.26
	Total	**98.6%**

98.60% ÷ 2 = **49.3** % Coverage

0° Scan Coverage 21.73 + 7.39

= **29.1** % Coverage

Aggregate Coverage = Weld + Base Material + 0° ÷ 3

= **30.2** **% Coverage**

Inspector / Date : Rod Sheffield / 10-30-13

ATTACHMENT B

18 of 80

Pressurizer Sampling Nozzle to Shell

Item No. : 02.B3.110.0009

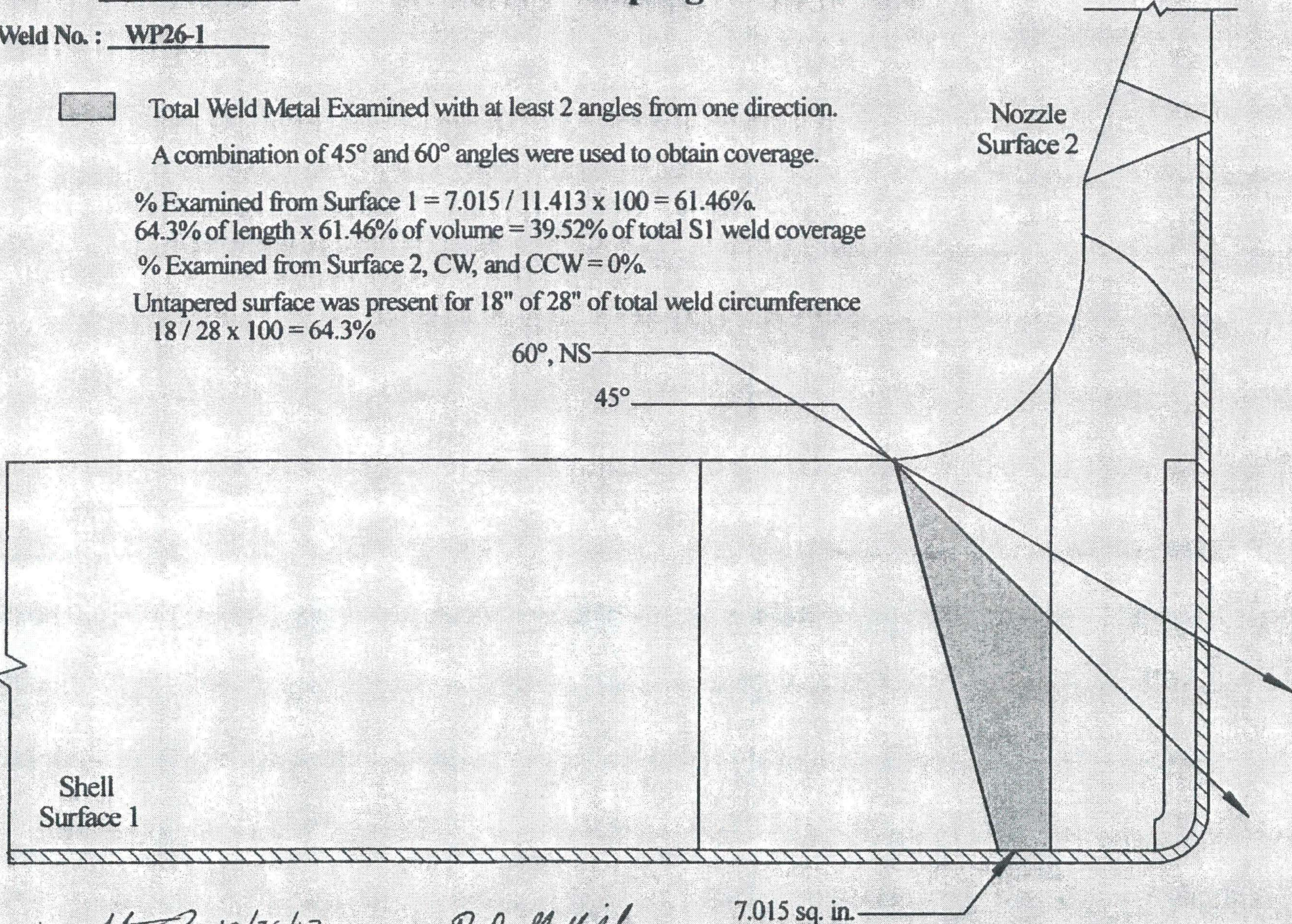
Weld No. : WP26-1

▭ Total Weld Metal Examined with at least 2 angles from one direction.

A combination of 45° and 60° angles were used to obtain coverage.

% Examined from Surface 1 = 7.015 / 11.413 x 100 = 61.46%.
64.3% of length x 61.46% of volume = 39.52% of total S1 weld coverage
% Examined from Surface 2, CW, and CCW = 0%.

Untapered surface was present for 18" of 28" of total weld circumference
18 / 28 x 100 = 64.3%



ATTACHMENT B
19 of 80

Inspector: [signature] 10/24/13

Rod Sheffield
10-30-13

Item No. : 02.B3.110.0009

Weld No. : WP26-1

Pressurizer Sampling Nozzle to Shell

Total Base Metal Examined with at least 2 angles from one direction.

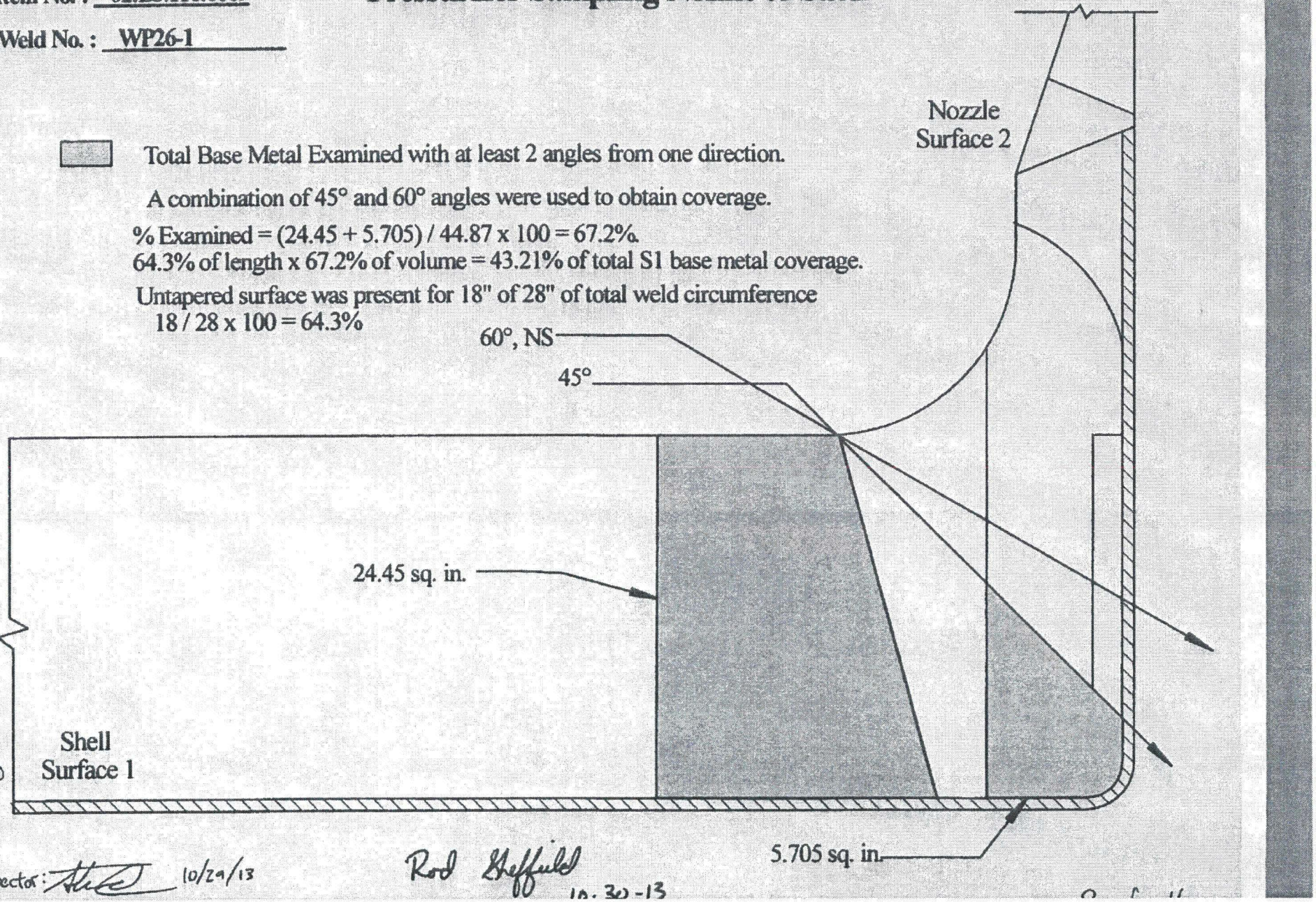
A combination of 45° and 60° angles were used to obtain coverage.

% Examined = (24.45 + 5.705) / 44.87 x 100 = 67.2%

64.3% of length x 67.2% of volume = 43.21% of total S1 base metal coverage.

