

April 9, 2004

U.S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, DC 20555

Subject: Duke Energy  
Oconee Nuclear Station, Unit 2  
Docket Nos. 50-270  
Third Ten Year Inservice Inspection Interval  
Requests for Relief No. 04-ON-002 and 003

Pursuant to 10 CFR 50.55a(g)(5)(iii), attached is a Request for Relief from the requirement to examine 100% of the volume specified by the ASME Boiler and Pressure Vessel Code, Section XI, 1989 Edition with no Addenda (as modified by Code Case N-460).

Request for Relief 04-ON-002 is to allow Duke Energy to take credit for eleven (11) limited ultrasonic examinations on welds associated with various systems and components described in the attached request.

Request for Relief 04-ON-003 is a similar request but addresses twelve (12) limited ultrasonic examinations on welds specifically associated with the Reactor Vessel as described in the attached request.

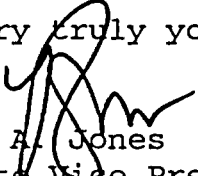
During examination of the subject Unit 2 welds, the ultrasonic examination coverage did not meet the 90% examination requirements of Code Case N-460. The obtainable volume coverage for each weld examination is indicated on the attached request. Achievement of greater examination coverage for these welds is impractical due to piping/valve geometry, interferences, and existing examination technology. Therefore, Duke Energy requests that the NRC grant relief as authorized under 10 CFR 50.55a(g)(6)(i).

A047

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If there are any questions or further information is needed  
you may contact R. P. Todd at (864) 885-3418.

Very truly yours,



R. A. Jones  
Site Vice President

Attachment

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ISI Relief Request File  
NRIA File/ELL EC050  
Document Control

**Proposed Relief in Accordance with 10 CFR 50.55a(g)(5)(iii)**  
**Inservice Inspection Impracticality**

**Duke Energy Corporation**

**Oconee Nuclear Station – Unit 2 (EOC-19)**

**Third 10-Year Interval – Inservice Inspection Plan**

**Interval Start Date= 12-16-1994    Interval End Date=9-9-2004**

**ASME Section XI Code – 1989 Edition with No Addenda**

	<b>I.</b>	<b>II. &amp; III.</b>	<b>IV.</b>	<b>V.</b>	<b>VI.</b>	<b>VII.</b>
<b>Limited Area/Weld I.D. Number</b>	<b>System / Component for Which Relief is Requested: Area or Weld to be Examined</b>	<b>Code Requirement from Which Relief is Requested: 100% Exam Volume Coverage Exam Category Item No. Fig. No. Limitation Percentage</b>	<b>Basis for Relief</b>	<b>Alternate Examinations or Testing</b>	<b>Justification for Granting Relief</b>	<b>Implementation Schedule</b>
2-PZR-WP45	Reactor Coolant System Pressurizer Spray Nozzle to Safe-End Weld	Exam Category B-F Item No. B05.040.002A Section XI, Appendix III, III-4420 Fig. IWB-2500-8(c) 75% Volume Coverage Limited Scan of Examination Volume C-D-E-F	See Paragraph "A"	See Paragraph "J"	See Paragraph "K"	See Paragraph "S"
2LP-189-15	Low Pressure Injection System Valve 2LP-47 to Pipe	Exam Category B-J Item No. B09.011.005 Fig. IWB-2500-8(c) 62.5% Volume Coverage Limited Scan of Examination Volume C-D-E-F	See Paragraph "B"	See Paragraph "J"	See Paragraph "L"	See Paragraph "S"
2-SGA-WG23-1	NC System Steam Generator A Main Steam Outlet Nozzle to Shell Weld	Exam Category C-B Item No. C02.021.001 Fig. IWC-2500-4 (b) 22.22% Volume Coverage Limited Scan of Examination Volume C-D-E-F	See Paragraph "C"	See Paragraph "J"	See Paragraph "N"	See Paragraph "S"