Untapered surface was present for 18" of 28" of total weld circumference

18 / 28 x 100 = 64.3%



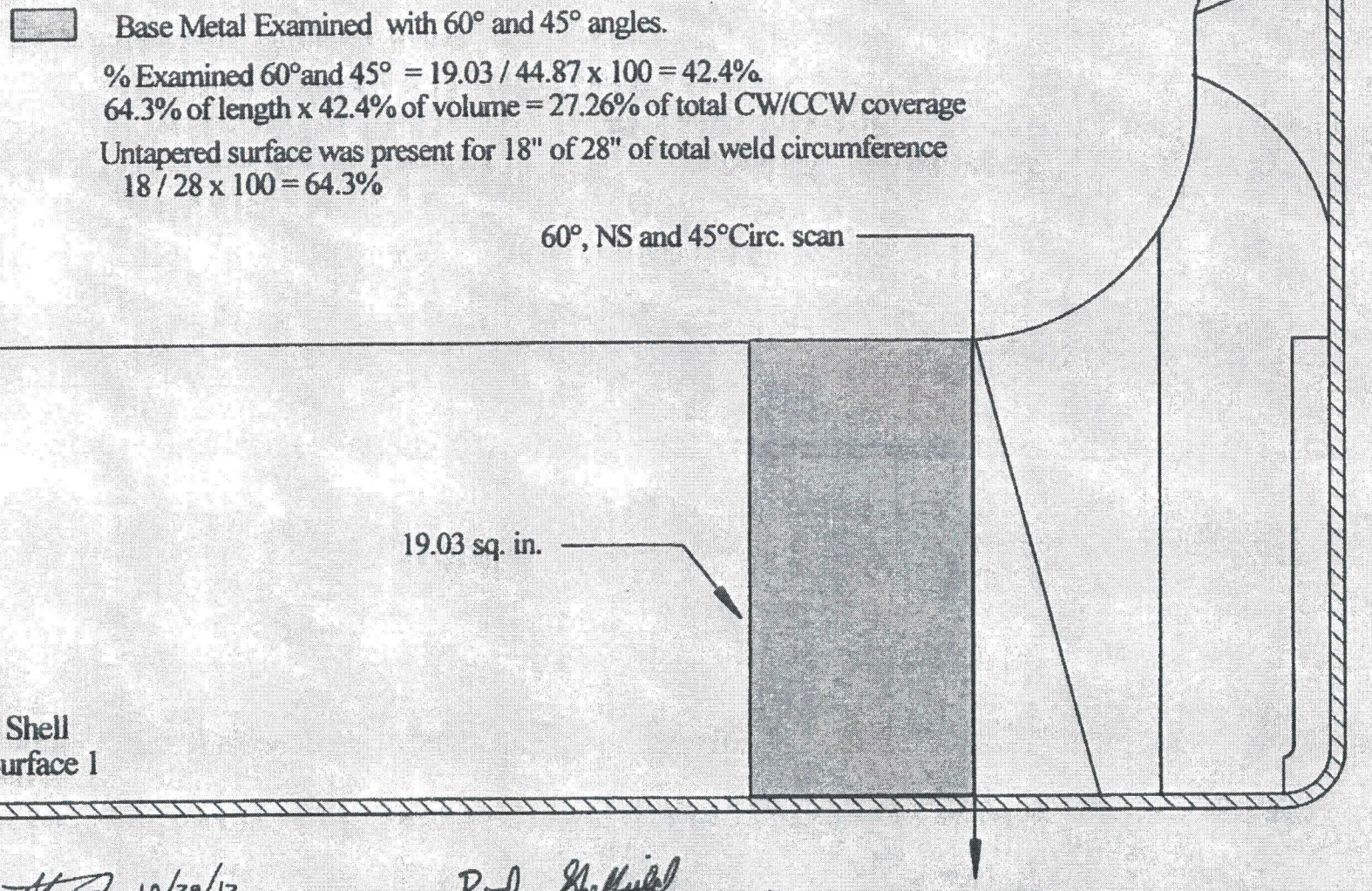
Inspector: [signature] 10/29/13

Rod Heffield 10-30-13

Item No. : 02.B3.110.0009

Weld No. : WP26-1

Pressurizer Sampling Nozzle to Shell



08/07/12

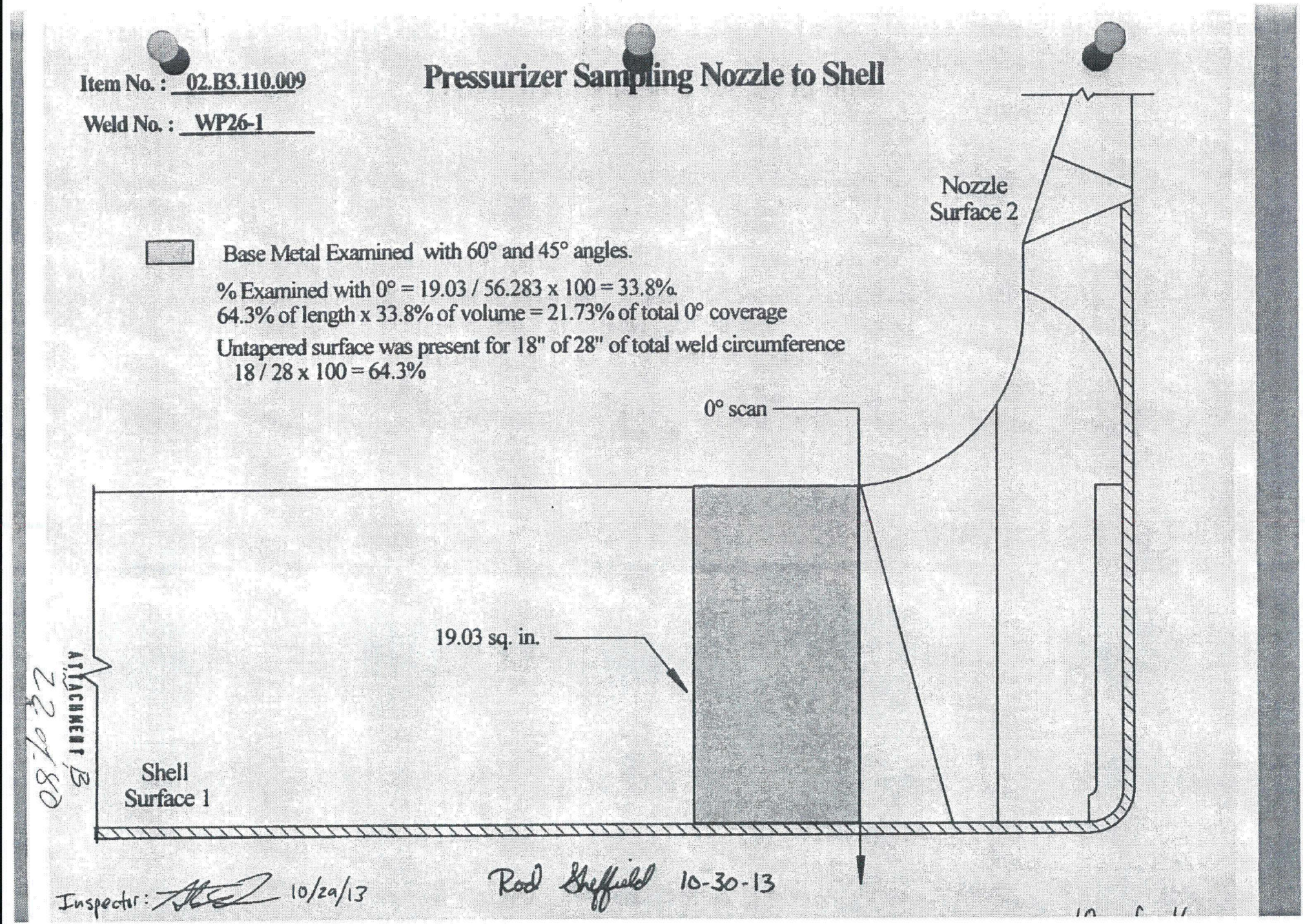
Inspector: 10/29/13

Rod Sheffield 10-30-13

Item No. : 02.B3.110.009

Weld No. : WP26-1

Pressurizer Sampling Nozzle to Shell



ATTACHMENT 2

08-10-22

Inspector: 10/29/13

Rod Sheffield 10-30-13

Item No. : 02.B3.110.0009

Pressurizer Sampling Nozzle to Shell Htr. Shell

Weld No. : WP26-1

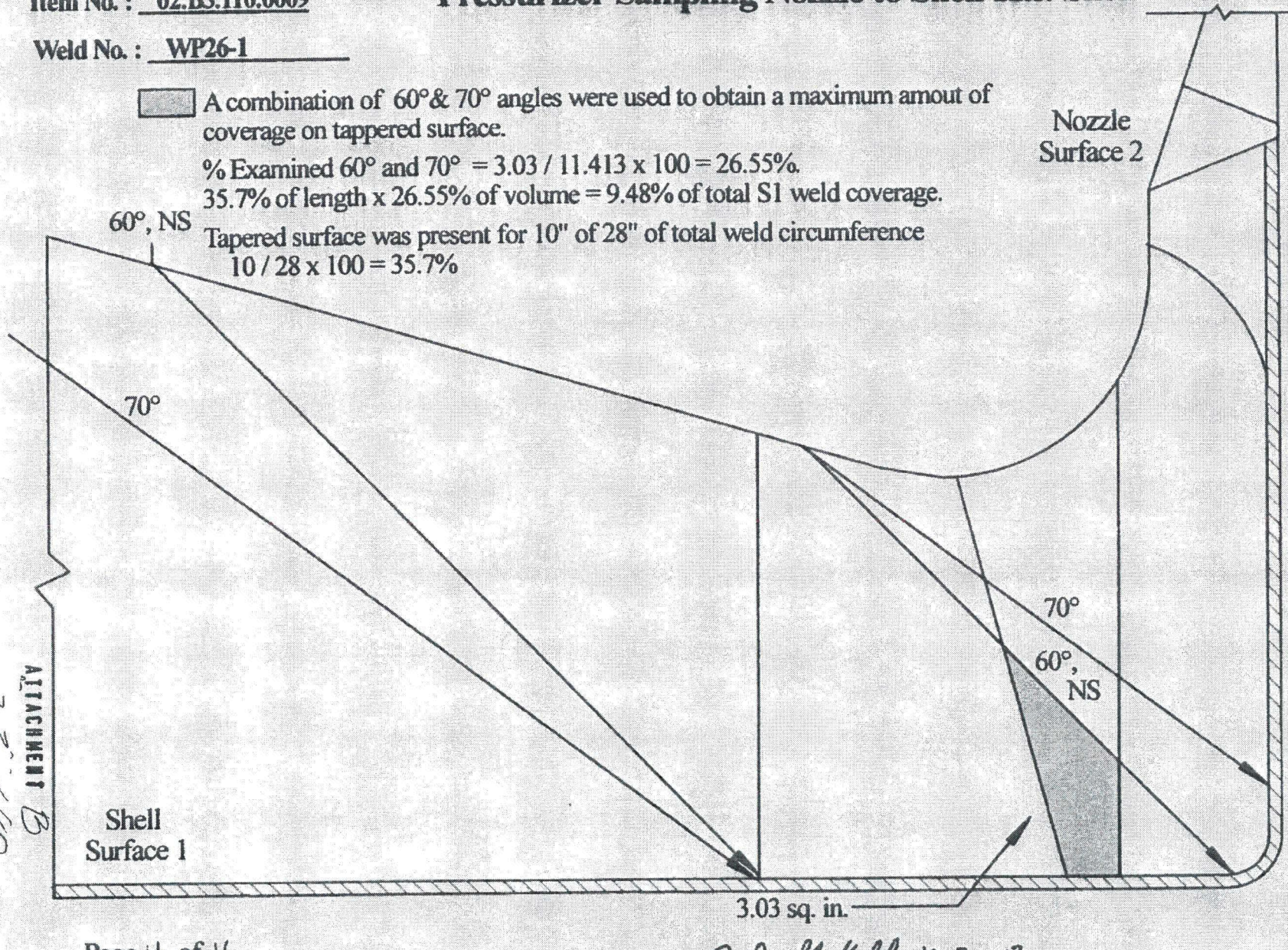
A combination of 60°& 70° angles were used to obtain a maximum amout of coverage on tappered surface.

% Examined 60° and 70° = 3.03 / 11.413 x 100 = 26.55%.

35.7% of length x 26.55% of volume = 9.48% of total S1 weld coverage.

Tapered surface was present for 10" of 28" of total weld circumference

10 / 28 x 100 = 35.7%



ATTACHMENT B
23 of 80

Page 11 of 16

Inspector: 10/29/13

Rod Gryfield 10-30-13

Item No. : 02.B3.110.0009

Pressurizer Sampling Nozzle to Shell Htr. Shell

Weld No. : WP26-1

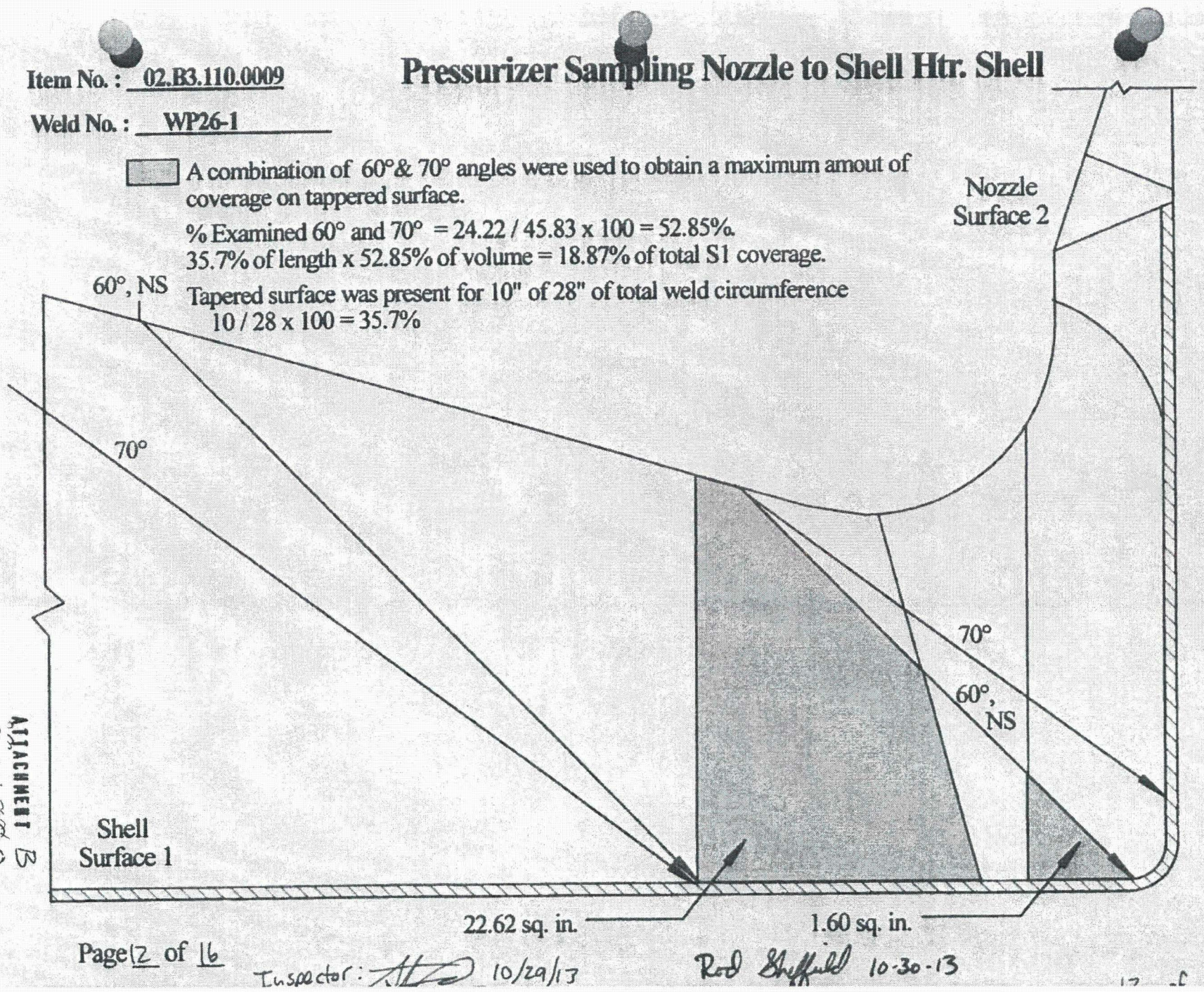
A combination of 60°& 70° angles were used to obtain a maximum amout of coverage on tappered surface.

% Examined 60° and 70° = 24.22 / 45.83 x 100 = 52.85%.

35.7% of length x 52.85% of volume = 18.87% of total S1 coverage.

Tapered surface was present for 10" of 28" of total weld circumference

10 / 28 x 100 = 35.7%



ATTACHMENT B

Page 12 of 16

Inspector: [signature] 10/29/13

Rod Sheffield 10-30-13

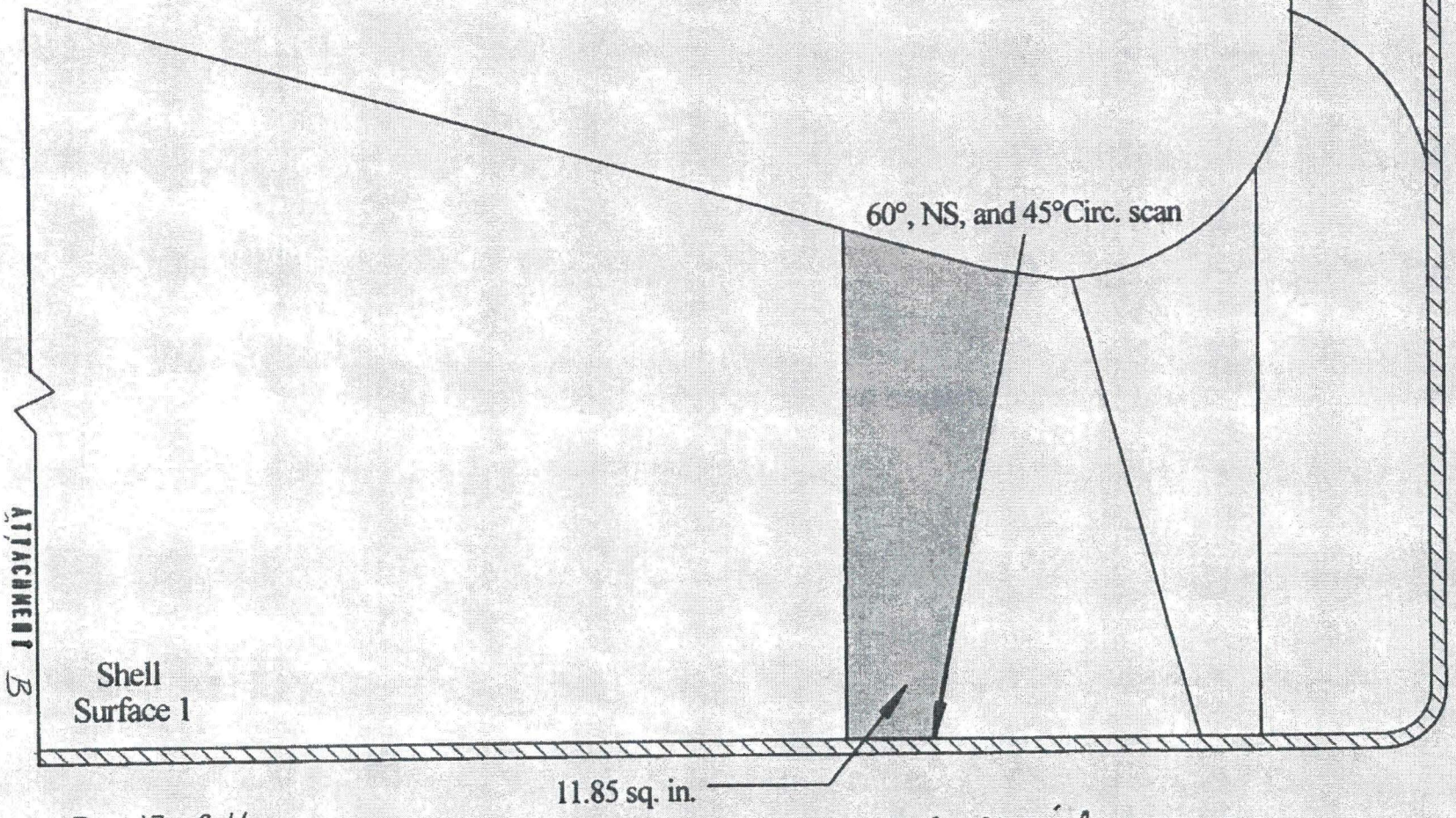
Item No. : 02.B3.110.0009

Pressurizer Sampling Nozzle to Shell Htr. Shell

Weld No. : WP26-1

% Examined 45° and 60° = 11.85 / 45.83 x 100 = 25.86%.
35.7% of length x 25.86% of volume = 9.23% of total CW/ CCW coverage

Tapered surface was present for 10" of 28" of total weld circumference
10 / 28 x 100 = 35.7%



ATTACHMENT B
25 of 80

Inspector: [signature] 10/29/13

Rod Sheffield 10-30-13

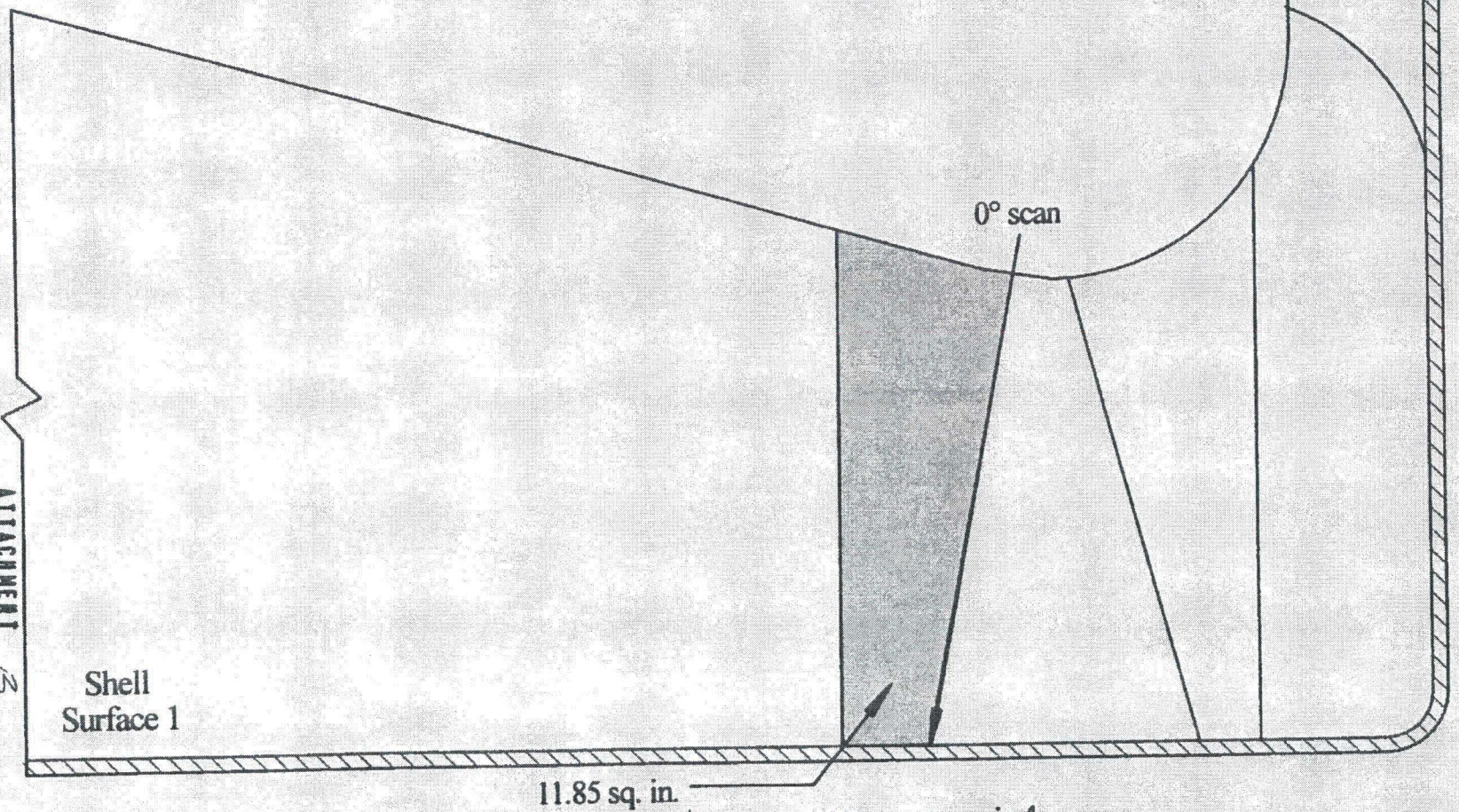
Pressurizer Sampling Nozzle to Shell Htr. Shell

Item No. : 02.B3.110.0009

Weld No. : WP26-1

% Examined with 0° = 11.85 / 57.24 x 100 = 20.7%.
35.7% of length x 20.7% of volume = 7.39 % of total 0° coverage.

Tapered surface was present for 10" of 28" of total weld circumference
10 / 28 x 100 = 35.7%



ATTACHMENT 3 08-27-80

 Inspector: 10/24/13 Rod Sheffield 10-30-13

Item No. : 02.B3.110.0009

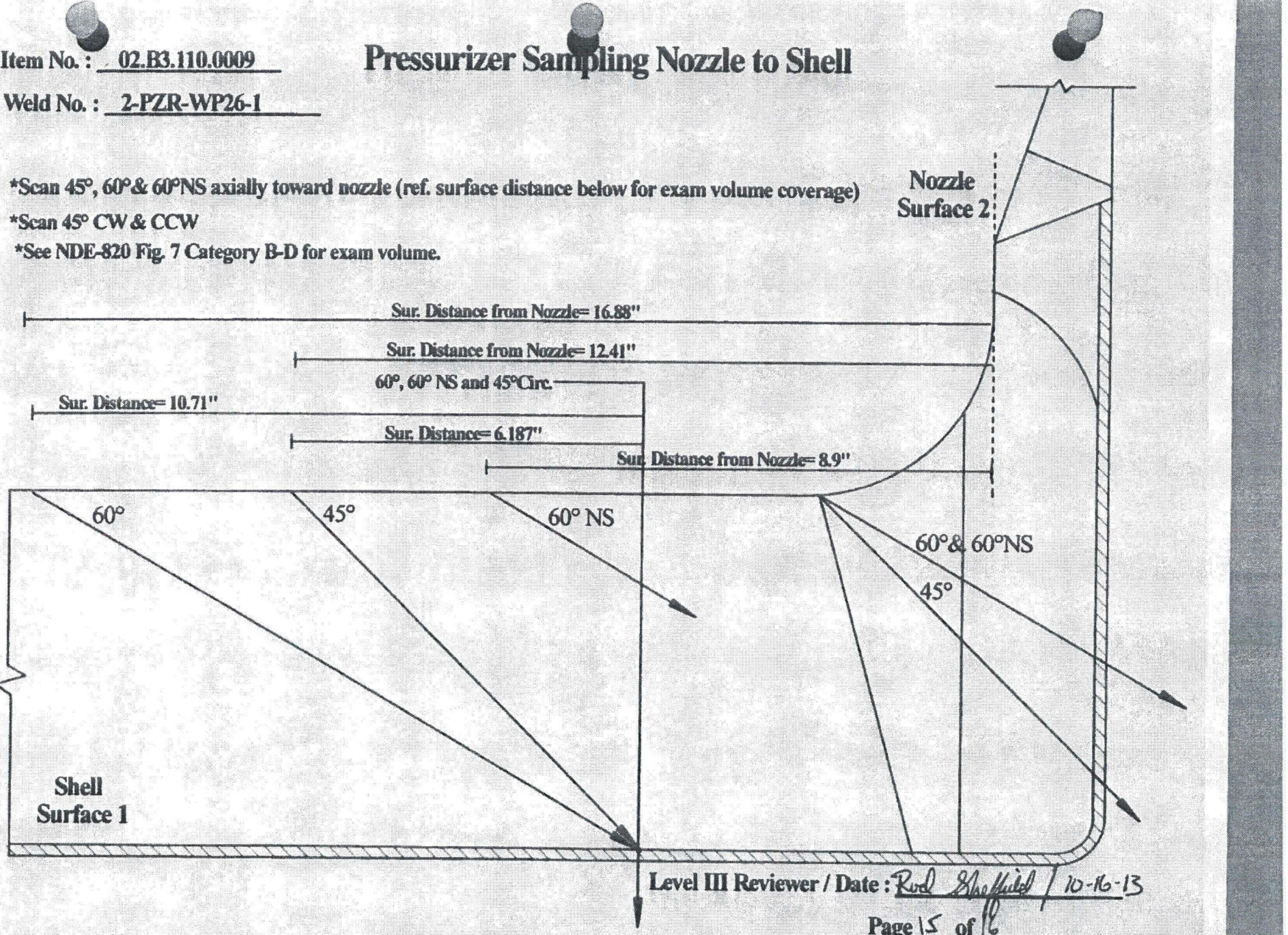
Weld No. : 2-PZR-WP26-1

Pressurizer Sampling Nozzle to Shell

*Scan 45°, 60° & 60°NS axially toward nozzle (ref. surface distance below for exam volume coverage)

*Scan 45° CW & CCW

*See NDE-820 Fig. 7 Category B-D for exam volume.



ATTACHMENT B

Level III Reviewer / Date : Rod Sheffield / 10-16-13

Item No. : 02.B3.110.0009

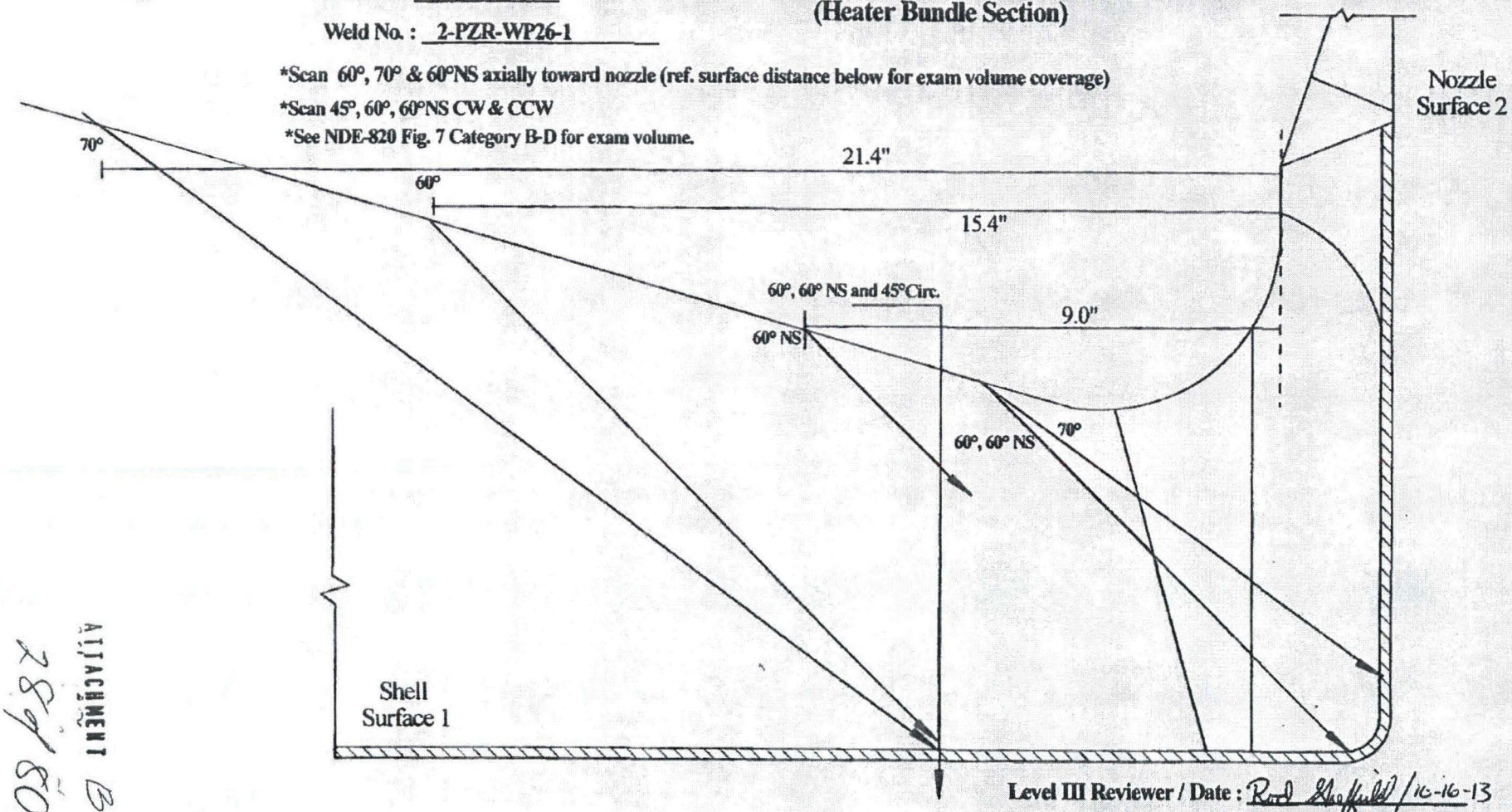
Weld No. : 2-PZR-WP26-1

Pressurizer Sampling Nozzle to Shell Htr. Shell
(Heater Bundle Section)

*Scan 60°, 70° & 60°NS axially toward nozzle (ref. surface distance below for exam volume coverage)

*Scan 45°, 60°, 60°NS CW & CCW

*See NDE-820 Fig. 7 Category B-D for exam volume.



Level III Reviewer / Date : Rod Sheffield / 10-16-13

ATTACHMENT 6

08-287

UT Calibration / Examination

Duke Energy

Site/Unit:	Oconee / 2	Procedure:	NDE-640	Outage No.:	O2-26
Summary No.:	O2.B3.110.0010	Procedure Rev.:	5	Report No.:	UT-13-1171
Workscope:	ISI	Work Order No.:	2025416	Page:	1 of 1

Code: 1998/2000A | Cat./Item: B-D /B3.110 | Location:

Drawing No.: ISI-OCN2-002 | Description: Nozzle to Shell

System ID: 50

Component ID: 2-PZR-WP26-2 | Size/Length: N/A | Thickness/Diameter: CS / 6.187 / NA

Limitations: Yes - See attached sheet | Start Time: 1050 | Finish Time: 1200

Instrument Settings

Serial No.:	13G00172		
Manufacturer:	GE		
Model:	USN 60 SW		
Delay:	1.2778	Range:	10"
M'tl Cal/Vel:	.2319	Pulser:	Square
Damping:	500	Reject:	0%
Rep. Rate:	Autohigh	Freq.:	2.25 MHz
Filter:	Fixed	Mode:	PE
Voltage:	450	Other:	Fullwave
Ax. Gain (dB):	9.5	Circ. Gain (dB):	N/A

1 Screen Div. = 1.0 in. of Depth

Linearity Report No.: L-13-271

Calibration Block

Cal. Block No. 40338

Thickness 7 Dia.: Flat

Cal. Blk. Temp. 72 Temp. Tool: MCNDE40198

Comp. Temp. 90 Temp. Tool: MCNDE40198

Search Unit

Serial No.:	006D7N		
Manufacturer:	KBA		
Size:	.75"	Shape:	Round
Freq.:	2.25 MHz	Style:	Gamma
Exam Angle:	0	# of Elements:	Single
Mode:	Long.		
Measured Angle:	N/A		
Wedge Style:	N/A		

Search Unit Cable

Type: RG - 174

Length: 6' No. Conn.: 0

Scan Coverage

Upstream ☑ Downstream ☐ Scan dB: 23.5

CW ☐ CCW ☐ Scan dB: N/A

Exam Surface: O.D.