	I.	II. & III.	IV.	V.	VI.	VII.
Limited Area/Weld I.D. Number	System / Component for Which Relief is Requested: Area or Weld to be Examined	Code Requirement from Which Relief is Requested: 100% Exam Volume Coverage Exam Category Item No. Fig. No. Limitation Percentage	Basis for Relief	Alternate Examinations or Testing	Justification for Granting Relief	Implementation Schedule
2-SGA-WG23-2	NC System Steam Generator A Main Steam Outlet Nozzle to Shell Weld	Exam Category C-B Item No. C02.021.002 Fig. IWC-2500-4 (b) 22.22% Volume Coverage Limited Scan of Examination Volume C-D-E-F	See Paragraph "C"	See Paragraph "J"	See Paragraph "N"	See Paragraph "S"
2-SGA-WG23-1	NC System Steam Generator A Main Steam Outlet Nozzle Inside Radius Section	Exam Category C-B Item No. C02.022.001 Fig. IWC-2500-4 (b) 88.11% Volume Coverage Limited Scan of Examination Volume G-H	See Paragraph "D"	See Paragraph "J"	See Paragraph "N"	See Paragraph "S"
2-SGA-WG23-2	NC System Steam Generator A Main Steam Outlet Nozzle Inside Radius Section	Exam Category C-B Item No. C02.022.002 Fig. IWC-2500-4 (b) 88.11% Volume Coverage Limited Scan of Examination Volume G-H	See Paragraph "D"	See Paragraph "J"	See Paragraph "N"	See Paragraph "S"
2LP-150-70	Low Pressure Injection System Valve 2LP-17 to Reducer Weld	Exam Category C-F-1 Item No. C05.011.012 Fig. IWC-2500-7(a) 56.75% Volume Coverage Limited Scan of Examination Volume C-D-E-F	See Paragraph "E"	See Paragraph "J"	See Paragraph "P"	See Paragraph "S"
2HP-219-14	High Pressure Injection System Valve 2HP-409 to Pipe Weld	Exam Category C-F-1 Item No. C05.021.013 Fig. IWC-2500-7(a) 37.5% Volume Coverage Limited Scan of Examination Volume C-D-E-F	See Paragraph "F"	See Paragraph "J"	See Paragraph "P"	See Paragraph "S"

	I.	II. & III.	IV.	V.	VI.	VII.
Limited Area/Weld I.D. Number	System / Component for Which Relief is Requested: Area or Weld to be Examined	Code Requirement from Which Relief is Requested: 100% Exam Volume Coverage Exam Category Item No. Fig. No. Limitation Percentage	Basis for Relief	Alternate Examinations or Testing	Justification for Granting Relief	Implementation Schedule
2HP-396-5	High Pressure Injection System Valve 2HP-140 to Pipe Weld	Exam Category C-F-1 Item No. C05.021.093 Fig. IWC-2500-7(a) 62.5% Volume Coverage Limited Scan of Examination Volume C-D-E-F	See Paragraph "G"	See Paragraph "J"	See Paragraph "P"	See Paragraph "S"
2HP-221-22	High Pressure Injection System Valve 2HP-410 to Elbow Weld	Exam Category C-F-1 Item No. C05.021.115 Fig. IWC-2500-7(a) 62.5% Volume Coverage Limited Scan of Examination Volume C-D-E-F	See Paragraph "H"	See Paragraph "J"	See Paragraph "P"	See Paragraph "S"
2-BWST-OUT-2	Low Pressure Injection System Pipe to Flange Weld	Exam Category C-F-2 Item No. C05.070.001 Fig. IWC-2500-7 63.66% Area Coverage Exam Surface A-B	See Paragraph "I"	See Paragraph "J"	See Paragraph "Q"	See Paragraph "S"

See Attachment A for C05.070.001 area/weld locations.

See Attachment B for Steam Generator A Main Steam Outlet Nozzle area/weld locations.

See Attachment C for inspection data on all 11 items with limited coverage.

See Attachment D for Pressurizer Spray Nozzle to Safe-End area/weld locations.

Note: The C05.011, C05.021, and C05.070 welds were inspected in August of 2002 and the B05.040, B09.011, C02.021, and C02.022 items were inspected in October of 2002.

#### **IV. Basis for Relief**

**Paragraph A:** (The Pressurizer Spray Nozzle material is SA508 CL. 1 and the Safe-End material is SB-166. The diameter of the Nozzle to Safe-End weld is 4 inches and it has a wall thickness of .75 inches.)

During the ultrasonic examination of dissimilar metal weld 2-PZR-WP45, 75% coverage of the required examination volume was obtained. Scanning limitations were caused by the taper of the nozzle which prevented scanning from both sides of the weld. The percent coverage reported represents the aggregate coverage from all scans performed on the weld. The examination volume was scanned in two circumferential and one axial direction using 45° shear wave and longitudinal wave search units. In order to scan all of the required surfaces for the inspection of this weld, the nozzle would have to be redesigned to allow scanning from both sides of the weld, which is impractical. There were no recordable indications found during the inspection of this weld.

**Paragraph B:** (The valve and pipe material was stainless steel. Weld 2LP-189-15 has a diameter of 10 inches and a wall thickness of 1.0 inches.)

During the ultrasonic examination of weld 2LP-189-15, 62.5% coverage of the required examination volume was obtained. Scanning limitations were caused by the valve configuration which prevented scanning from both sides of the weld. The percent coverage reported represents the aggregate coverage from all scans performed on the weld. The examination volume was scanned in two circumferential directions using 45° shear waves and in one axial direction using 60° shear and longitudinal waves. In order to scan all of the required surfaces for the inspection of this weld, the valve would have to be redesigned to allow scanning from both sides of the weld, which is impractical. There was a recordable indication found during the inspection of this weld. It was determined to be a geometric reflector due to root geometry.

**Paragraph C:** (The Steam Generator shell material is SA212 GR. B and the nozzle material is SA 508 CL. 1. The diameter of the Nozzle to Steam Generator shell weld is 29 inches and it has a wall thickness of 6.75 inches.)