Surface Condition: Machined

Cal. Checks	Time	Date
Initial Cal.	1057	10/24/2013
Inter. Cal.		
Inter. Cal.	1138	10/24/2013
Inter. Cal.		
Final Cal.	1215	10/24/2013

Couplant

Cal. Batch: 12125

Type: ULTRAGEL II

Mfg.: MAGNAFLUX

Exam Batch: 12125

Type: ULTRAGEL II

Mfg.: MAGNAFLUX

Reference Block

Serial No.: 97-5588

Type: ROMPAS

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Depth
1/4T SDH	80	1.5	1.51"
1/2T SDH	45	3.3	3.29"
3/4T SDH	22	5.0	5.04"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Depth
N/A			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Depth
1.3	1" Side	80	1.0	1.00"

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

Results: Accept ☑ Reject ☐ Info ☐

Comments: Reference Report # UT-13-1172 for additional information.

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

Examiner: Tucker, David K.	Level: II-N	Signature:	Date: 10/24/2013	Reviewer: ROD SHEFFIELD	Signature:	Date: 10-31-13
Examiner: Bull, W. Keith	Level: II-N	Signature:	Date: 10/24/2013	Site Review	Signature:	Date:
Other: N/A	Level: N/A	Signature:	Date:	ANII Review: MARK E. ZURBUCH	Signature:	Date: 11/5/13

ATTACHMENT 2, Page 80 of 89

DUKE ENERGY COMPANY

ISI LIMITATION REPORT

Summary #: 2-PZR-WP26-2 **Component ID** O2.B3.110.0010 **remarks:**

☒ NO SCAN SURFACE BEAM DIRECTION — Due to nozzle configuration

☐ LIMITED SCAN ☐ 1 ☒ 2 ☒ 1 ☐ 2 ☒ cw ☒ ccw

FROM L N/A to L N/A INCHES FROM W0 Toe to Beyond

ANGLE: ☒ 0 ☒ 45 ☒ 60 other 70 FROM 0 DEG to 360 DEG

☐ NO SCAN SURFACE BEAM DIRECTION

☐ LIMITED SCAN ☐ 1 ☐ 2 ☐ 1 ☐ 2 ☐ cw ☐ ccw

FROM L _____ to L _____ INCHES FROM W0 _____ to _____

ANGLE: ☐ 0 ☐ 45 ☐ 60 other _____ FROM _____ DEG to _____ DEG

☐ NO SCAN SURFACE BEAM DIRECTION

☐ LIMITED SCAN ☐ 1 ☐ 2 ☐ 1 ☐ 2 ☐ cw ☐ ccw

FROM L _____ to L _____ INCHES FROM W0 _____ to _____

ANGLE: ☐ 0 ☐ 45 ☐ 60 other _____ FROM _____ DEG to _____ DEG

☐ NO SCAN SURFACE BEAM DIRECTION

☐ LIMITED SCAN ☐ 1 ☐ 2 ☐ 1 ☐ 2 ☐ cw ☐ ccw — UT-13-1172

FROM L _____ to L _____ INCHES FROM W0 _____ to _____

ANGLE: ☐ 0 ☐ 45 ☐ 60 other _____ FROM _____ DEG to _____ DEG

Sketch(s) attached ☒ yes ☐ No

Prepared By: Steven Dean Level: II Date: 10/24/13 Sheet 5 of 16

Reviewed By: Rod Sheffield Date: 10-31-13 Authorized Inspector: MARK E. ZURBUCH Date: 11/5/13

ATTACHMENT B

PZR Sampling Nozzle to Shell % of Coverage

Item No. : 02.B3.110.0010 **Weld No. :** WP26-2

Weld Coverage

Scan	Angle	% Coverage Obtained
S1	45° & 60°	39.52 +
S1	60° & 70°	9.48 =
S1	Aggregate	49
S2	45° & 60°	0
CW	45° & 60°	0
CCW	45° & 60°	0
	Total	49

49 ÷ 4 = **12.3** % Coverage

Base Material Coverage

S1	45° & 60°	43.21%
S1	60° & 70°	18.87
CW & CCW	on taper	9.23
CW & CCW	on flat	27.26
	Total	**98.6%**

98.60% ÷ 2 = **49.3** % Coverage

0° Scan Coverage 21.73 + 7.39

= **29.1** % Coverage

Aggregate Coverage = Weld + Base Material + 0° ÷ 3

= **30.2** **% Coverage**

Inspector / Date : Rod Sheffield/10-31-13

ATTACHMENT B

31 of 80

Item No. : 02.B3.110.0010

Weld No. : WP26-2

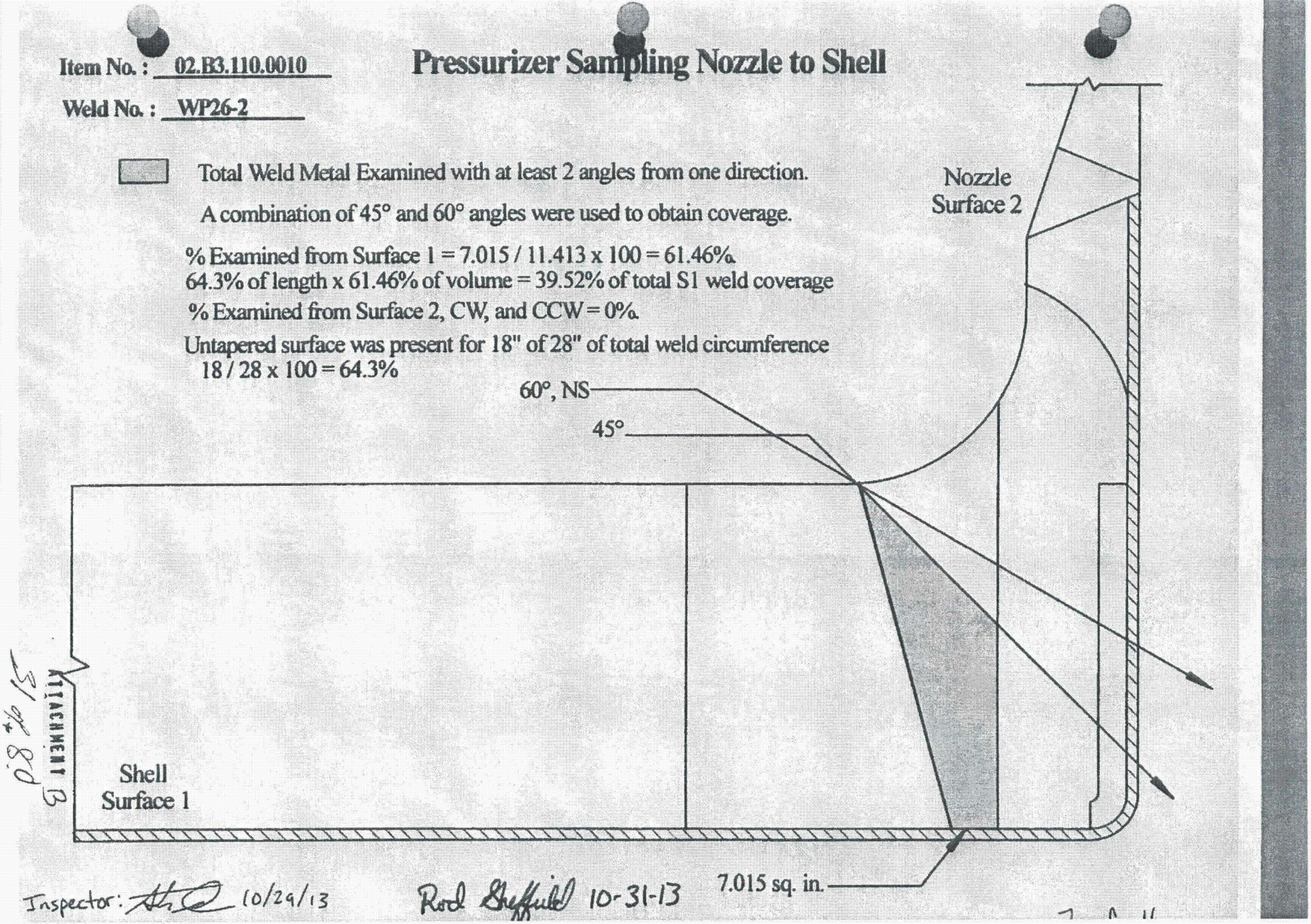
Pressurizer Sampling Nozzle to Shell

Total Weld Metal Examined with at least 2 angles from one direction.

A combination of 45° and 60° angles were used to obtain coverage.

% Examined from Surface 1 = 7.015 / 11.413 x 100 = 61.46%.
64.3% of length x 61.46% of volume = 39.52% of total S1 weld coverage
% Examined from Surface 2, CW, and CCW = 0%.

Untapered surface was present for 18" of 28" of total weld circumference
18 / 28 x 100 = 64.3%



Inspector: [signature] 10/29/13

Rod Sheffield 10-31-13

Item No. : 02.B3.110.0010

Weld No. : WP26-2

Pressurizer Sampling Nozzle to Shell

Total Base Metal Examined with at least 2 angles from one direction.

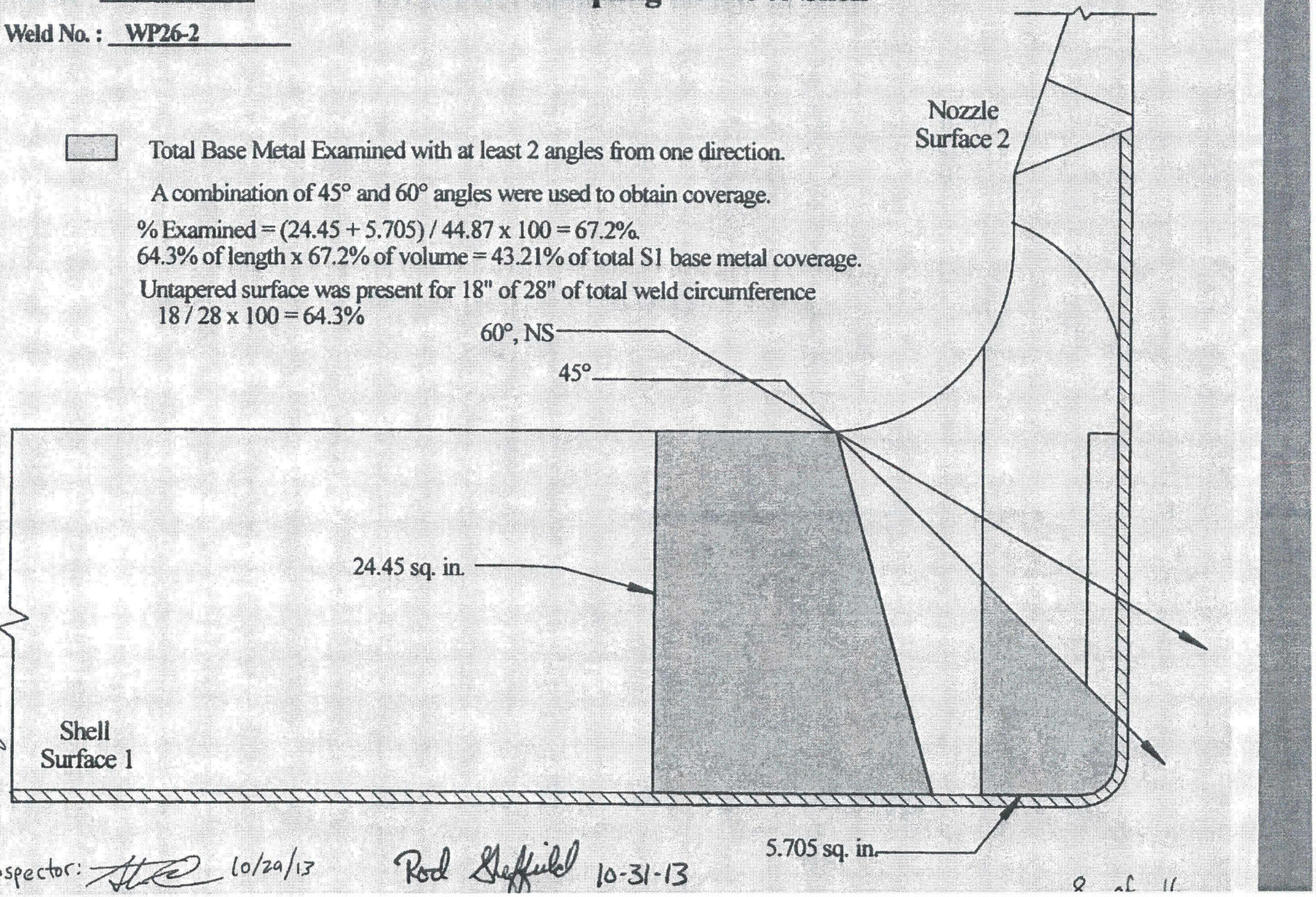
A combination of 45° and 60° angles were used to obtain coverage.

% Examined = (24.45 + 5.705) / 44.87 x 100 = 67.2%.

64.3% of length x 67.2% of volume = 43.21% of total S1 base metal coverage.