During the ultrasonic examination of welds 2-SGA-WG23-1 and 2-SGA-WG23-2, 100% coverage of the required examination volume could not be obtained. The examination coverage was limited to 22.22%. Limitations were caused by the nozzle configuration. The percent coverage reported represents the aggregate coverage from all scans performed on the weld. The examination volume was scanned with 45° and 60° shear waves from one axial direction. No coverage could be achieved in the circumferential direction or with the straight beam scan because of the interference caused by the nozzle blend radius. The percentage of coverage reported represents the aggregate coverage. In order to scan all of the required surfaces for the inspection of this weld, the nozzles would have to be redesigned to allow scanning from both sides of the weld, which is impractical. There were no recordable indications found during the inspection of these welds.

**Paragraph D:**

During the ultrasonic examination of the inside radius sections for 2-SGA-WG23-1 and 2-SGA-WG23-2, 100% coverage of the required examination volume was not obtained. The examination coverage was limited to 88.11%. The percentage of coverage reported represents the aggregate coverage. The inner radius examination volume was scanned from the vessel shell side using 60° and 70° shear waves. Duke Energy Corporation had been investigating the use of computer modeling of the nozzles to develop ultrasonic techniques that would achieve 100% coverage of the examination volume. However, these techniques were not ready at the time these examinations were scheduled. Therefore, a best effort examination was performed. The steam generators will be replaced in the spring of 2004. There were no recordable indications found during these inspections.

**Paragraph E:** (The valve and reducer material was stainless steel. Weld 2LP-150-70 has a diameter of 12 inches and a wall thickness of 1.312 inches.)

During the ultrasonic examination of weld 2LP-150-70, 56.75% coverage of the required examination volume was obtained. Scanning limitations were caused by the valve configuration which prevented scanning from both sides of the weld. The percent coverage reported represents the aggregate coverage from all scans performed on the weld. The examination volume was scanned using 45° shear waves in two circumferential directions covering 63.5% of the volume and in one axial direction using 60° shear and longitudinal waves covering 100% of the examination volume. In order to scan all of the required surfaces for the inspection of this weld, the valve would have to be redesigned to allow scanning from both sides of the weld, which is impractical. There were no recordable indications found during the inspection of this weld.

**Paragraph F:** (The valve and pipe material was stainless steel. Weld 2HP-219-14 has a diameter of 4 inches and a wall thickness of .674 inches.)

During the ultrasonic examination of weld 2HP-219-14, 37.5% coverage of the required examination volume was obtained. Scanning limitations were caused by the valve configuration which prevented scanning from both sides of the weld. The percent coverage reported represents the aggregate coverage from all scans performed on the weld. The examination volume was scanned using 45° shear waves in two circumferential directions covering 50% of the volume and in one axial direction using 60° shear and longitudinal waves covering 100% of the examination volume. In order to scan all of the required surfaces for the inspection of this weld, the valve would have to be redesigned to allow scanning from both sides of the weld, which is impractical. There were no recordable indications found during the inspection of this weld.

**Paragraph G:** (The valve and pipe material was stainless steel. Weld 2HP-396-5 has a diameter of 4 inches and a wall thickness of .531 inches.)

During the ultrasonic examination of weld 2HP-396-5, 62.5% coverage of the required examination volume was obtained. Scanning limitations were caused by the valve configuration which prevented scanning from both sides of the weld. The percent coverage reported represents the aggregate coverage from all scans performed on the weld. The examination volume was scanned using 45° shear waves in two circumferential directions covering 50% of the volume and in one axial direction using 60° shear and longitudinal waves covering 100% of the examination volume. In order to scan all of the required surfaces for the inspection of this weld, the valve would have to be redesigned to allow scanning from both sides of the weld, which is impractical. There were no recordable indications found during the inspection of this weld.

**Paragraph H:** (The valve and elbow material was stainless steel. Weld 2HP-221-22 has a diameter of 4 inches and a wall thickness of .531 inches.)

During the ultrasonic examination of weld 2HP-221-22, 62.5% coverage of the required examination volume was obtained. Scanning limitations were caused by the valve configuration which prevented scanning from both sides of the weld. The percent coverage reported represents the aggregate coverage from all scans performed on the weld. The examination volume was scanned using 45° shear waves in two circumferential directions covering 100% of the volume and in one axial direction using 60° shear and longitudinal waves covering 100% of the examination volume. In order to scan all of the required surfaces for the inspection of this weld, the valve would have to be redesigned to allow scanning from both sides of the weld, which is impractical. There were no recordable indications found during the inspection of this weld.



**Paragraph I:** (The diameter of the pipe to flange weld is 14 inches and it has a wall thickness of .375 inches. The material was carbon steel.)

During MT examination of welds 2BWST-OUT-2, 100% coverage of the required examination surface could not be obtained. The examination coverage was limited to 63.66%. Limitations were caused because the pipe has minimum clearance from steel support members; thus, access for the inspection of 100% of the weld is not possible. The percentage of coverage reported represents the aggregate coverage. There were no recordable indications found during the inspection of this weld. In order to achieve more coverage, the pipe would have to be relocated to allow full access to MT or PT 100% weld, which is impractical.