Untapered surface was present for 18" of 28" of total weld circumference

18 / 28 x 100 = 64.3%



ATTACHMENT 6

Inspector: [signature] 10/29/13

Rod Steffield 10-31-13

Item No. : 02.B3.110.0010

Weld No. : WP26-2

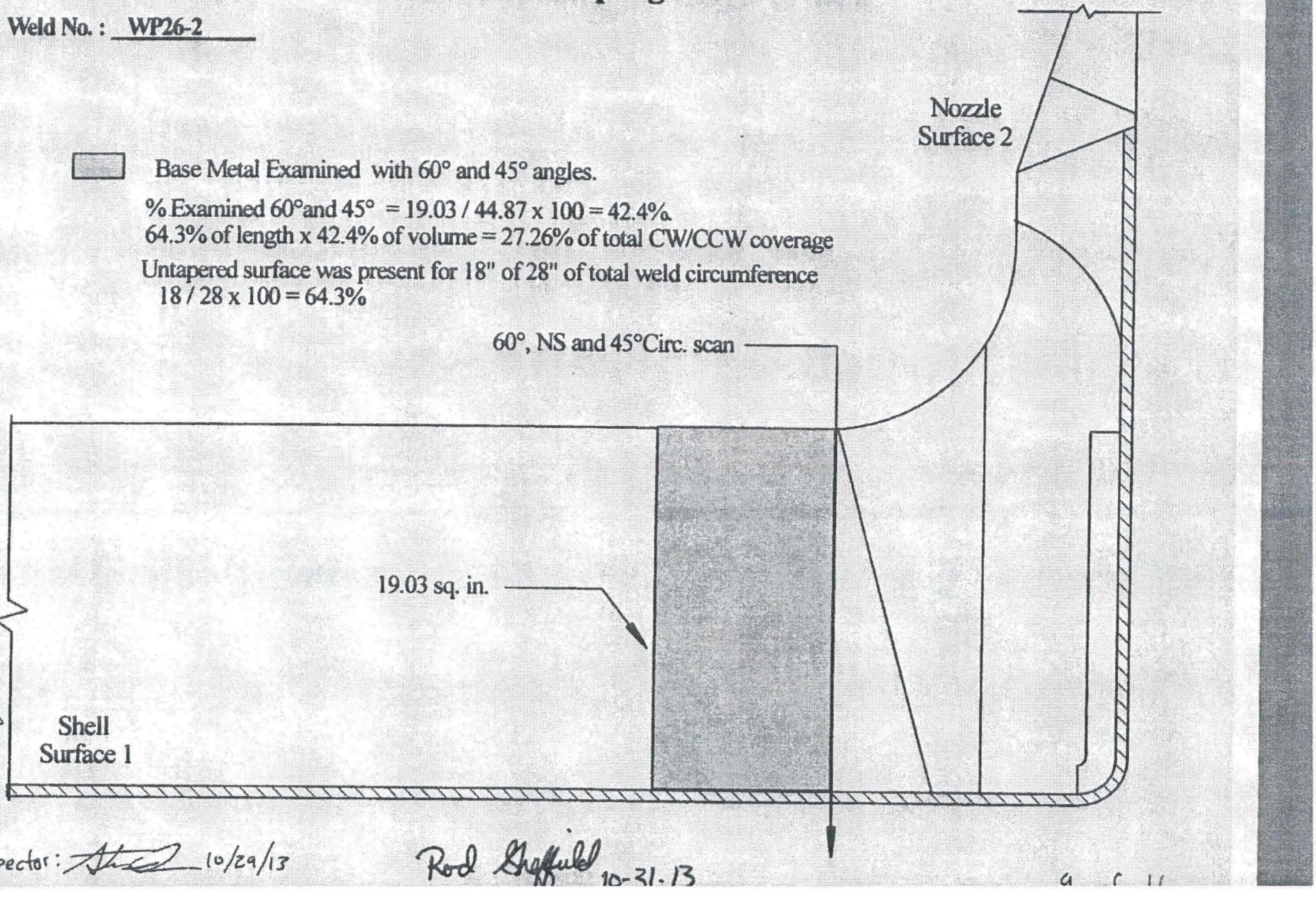
Pressurizer Sampling Nozzle to Shell

Base Metal Examined with 60° and 45° angles.

% Examined 60°and 45° = 19.03 / 44.87 x 100 = 42.4%

64.3% of length x 42.4% of volume = 27.26% of total CW/CCW coverage

Untapered surface was present for 18" of 28" of total weld circumference
18 / 28 x 100 = 64.3%



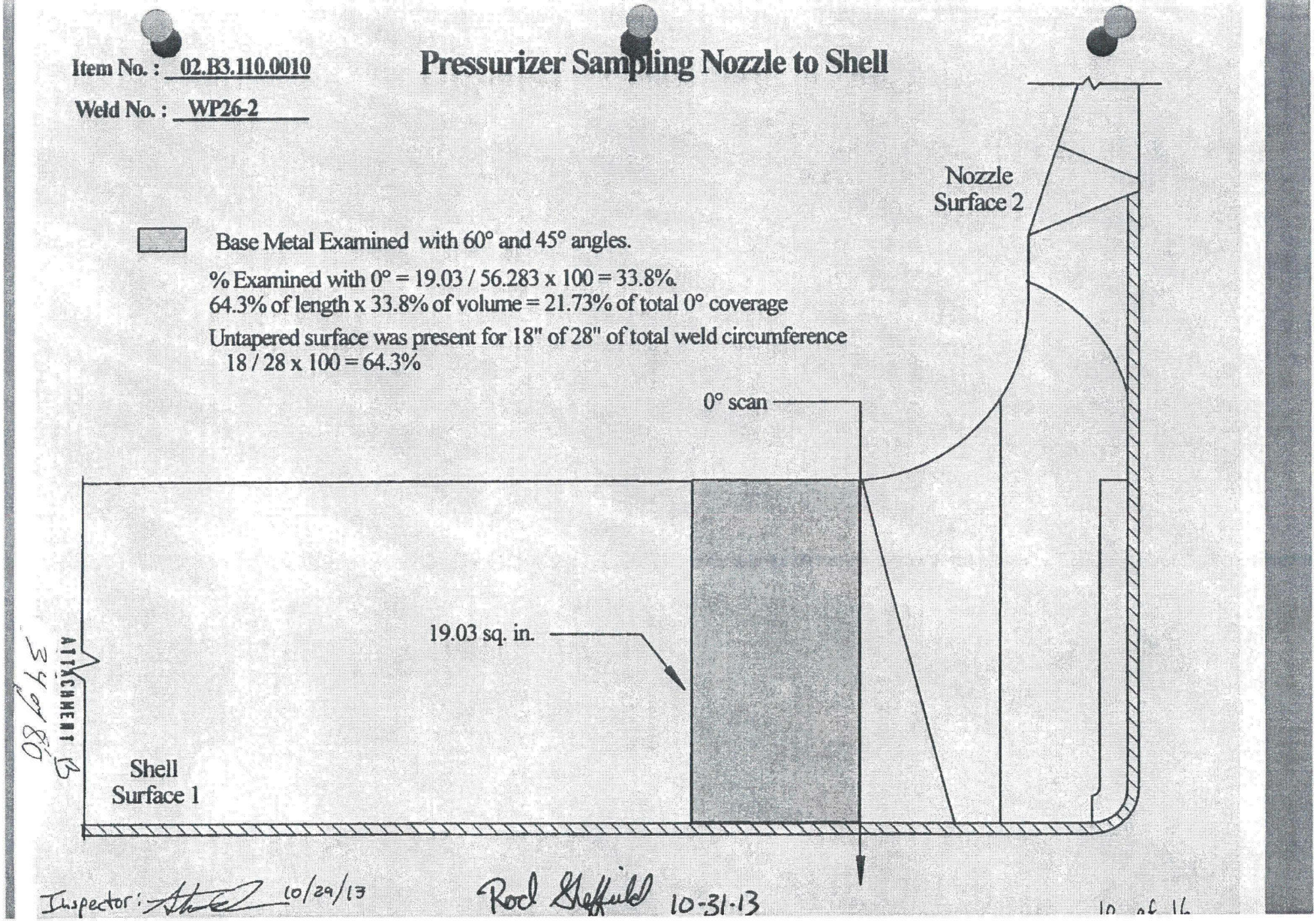
Inspector: 10/29/13

Rod Shaffield 10-31-13

Item No. : 02.B3.110.0010

Weld No. : WP26-2

Pressurizer Sampling Nozzle to Shell



Inspector: [signature] 10/29/13

Rod Steffield 10-31-13

Item No. : 02.B3.110.0010

Pressurizer Sampling Nozzle to Shell Htr. Shell

Weld No. : WP26-2

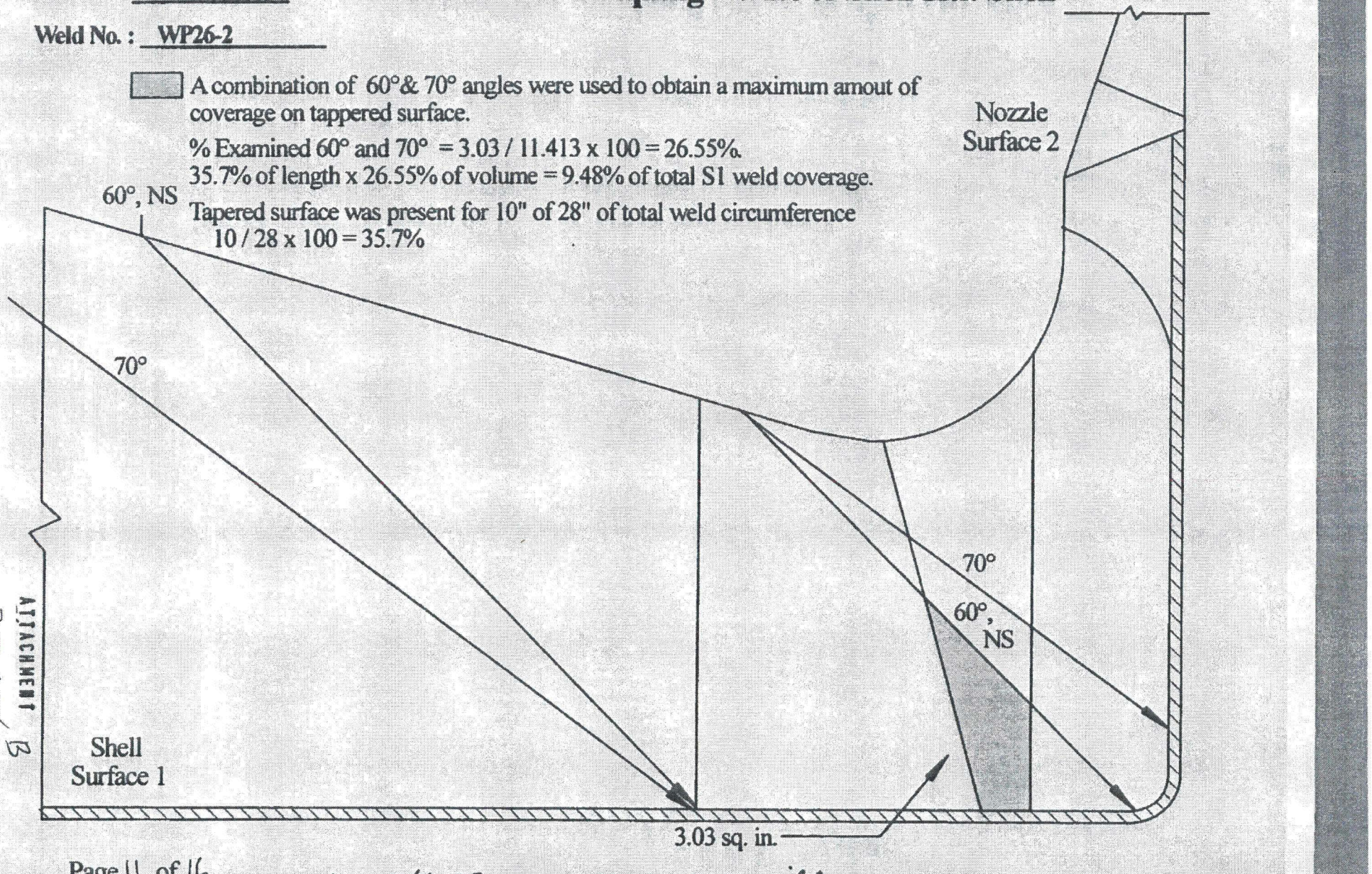
A combination of 60°& 70° angles were used to obtain a maximum amout of coverage on tappered surface.

% Examined 60° and 70° = 3.03 / 11.413 x 100 = 26.55%.

35.7% of length x 26.55% of volume = 9.48% of total S1 weld coverage.

Tapered surface was present for 10" of 28" of total weld circumference

10 / 28 x 100 = 35.7%



ATTACHMENT 13

35 of 80

Inspector: 10/29/13 Rod Sheffield 10-31-13

Item No. : 02.B3.110.0010

Pressurizer Sampling Nozzle to Shell Htr. Shell

Weld No. : WP26-2

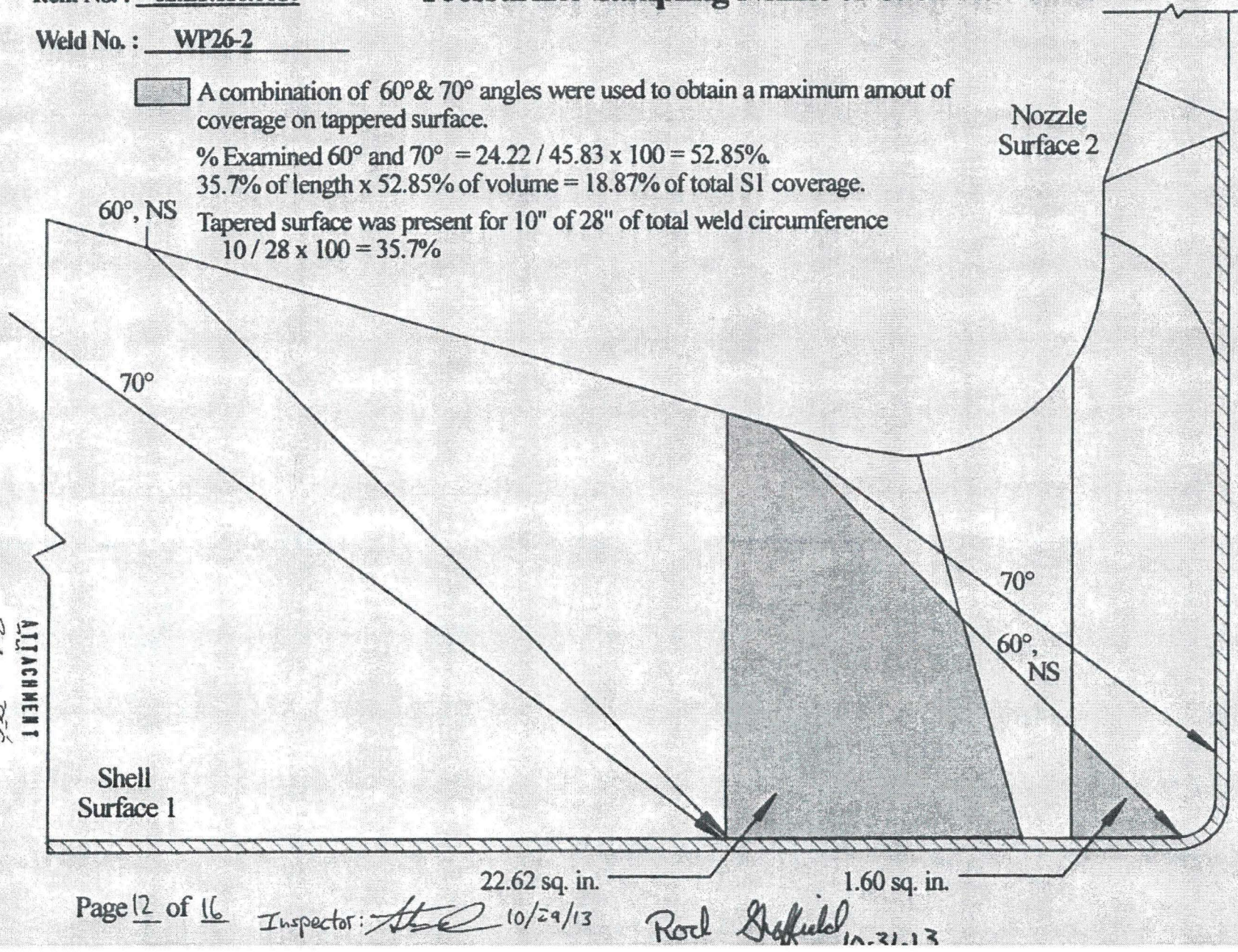
A combination of 60°& 70° angles were used to obtain a maximum amout of coverage on tappered surface.

% Examined 60° and 70° = 24.22 / 45.83 x 100 = 52.85%.

35.7% of length x 52.85% of volume = 18.87% of total S1 coverage.

Tapered surface was present for 10" of 28" of total weld circumference

10 / 28 x 100 = 35.7%



ATTACHMENT 1

Inspector: 10/29/13 Rod Sheffield 10-31-13

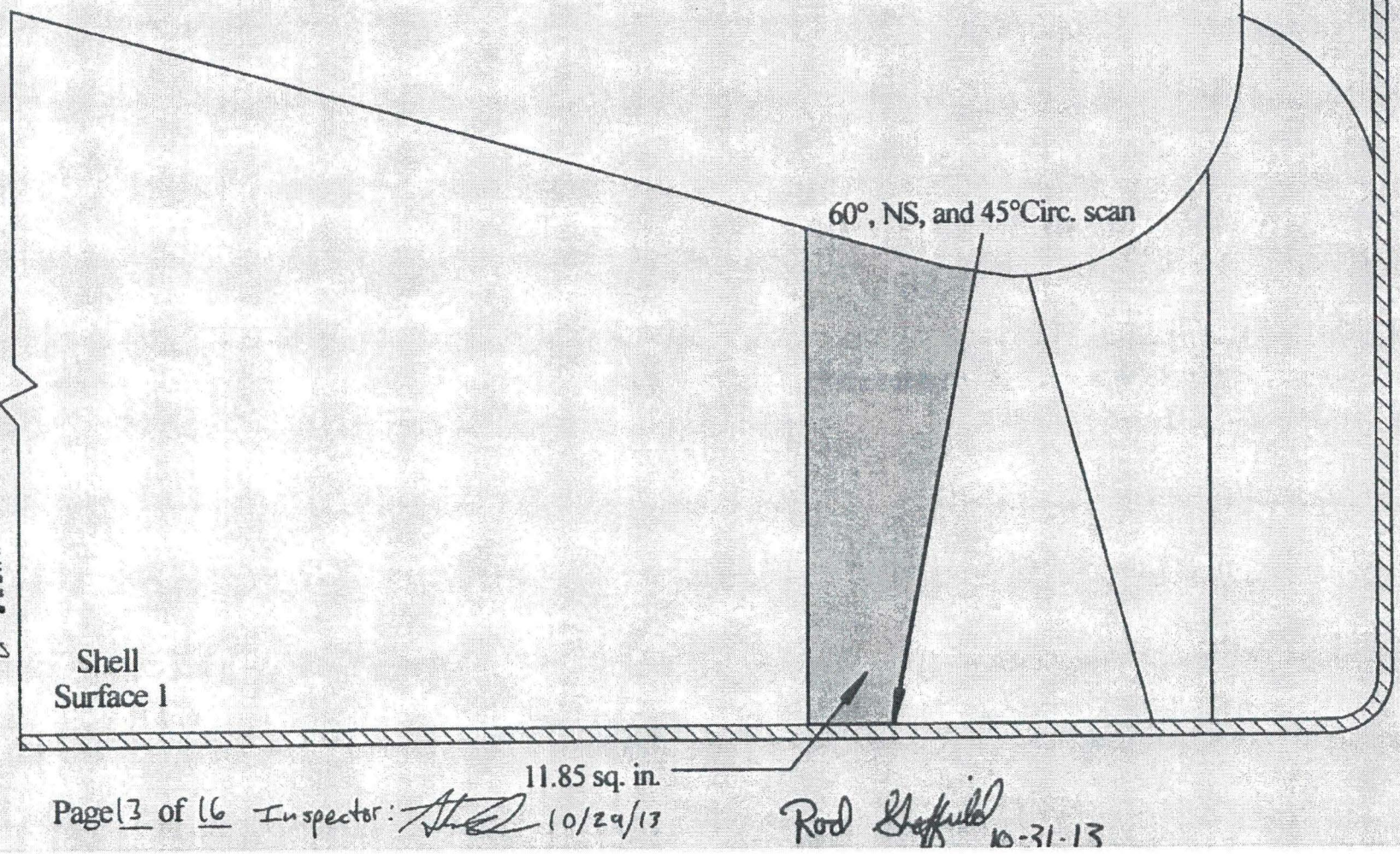
Item No. : 02.B3.110.0010

Pressurizer Sampling Nozzle to Shell Htr. Shell

Weld No. : WP26-2

% Examined 45° and 60° = 11.85 / 45.83 x 100 = 25.86%.
35.7% of length x 25.86% of volume = 9.23% of total CW/ CCW coverage

Tapered surface was present for 10" of 28" of total weld circumference
10 / 28 x 100 = 35.7%



ATTACHMENT B
28 of 65

 Inspector: 10/29/13 Rod Gaffield 10-31-13

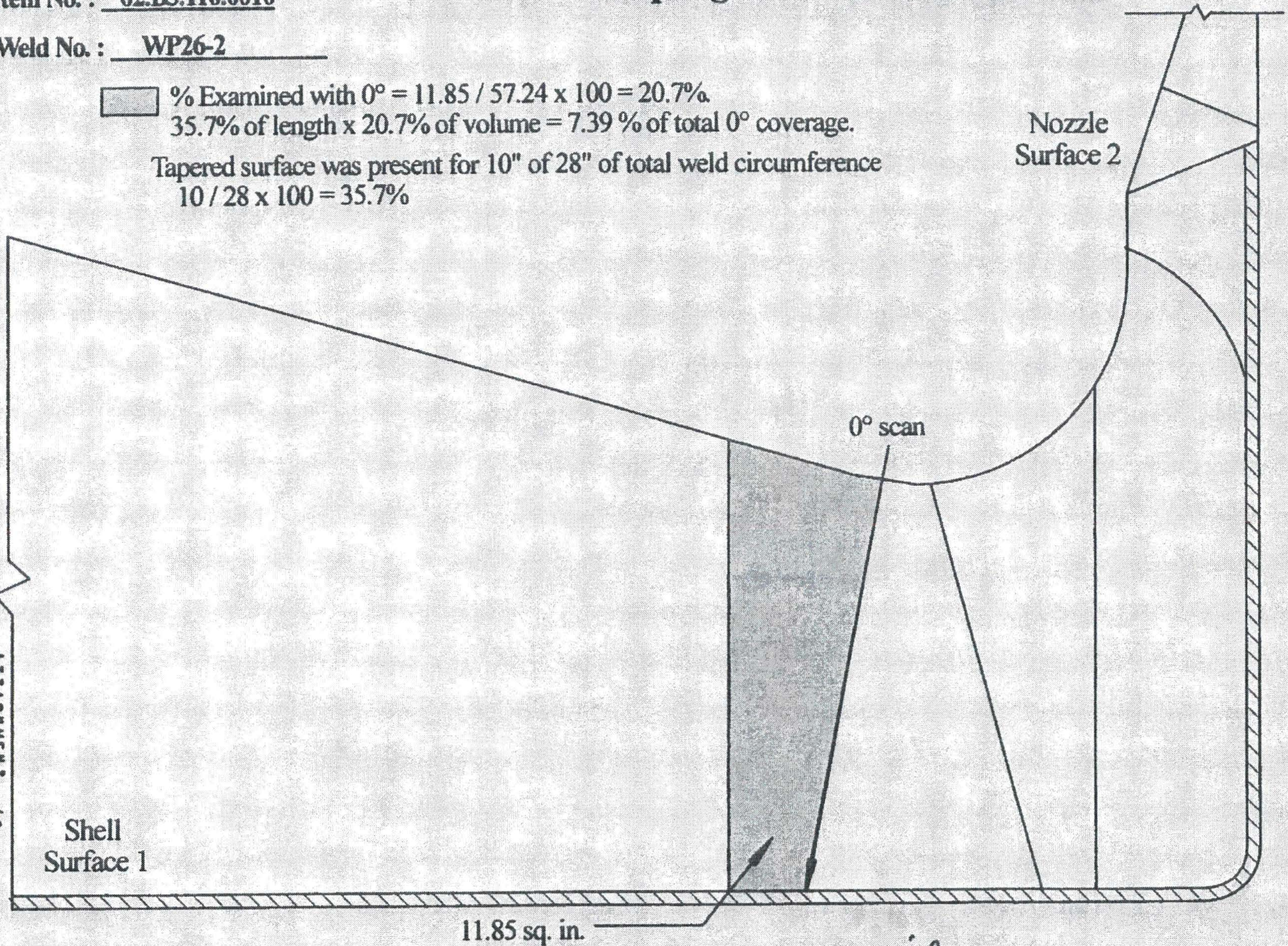
Pressurizer Sampling Nozzle to Shell Htr. Shell

Item No. : 02.B3.110.0010

Weld No. : WP26-2

% Examined with 0° = 11.85 / 57.24 x 100 = 20.7%.
35.7% of length x 20.7% of volume = 7.39 % of total 0° coverage.

Tapered surface was present for 10" of 28" of total weld circumference
10 / 28 x 100 = 35.7%



ATTACHMENT B

38 of 80

 Inspector: [signature] 10/29/13

Rod Sheffield 10-31-13

Item No. : 02.B3.110.0010

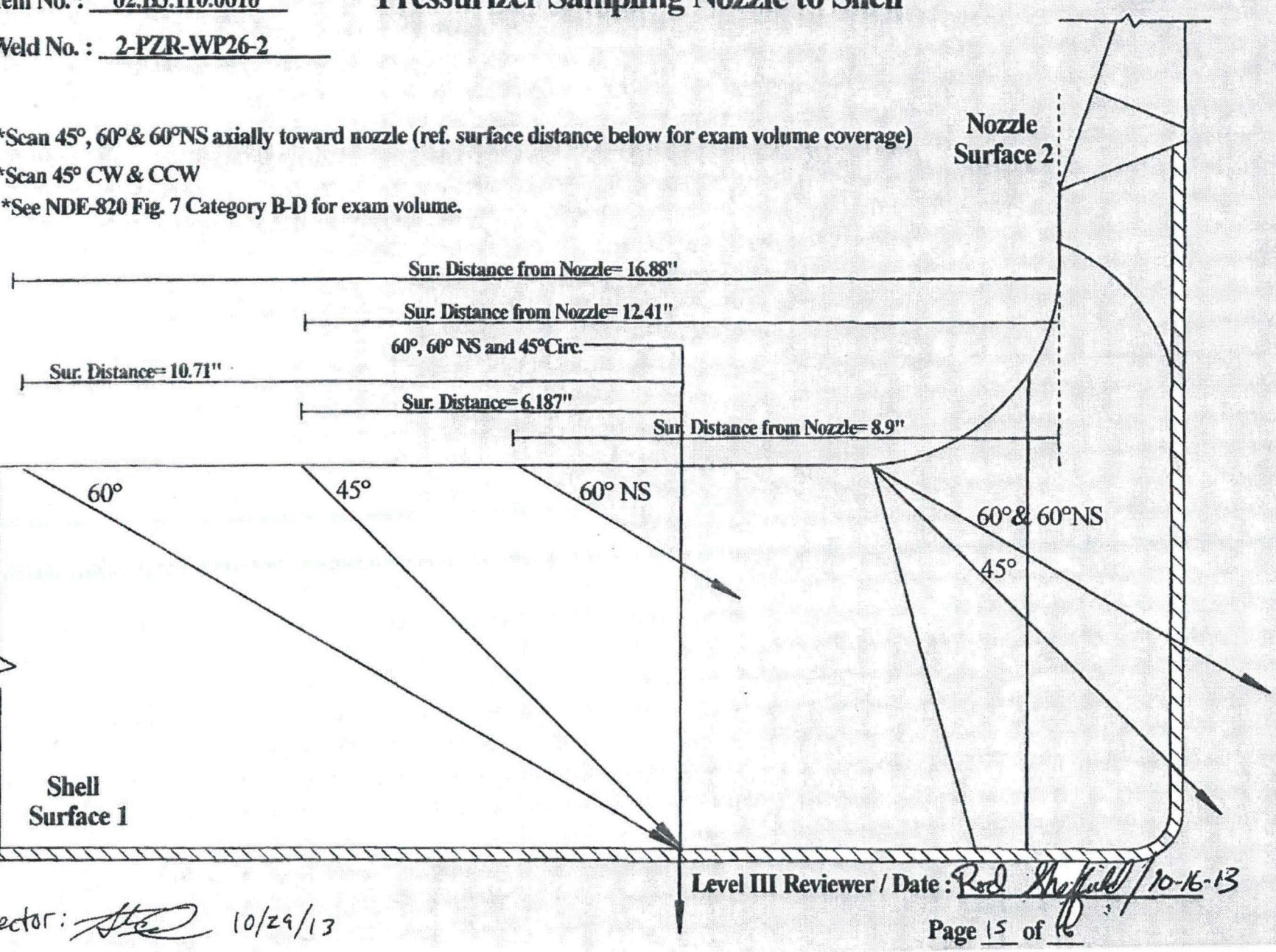
Weld No. : 2-PZR-WP26-2

Pressurizer Sampling Nozzle to Shell

*Scan 45°, 60°& 60°NS axially toward nozzle (ref. surface distance below for exam volume coverage)

*Scan 45° CW & CCW

*See NDE-820 Fig. 7 Category B-D for exam volume.