#### **V. Alternate Examinations or Testing**

**Paragraph J:**

The scheduled 10-year code examination was performed on the referenced area/weld and it resulted in the noted limited coverage. No additional examinations are planned for the area/weld during the current inspection interval.

#### **VI. Justification for Granting Relief**

**Paragraph K:**

Ultrasonic examination of areas/welds for item number B05.040 were conducted using personnel, equipment and procedures qualified in accordance with ASME Section XI, Appendix VIII Supplement 10 of the 1995 Edition with the 1996 Addenda as administered by the PDI. Although 100% of the required scanning could not be achieved, the amount of coverage of the examination volume obtained for this weld provides an acceptable level of quality and integrity. In addition to the volumetric examination with limited scan, Duke Energy performed a surface examination (code required) on the B05.040 item and achieved 100% coverage. The result from the surface examination was acceptable. (See Paragraph M for additional justification.)

**Paragraph L:**

Ultrasonic examination of areas/welds for item number B09.011 were conducted using personnel, equipment and procedures qualified in accordance with ASME Section XI, Appendix VIII Supplement 2 of the 1995 Edition with the 1996 Addenda as administered by the PDI. Although 100% of the required scanning could not be achieved, the amount of coverage of the examination volume obtained for this weld provides an acceptable level of quality and integrity. In addition to the volumetric examination with limited scan, Duke Energy performed a surface examination (code required) on the B09.011 item and achieved 100% coverage. The result from the surface examination was acceptable. (See Paragraph M for additional justification.)

**Paragraph M:**

Duke Energy will use Class 1, Examination Category B-P, pressure testing and VT-2 visual examination to compliment the limited scan examinations. The Code requires that a pressure test be performed after each refueling outage for Class 1. These tests require a VT-2 visual examination for evidence of leakage. This testing provides adequate assurance of pressure boundary integrity.

In addition to the above Code required examinations (volumetric and pressure test), there are other activities which provide a high level of confidence that, in the unlikely event that leakage did occur through these welds, it would be detected and isolated. Specifically, leakage from these welds would be detected by monitoring of the Reactor Coolant System (RCS), which is performed once each shift under procedure PT/1,2,3/A/0600/10, "RCS Leakage". This RCS leakage monitoring is a requirement of Technical Specification 3.4.13, "Reactor Coolant System Leakage". Leakage is also evaluated in accordance with this Technical Specification. The leakage could also be detected through several other methods. One is the RCS mass balance calculation. A second is the Reactor Building air particulate monitor. This monitor is sensitive to low leak rates; the iodine monitor, gaseous monitor and area monitor are capable of detecting any fission products in the coolant and will make these monitors sensitive to coolant

leakage. A third is the level indicator in the Reactor Building normal sump. A fourth is a loss of level in the Letdown Storage Tank. Based on the portions and results of the required volumetric, surface and VT-2 examinations performed during this outage, it's Duke's belief that this combination of examinations provides a reasonable assurance of component integrity.

**Paragraph N:**

Ultrasonic examination of welds for item numbers C02.021 and C02.022 were conducted using personnel, qualified in accordance with ASME Section XI, Appendix VII. Procedures were in compliance with ASME Section V, Article 4 and Section XI, Appendix I. Due to the design of the Steam Generator Shell and Steam Outlet Nozzle; it is not feasible to obtain the examination scanning and volume coverage required. Duke Energy has examined the weld/area to the maximum extent possible utilizing the latest in examination techniques and equipment. The weld was rigorously inspected by volumetric NDE methods during construction and verified to be free from unacceptable fabrication defects. Although 100% of the required scanning could not be achieved, the amount of coverage of the examination volume obtained for this weld provides an acceptable level of quality and integrity. (See Paragraph O for additional justification.)

**Paragraph O:**

Duke Energy will use Class 2, Examination Category C-H, pressure testing and VT-2 visual examination to compliment the limited scanning and examination volume coverage. The Code requires that a pressure test be performed once each period for Class 2 items. These tests require a VT-2 visual examination for evidence of leakage. This testing provides adequate assurance of pressure boundary integrity.

In addition to the above Code required examinations (surface and pressure test), there are other activities which provide a high level of confidence that, in the unlikely event that leakage did occur through these welds, it would be detected. The Steam Generator C2.21 Main Steam outlet nozzle welds are located in the reactor building and not accessible for routine inspection. However, Table IWB-2500-1 of ASME Section XI, Class 1, Examination Category B-P, requires that a pressure test be performed after each refueling outage for Class 1 systems. This test requires a VT-2 visual examination for evidence of leakage at normal operating conditions. A portion of this test is near the Class 2 shell to main steam nozzle welds and a leak from the Steam Generator shell to nozzle weld would be observed during this test. Once a leak is identified, its location needs to be determined and assessed. This would provide adequate assurance of pressure boundary integrity. Further, the level of the Reactor Building normal sump is monitored daily and any change in the level or pumping frequency must be evaluated to verify there is no RCS leakage. Due to the location of these nozzles, any leakage would eventually end up in the reactor building sump. All of these together will provide reasonable assurance that if the weld/component developed a leak during a fuel cycle the leakage would be identified.