Level III Reviewer / Date : Rod Sheffield / 10-16-13

Inspector : [signature] 10/29/13

Item No. : 02.B3.110.0010

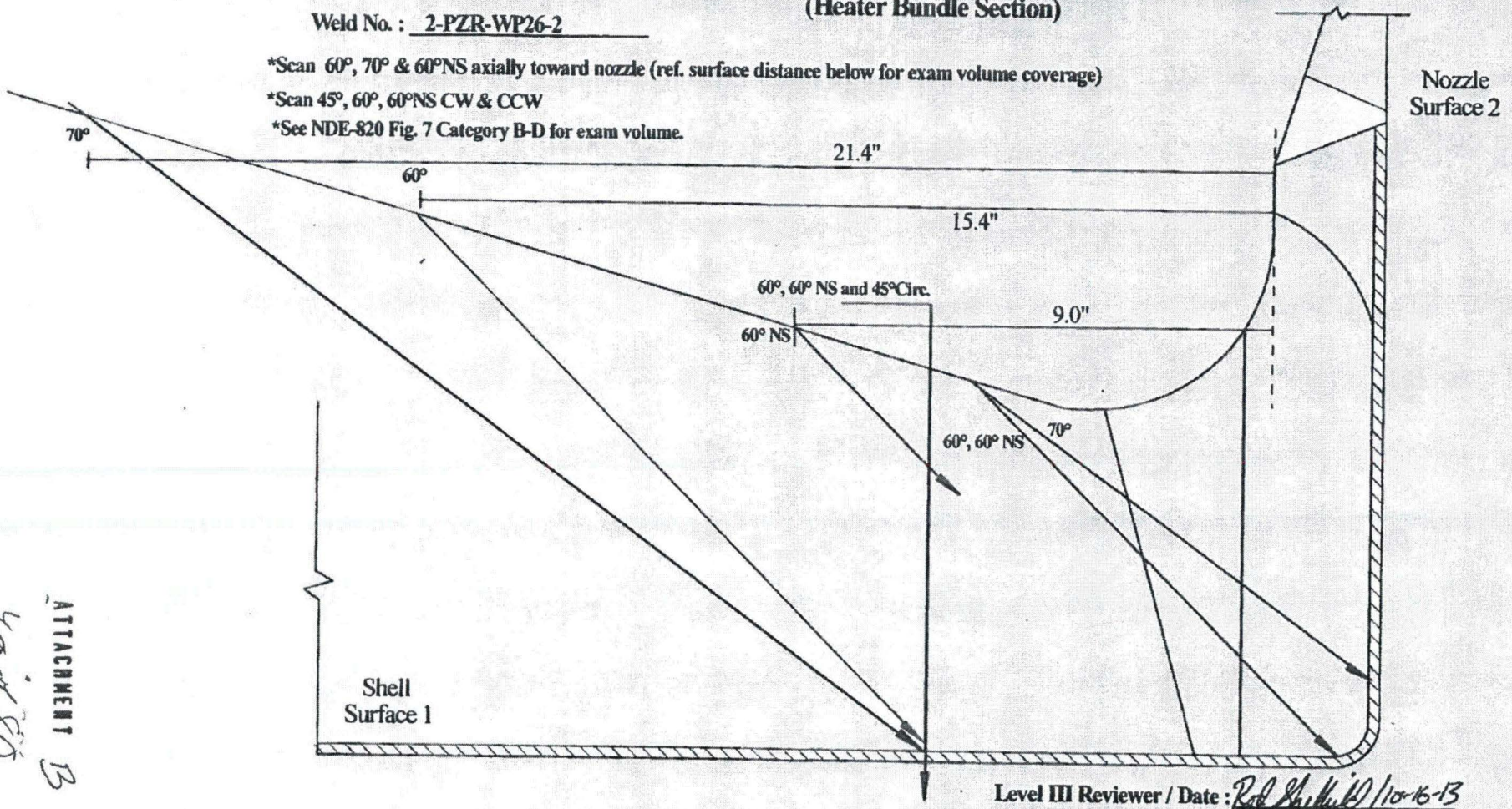
Weld No. : 2-PZR-WP26-2

Pressurizer Sampling Nozzle to Shell Htr. Shell
(Heater Bundle Section)

*Scan 60°, 70° & 60°NS axially toward nozzle (ref. surface distance below for exam volume coverage)

*Scan 45°, 60°, 60°NS CW & CCW

*See NDE-820 Fig. 7 Category B-D for exam volume.



ATTACHMENT B
4 of 80

Level III Reviewer / Date : Rod Sheffield/10-16-13

Duke Energy.

UT Calibration/Examination

Site/Unit:	Oconee / 2	Procedure:	NDE-640	Outage No.:	O2-26
Summary No.:	O2.B3.110.0011	Procedure Rev.:	5	Report No.:	UT-13-1174
Workscope:	ISI	Work Order No.:	2025416	Page:	1 of 1

Code: 1998/2000A Cal./Item: B-D /B3.110 Location:

Drawing No.: ISI-OCN2-002 Description: Nozzle to Shell

System ID: 50

Component ID: 2-PZR-WP26-3 Size/Length: N/A Thickness/Diameter: CS / 6.187 / NA

Limitations: Yes - See attached sheet Start Time: 0920 Finish Time: 1033

Instrument Settings

Serial No.:	13G00172		
Manufacturer:	GE		
Model:	USN 60 SW		
Delay:	1.2778	Range:	10"
M'tl Cal/Vel:	.2319	Pulser:	Square
Damping:	500	Reject:	0%
Rep. Rate:	Autohigh	Freq.:	2.25 MHz
Filter:	Fixed	Mode:	PE
Voltage:	450	Other:	Fullwave
Ax. Gain (dB):	9.5	Circ. Gain (dB):	N/A
1 Screen Div. =	1.0	in. of	Depth
Linearity Report No.:	L-13-271		

Calibration Block

Cal. Block No.	40338		
Thickness	7	Dia.:	Flat
Cal. Blk. Temp.	72	Temp. Tool:	MCNDE40198
Comp. Temp.	90	Temp. Tool:	MCNDE40198

Search Unit

Serial No.:	006D7N		
Manufacturer:	KBA		
Size:	.75"	Shape:	Round
Freq.:	2.25 MHz	Style:	Gamma
Exam Angle:	0	# of Elements:	Single
Mode:	Long.		
Measured Angle:	N/A		
Wedge Style:	N/A		

Search Unit Cable

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

Scan Coverage

Upstream ☑ Downstream ☐ Scan dB: 23.5

CW ☐ CCW ☐ Scan dB: N/A

Exam Surface: O.D.

Surface Condition: Machined

Cal. Checks	Time	Date
Initial Cal.	0920	10/23/2013
Inter. Cal.		
Inter. Cal.	1012	10/23/2013
Inter. Cal.		
Final Cal.	1045	10/23/2013

Couplant

Cal. Batch:	12125
Type:	ULTRAGEL II
Mfg.:	MAGNAFLUX
Exam Batch:	12125
Type:	ULTRAGEL II
Mfg.:	MAGNAFLUX

Reference Block

Serial No.: 97-5588

Type: ROMPAS

Axial Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Depth
1/4T SDH	80	1.5	1.51"
1/2T SDH	45	3.3	3.29"
3/4T SDH	22	5.0	5.04"

Circumferential Orientated Search Unit

Calibration Reflector	Signal Amplitude %	Sweep Division	Depth
N/A			

Reference/Simulator Block

Gain dB	Reflector	Signal Amplitude %	Sweep Division	Depth
1.3	1" Side	80	1.0	1.00"

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

Results: Accept ☑ Reject ☐ Info ☐

Comments: Reference Report # UT-13-1175 for additional information.

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

Examiner	Level	Signature	Date	Reviewer	Signature	Date
Tucker, David K.	II-N	[signature]	10/23/2013	Rod Sheffield	[signature]	10-30-13
Examiner	**Level**	**Signature**	**Date**	**Site Review**	**Signature**	**Date**
Bull, W. Keith	II-N	[signature]	10/23/2013			
Other	**Level**	**Signature**	**Date**	**ANII Review**	**Signature**	**Date**
N/A	N/A			MARK E. ZURBUCH	[signature]	11/5/13

ATTACHMENT

41 of 80 B

DUKE ENERGY COMPANY
ISI LIMITATION REPORT

Summary #: 2-PZR-WP26-3 **Component ID** O2.B3.110.0011

☒ NO SCAN — SURFACE — BEAM DIRECTION ☐ LIMITED SCAN — ☐ 1 ☒ 2 — ☒ 1 ☐ 2 ☒ cw ☒ ccw FROM L N/A to L N/A — INCHES FROM W0 Toe to Beyond ANGLE: ☒ 0 ☒ 45 ☒ 60 other ____ FROM 0 DEG to 360 DEG	**remarks:** Due to nozzle configuration
☐ NO SCAN — SURFACE — BEAM DIRECTION ☐ LIMITED SCAN — ☐ 1 ☐ 2 — ☐ 1 ☐ 2 ☐ cw ☐ ccw FROM L ____ to L ____ — INCHES FROM W0 ____ to ____ ANGLE: ☐ 0 ☐ 45 ☐ 60 other ____ FROM ____ DEG to ____ DEG	
☐ NO SCAN — SURFACE — BEAM DIRECTION ☐ LIMITED SCAN — ☐ 1 ☐ 2 — ☐ 1 ☐ 2 ☐ cw ☐ ccw FROM L ____ to L ____ — INCHES FROM W0 ____ to ____ ANGLE: ☐ 0 ☐ 45 ☐ 60 other ____ FROM ____ DEG to ____ DEG	
☐ NO SCAN — SURFACE — BEAM DIRECTION ☐ LIMITED SCAN — ☐ 1 ☐ 2 — ☐ 1 ☐ 2 ☐ cw ☐ ccw FROM L ____ to L ____ — INCHES FROM W0 ____ to ____ ANGLE: ☐ 0 ☐ 45 ☐ 60 other ____ FROM ____ DEG to ____ DEG	UT-13-1175 Sketch(s) attached ☒ yes ☐ No

Prepared By: Steven Dean *[signature]* Level: II Date: 10/23/13 Sheet 4 of 10

Reviewed By: *Rod Sheffield* Date: *10-30-13* Authorized Inspector: MARK E. ZURBUCH *[signature]* Date: *11/5/13*

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PZR Sampling Nozzle to Shell % of Coverage

Item No. : 02.B3.110.0011 **Weld No. :** WP26-3

Weld Coverage

Scan	Angle	% Coverage Obtained
S1	45° & 60°	61.46
S2	45° & 60°	0
CW	45° & 60°	0
CCW	45° & 60°	0
	Total	61.46