**Paragraph P:**

Ultrasonic examination of areas/welds for the item numbers C05.011 and C05.021 were conducted using personnel, equipment and procedures qualified in accordance with ASME Section XI, Appendix VIII Supplement 2 of the 1995 Edition with the 1996 Addenda as administered by the PDI. Although 100% of the required scanning could not be achieved, the amount of coverage of the examination volume obtained for each of these welds provides an acceptable level of quality and integrity. In addition to the volumetric examinations with limited scan, Duke Energy performed a surface examination (code required) on each of the C05.011 and C05.021 items and achieved 100% coverage. The results from the surface examinations were acceptable. (See Paragraph R for additional justification.)

In addition to C05.021 welds that relief is being requested for limited scanning and limited examination coverage, there were 23 additional C05.021 welds that surface and volumetric examinations were performed on. The examinations didn't identify any reportable indications and greater than 90% coverage was obtained on each of the 23 welds. The 23 additional welds were from the same system as the C05.021 welds of this request.

Duke Energy Corporation does not claim credit for coverage of the far side of austenitic piping welds. The characteristics of austenitic weld metal attenuate and distort the sound beam when shear waves pass through the weld. Refracted longitudinal waves provide better penetration but cannot be used beyond the first sound path leg. Duke Energy Corporation uses a combination of shear waves and longitudinal waves to examine single sided austenitic piping welds.

The procedures, personnel and equipment have been qualified through the Performance Demonstration Initiative (PDI). However, although longitudinal wave search units were used in the qualification and cracks were detecting through the weld metal, PDI does not provide a qualification for single sided examination of similar metal austenitic piping welds.

**Paragraph Q:**

Liquid Penetrant examination of area/weld for item number C05.070 was conducted using personnel, equipment and procedures qualified in accordance with the 1989 Edition with no Addenda of the ASME Section XI Code. Although 100% coverage of the examination area could not be achieved, the amount of coverage obtained for this examination provides an acceptable level of quality and integrity. (See Paragraph R for additional justification.)

**Paragraph R:**

Duke Energy will use Class 2, Examination Category C-H, pressure testing and VT-2 visual examination to compliment the limited examination coverage. The Code requires that a pressure test be performed once each period for Class 2 items. These tests require a VT-2 visual examination for evidence of leakage. This testing provides adequate assurance of pressure boundary integrity.

In addition to the above Code required examinations (surface and pressure test), there are other activities which provide a high level of confidence that, in the unlikely case that leakage did occur through this weld, it would be detected and isolated. One activity is that leakage from this weld would be detected by Operations personnel during their regular rounds. The Nuclear Equipment Operator has been trained to look for any unusual conditions, such as leaks. The C05.011, C05.021, C05.070 items, and item C05.051.012 in this request are located in an area where operations personnel will be walking through as part of their rounds; therefore, any leak would be identified by visual observation. All of these activities together will provide reasonable assurance of weld/component integrity.

Duke Energy has examined the weld/component referenced in this request to the maximum extent possible utilizing the latest in examination techniques and equipment. The welds/components were rigorously inspected by volumetric NDE methods during construction and verified to be free from unacceptable fabrication defects. Based on the coverage and results of the required volumetric exams this outage and the additional pressure testing (VT-2) exams, it's our opinion that this combination of examinations provides a reasonable assurance of component integrity.

## **VII. Implementation Schedule**

**Paragraph S**

The scheduled third 10-year interval plan code examination was performed on the referenced area/weld resulting in limited volumetric coverage. No additional examinations are planned for the area/weld during the current inspection interval. With the exception of welds on the Oconee Unit 2 Steam Generators (because the generators will be replaced in the spring of 2004), the same areas/welds may be examined again as part of the next (fourth) 10-year interval plan, depending on the applicable code year edition and addenda requirements adopted in the future.

**VIII. Other Information**

The following individuals contributed to the development of this relief request:

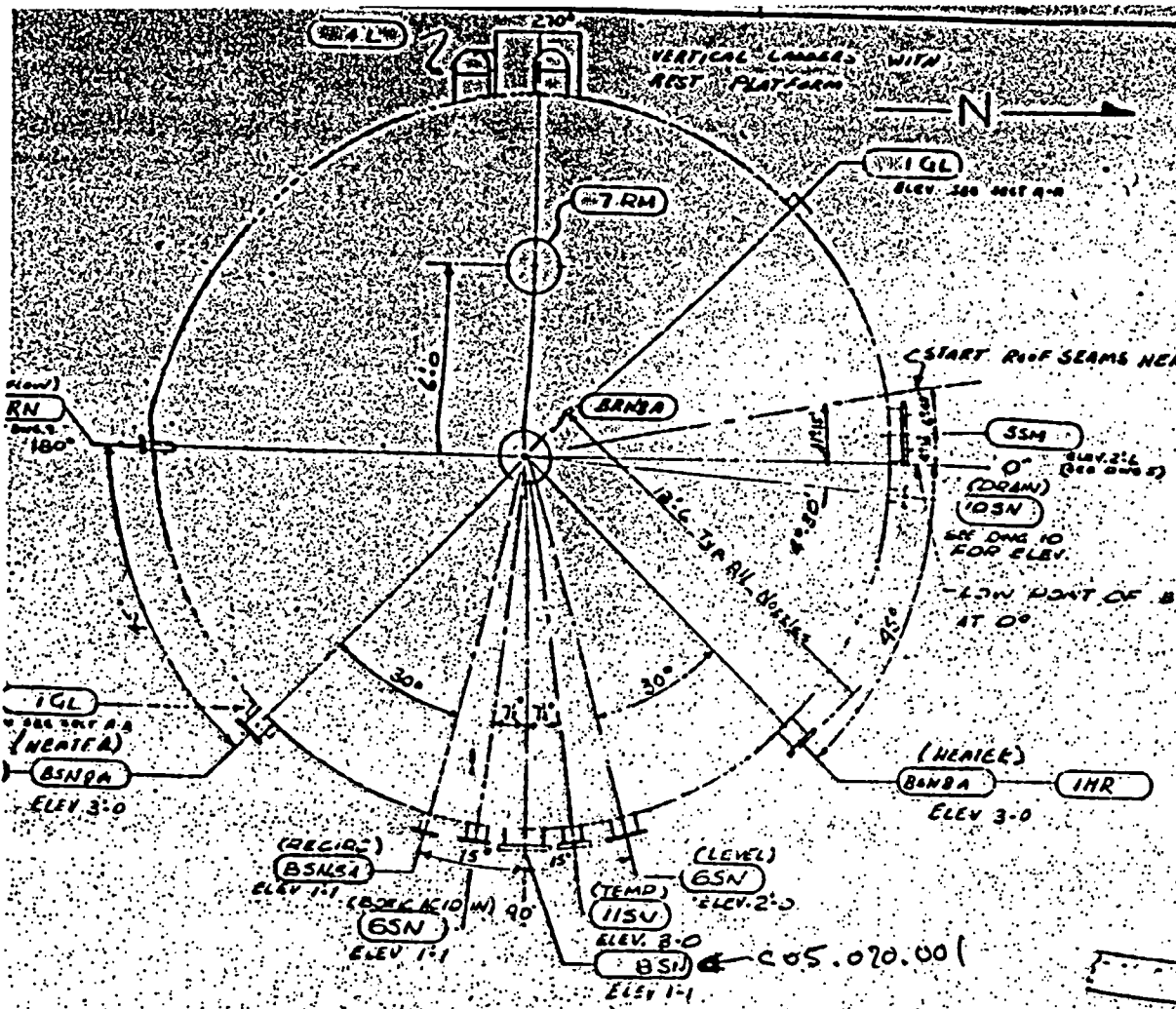
James J. McArdle (NDE Level III Examiner) provided Sections II through V and part of Section VI.

B. W. Carney, Jr. (Oconee Engineering) provided part of Section VI.

Larry C. Keith (Oconee ISI Plan Manager) compiled the remaining sections.

Sponsored By: Larry C. Keith Date 3-26-04

Approved By: R. Kevin Rhyme Date 3/26/04



**TABLE OF ARCS ON DOME SHELL**

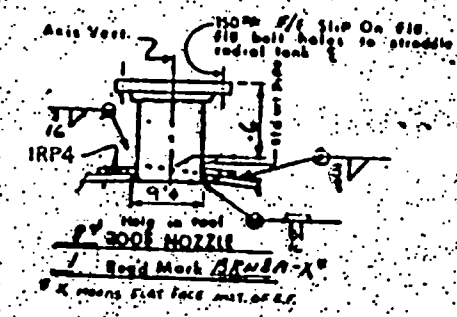
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40-30	15.44
15-15	4.85
11-15	3.67
4-5	14.11
30	9.56
40	28.36

CHORD ON INSIDE ONE SHELL PLATE: 25.52

COS. 070.00  
Slip-on Flange  
to nozzle weld

**DRAWING ACCESSORY LIST**

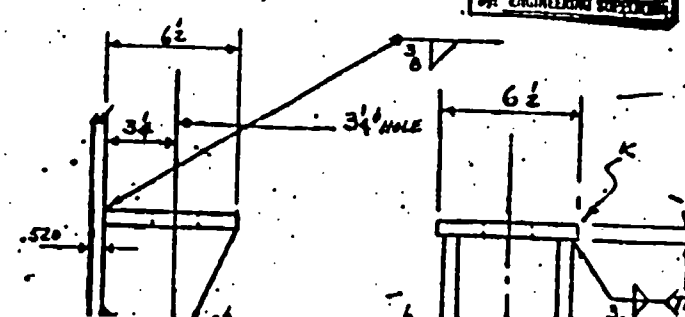
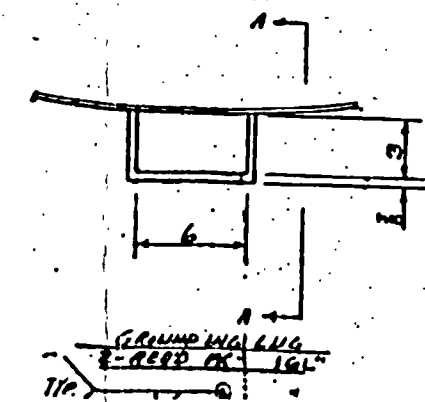
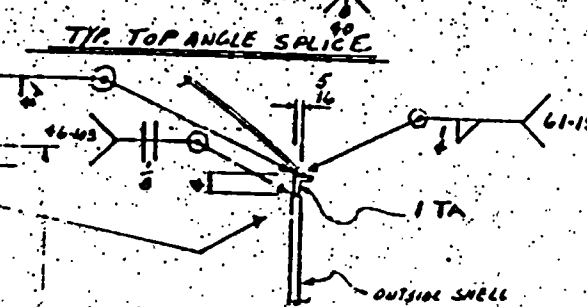
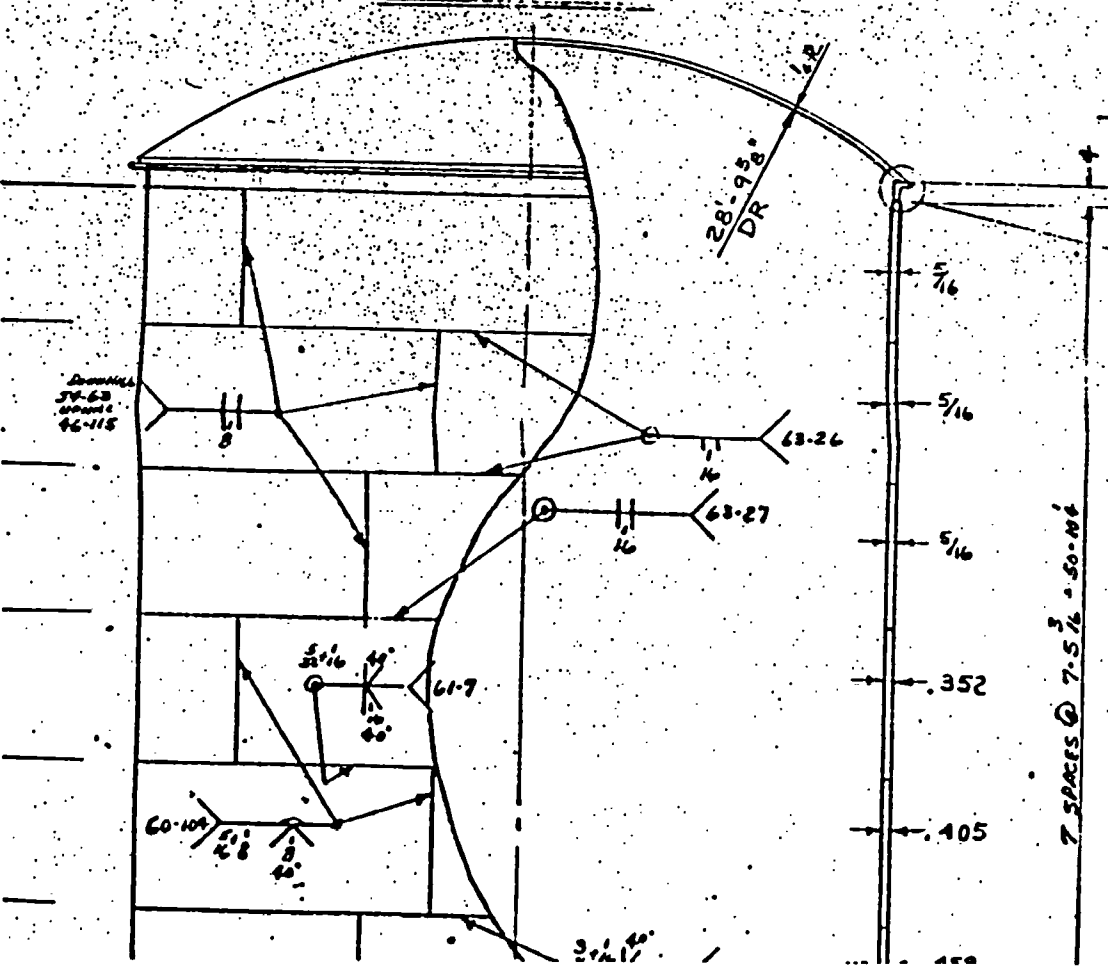
NO.	QTY.	DESCRIPTION	NO. OF PIECES	NO. OF SHEETS	NO. OF PIECES	NO. OF SHEETS
1	1	GENERAL PLAN	1	1	1	1
1	3	9" SHLL NOZZLES (MURPHY)	2	1	1	1
1	1	8" ROOF VENT NOZZLE	1	1	1	1
2	1	BOTTOM PLAN	1	1	1	1
3	1	ROOF PLAN	1	1	1	1
4	1	OUTSIDE LADDER & PLATFORM	10	1	1	1
5	1	30" SHLL MANHOLE	2	1	1	1
6	2	1" SHLL NOZZLE (BAND LEVEL)	1	1	1	1
7	1	30" ROOF MANHOLE	1	1	1	1
8	1	14" SHLL NOZZLE (ANCHOR)	3	1	1	1
9	39	ANCHOR BRACKETS	3	1	1	1
10	1	2" SHLL NOZZLES	1	1	1	1
11	1	8" OVERFLOW NOZZLE	2	1	1	1
12	1	4" BOTTOM NOZZLE (DRAW)	1	1	1	1
13	1	39	1	1	1	1
14	1	39	1	1	1	1
15	1	78	1	1	1	1