61.46 ÷ 4 = **15.4** % Coverage

Base Material Coverage

S1	45° & 60°	67.2
CW & CCW	45° & 60°	42.4
	Total	109.6

109.6 ÷ 2 = **54.8** % Coverage

0° Scan Coverage = **33.8** % Coverage

Aggregate Coverage = Weld + Base Material + 0° ÷ 3

= **34.7** **% Coverage**

Inspector / Date : Rod Sheffield / 10-30-13

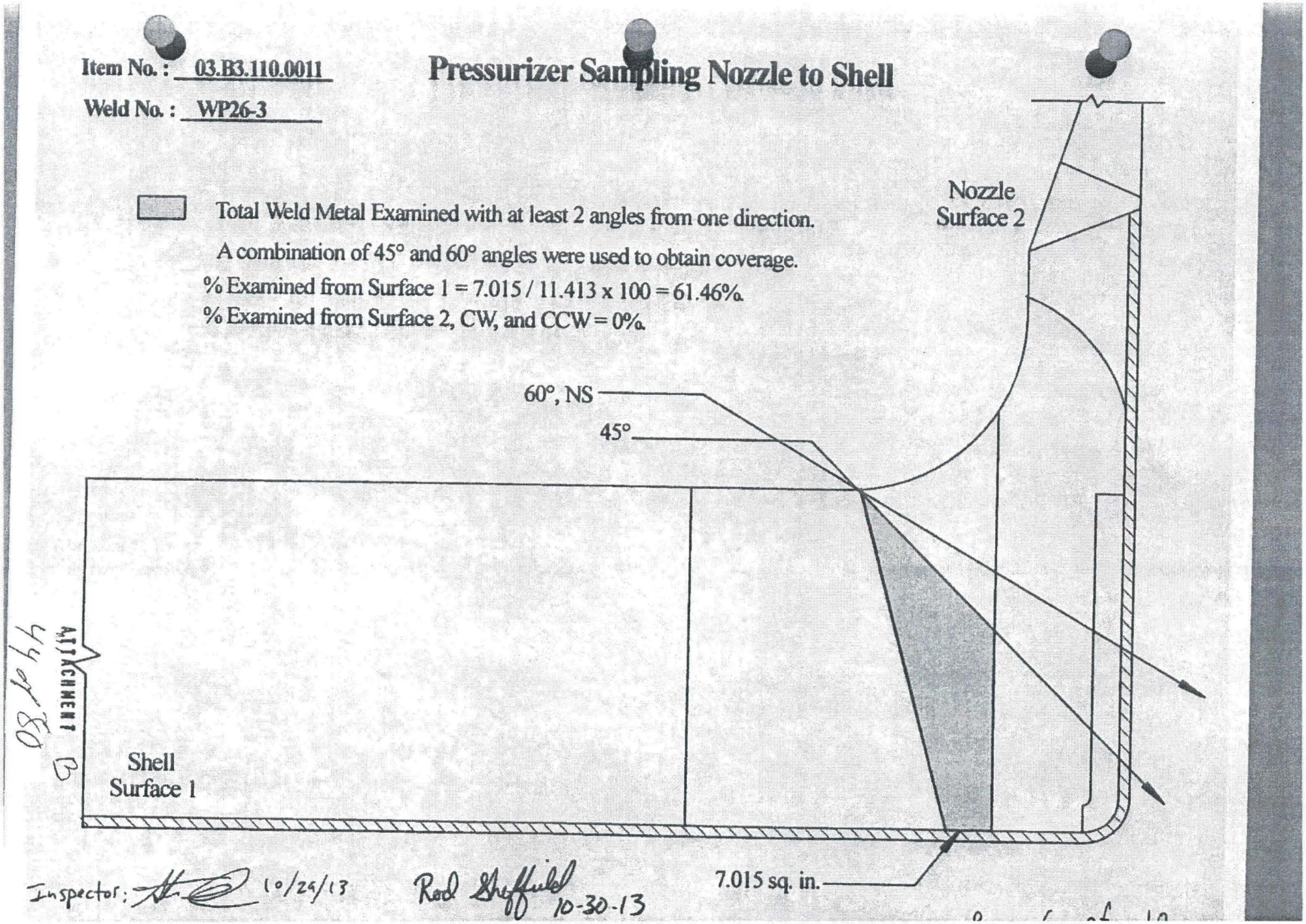
ATTACHMENT B

43 of 80

Item No. : 03.B3.110.0011

Weld No. : WP26-3

Pressurizer Sampling Nozzle to Shell

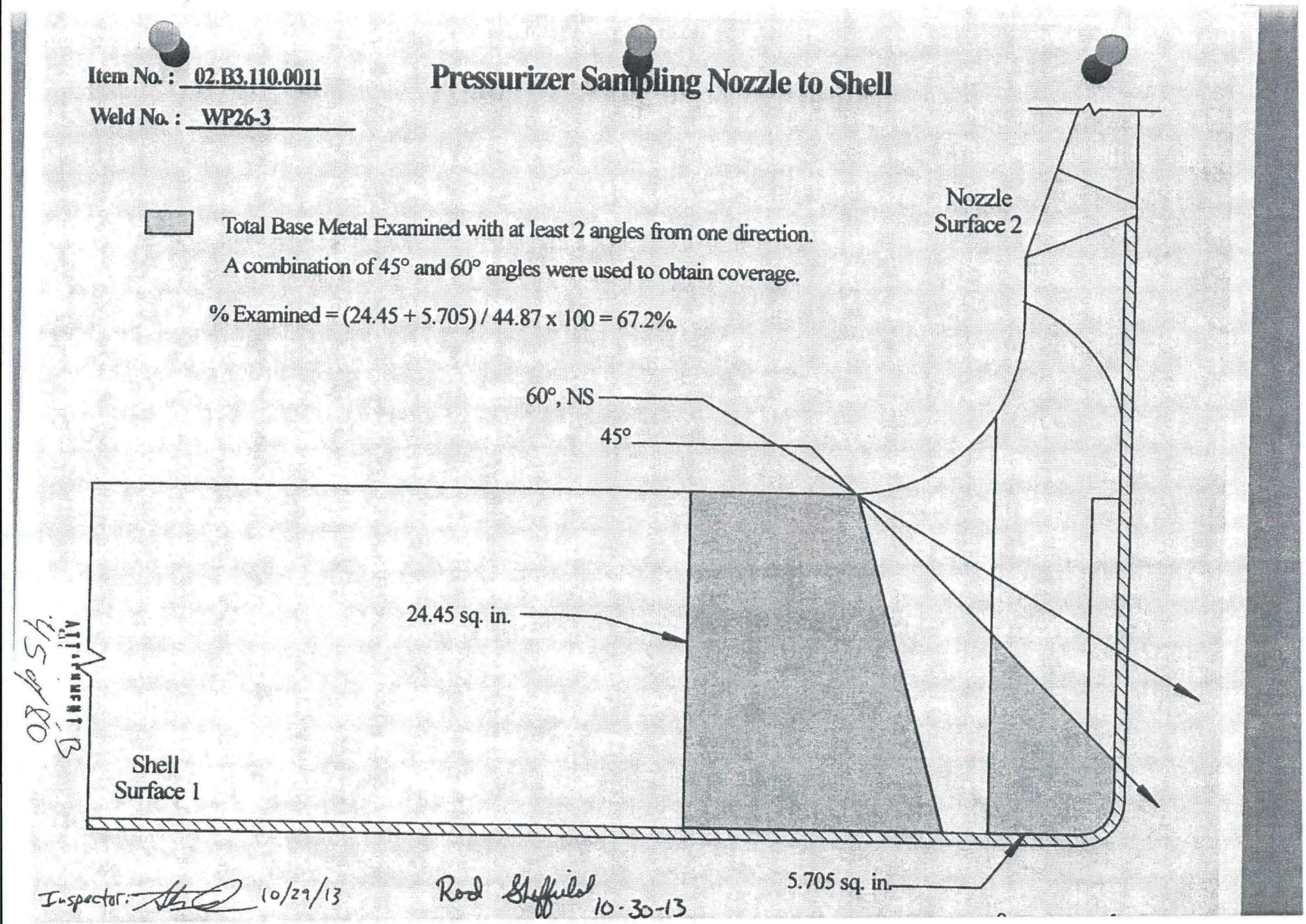


Inspector: 10/24/13 Rod Sheffield 10-30-13

Item No. : 02.B3.110.0011

Weld No. : WP26-3

Pressurizer Sampling Nozzle to Shell



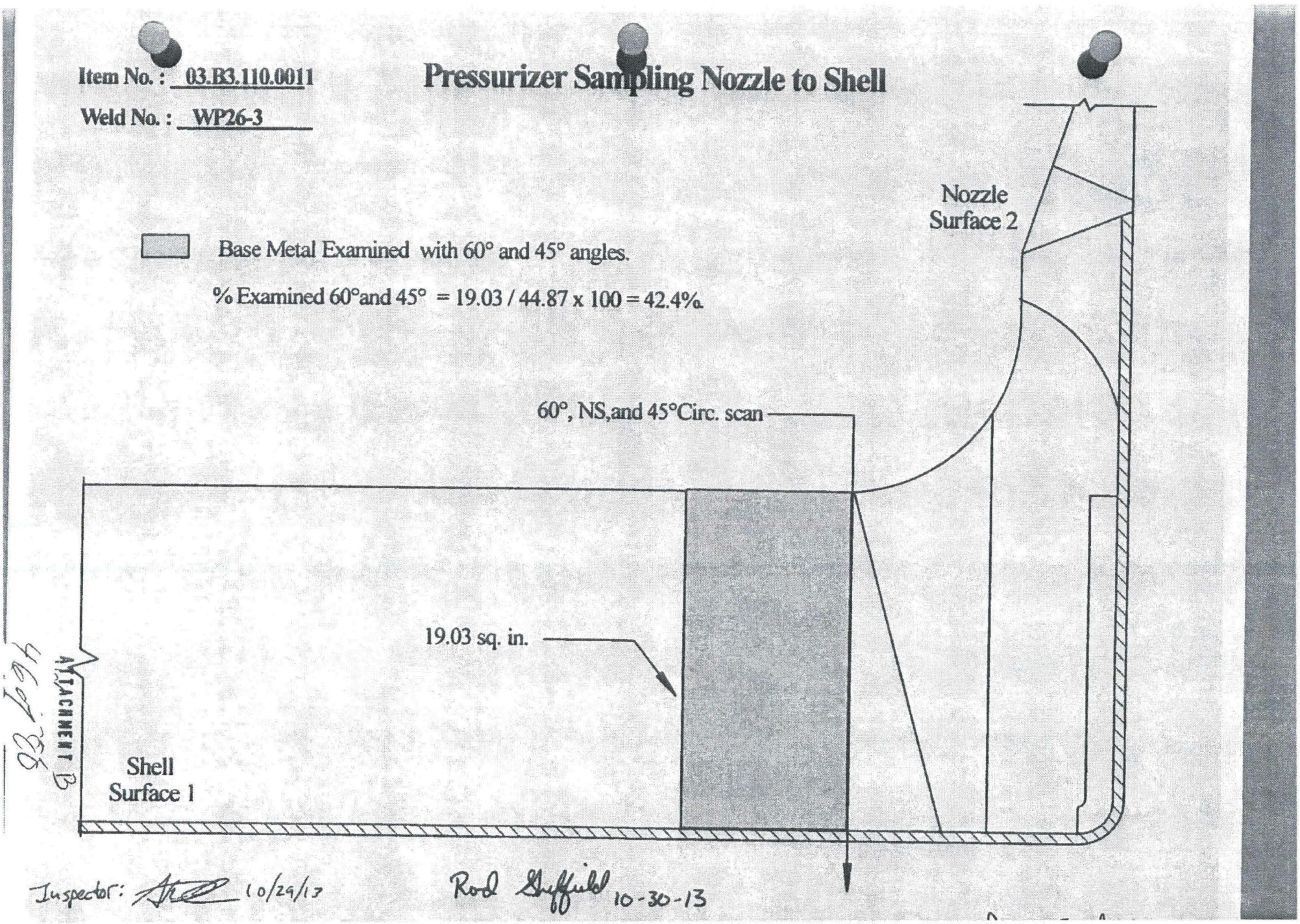
Inspector: [signature] 10/29/13

Rod Stoffield 10-30-13

Item No. : 03.B3.110.0011

Weld No. : WP26-3

Pressurizer Sampling Nozzle to Shell



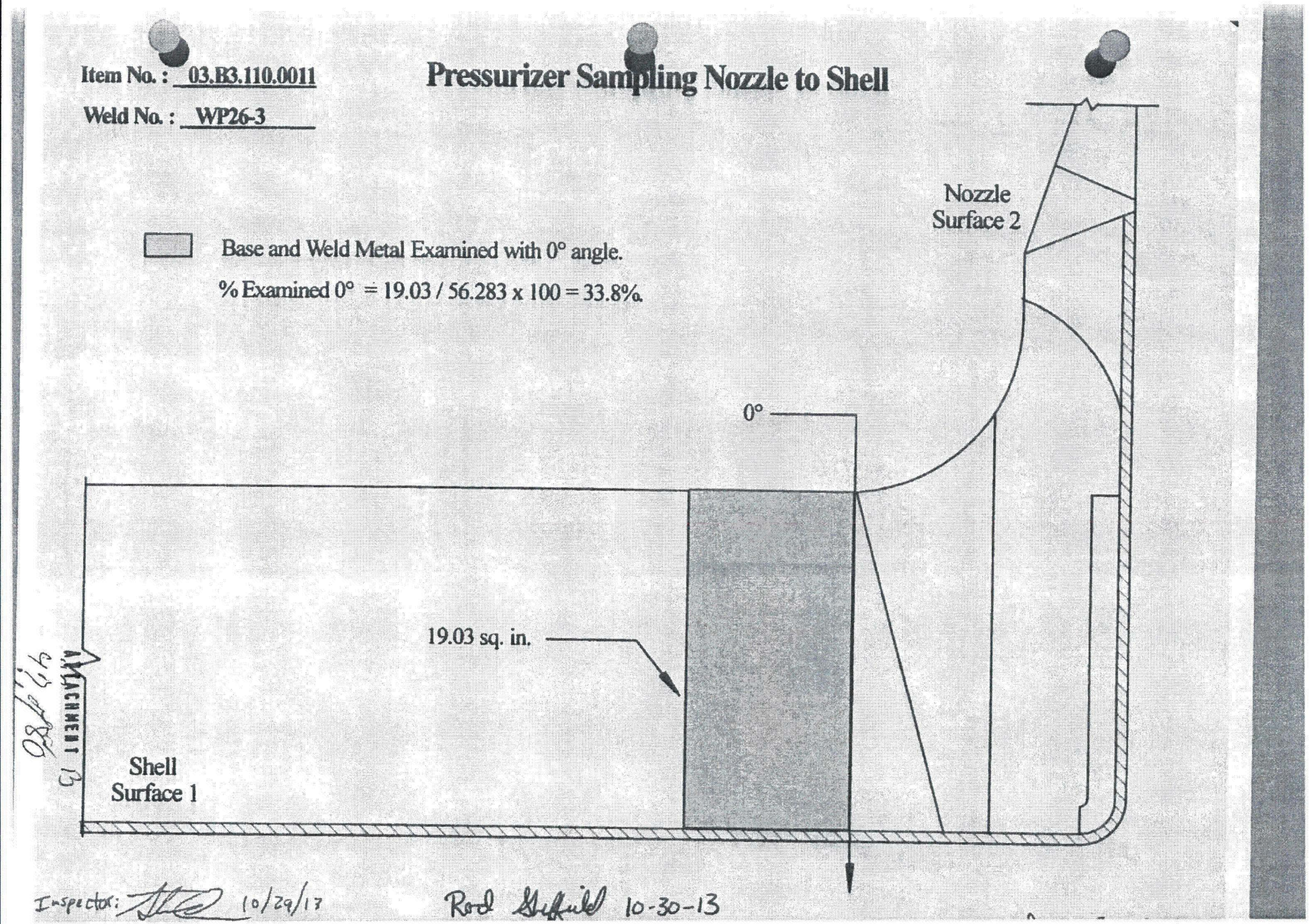
Inspector: [signature] 10/29/13

Rod Stuffield 10-30-13

Item No. : 03.B3.110.0011

Weld No. : WP26-3

Pressurizer Sampling Nozzle to Shell



Inspector: [signature] 10/29/17

Rod Gilfield 10-30-13

Item No. : 02.B3.110.0011

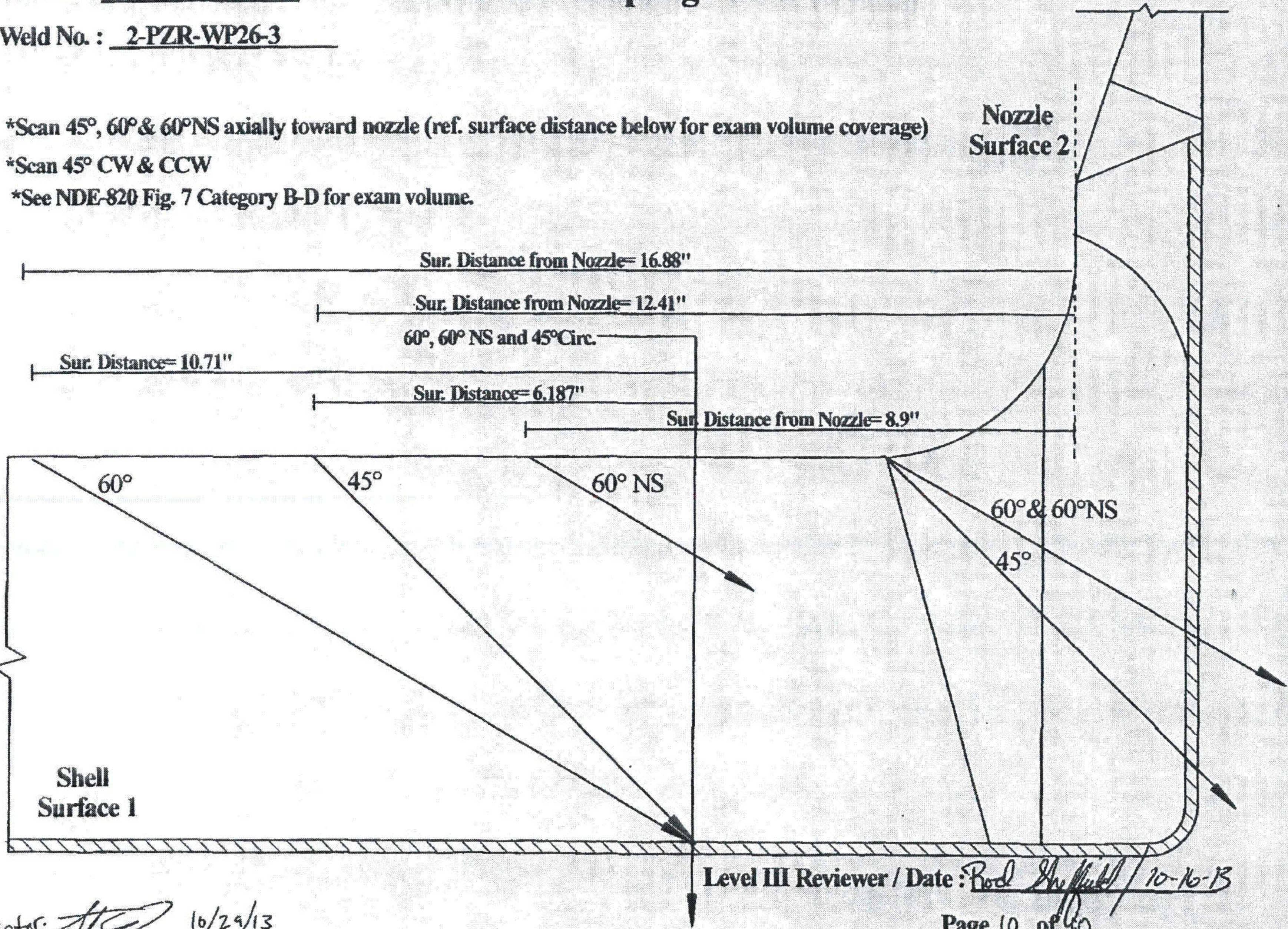
Pressurizer Sampling Nozzle to Shell

Weld No. : 2-PZR-WP26-3

*Scan 45°, 60° & 60°NS axially toward nozzle (ref. surface distance below for exam volume coverage)

*Scan 45° CW & CCW

*See NDE-820 Fig. 7 Category B-D for exam volume.



ATTACHMENT B

48% 80

Level III Reviewer / Date : Rod Sheffield / 10-16-13

Inspector: [signature] 10/29/13