**GENERAL NOTES (CONT.)**  
14. Reference calculation #03C-1879 for design data and qualification of these tanks.

- GENERAL**
- One (1) sloping flat bottom, dome roof tank fabricated and erected by ADM according to and under supervision of ADM.
  - THE MATERIALS OF CONSTRUCTION SHALL BE: (a) PLATE: A285 GRC (MIL 71) (b) PIPE: A53 GR B (MIL 32) (c) FLANGES: A53 GR B (MIL 32) (d) STRUCTURAL: A36 (MIL 32) (e) BOLT: A36 (MIL 32) (f) BOLT NUT: A36 (MIL 32)
  - DESIGN CRITERIA: (a) PRESSURE: HIGH WATER LEVEL PLUS 10 FT. (b) TEMPERATURE: 170° F. (c) CORROSION ALLOWANCE: 1/8 IN. (d) WIND LOAD: 40 PSF (e) WIND WAVE LOAD: 40 PSF (f) TANK WEIGHT: 100,000 LB. (g) SEISMIC LOAD: 0.15 G (h) SEISMIC ACC. 15% OF SEA
  - ALL SHELL BUTT WELDS SHALL HAVE 100% INSPECTION OF SHELL BUTT WELDS SHALL BE ACCORDING TO AWS A-D10.67 CODE, SUB 3.
  - ROOF AND BOTTOM SEAMS SHALL BE TESTED BY METHOD ACCORDING TO PROVISIONS TO SEC.
  - AFTER COMPLETION THE TANK SHALL BE FILLED TO THE HIGH WATER LI. CONNECTED, PUMPED INTO TANK AND DIS.
  - FOUNDATION LOADS: (a) TANK WEIGHT (EMPTY) (See Note 14) (b) TANK WEIGHT (FULL) (c) TANK VOLUME 31,912
  - ALL INTERIOR TANK WELDS SHALL BE GRINDING INTERIOR PROJECTIONS AND CORNERS SHALL BE BOLT HOLES IN SHELL NOZZLE FLANGES: BOLT HOLES IN ROOF NOZZLE FLANGES:
  - INSIDE TANK COATING SHALL BE PAINT TO PAINT SPECIFICATION SECT P-1.
  - IN CASE SECTION PROBLEMS ARISE SUCH AS THE P-PM FIELD FORHMAN SHALL CC MR CITY STATE
  - DESIGN FORCES: (See Note 14) (a) DEAD LOAD AT SHELL 1200 (b) LIVE LOAD ON BOTTOM PLATE 30 (c) WIND LOAD (TORNADO) 5,740 (d) EARTHQUAKE 28,220

**APPROVED**  
DUKE POWER CO.  
DATE OCT 3 1990  
T. H. WOOD  
CHIEF ENGINEER  
BY: ENGINEERING SUPERVISOR



**RECEIVED**  
MILITARY



<b>DUKE POWER COMPANY</b>										Exam Start: 1129		Form NDE-UT-2A		
<b>ULTRASONIC EXAMINATION DATA SHEET FOR PLANAR REFLECTORS</b>										Exam Finish: 1146		Revision 4		
Station: Ocone			Unit: 2		Component/Weld ID: 2-PZR-WP45						Date: 10/23/2002			
Weld Length (in.): 14.1			Surface Condition: FLUSH			Lo: 9.1.1.1		Surface Temperature: <u>84</u> ° <u>F</u>						
Examiner: James L. Panel <i>[Signature]</i>			Level: II		Scans: 45 <input checked="" type="checkbox"/> <u>72</u> dB    70 <input type="checkbox"/> _____ dB 45T <input type="checkbox"/> _____ dB    70T <input type="checkbox"/> _____ dB 60 <input type="checkbox"/> _____ dB 60T <input type="checkbox"/> _____ dB Other: <u>35° - 61</u> dB					Pyrometer S/N: <u>MCNDE 27228</u>				
Examiner: Marion T. Weaver <i>[Signature]</i>			Level: II							Cal Due: <u>12/12/2002</u>				
Procedure: NDE-610    Rev: 4			FC: *							Configuration: <u>NOZZLE TO SAFE END</u>				
Calibration Sheet No: 0202068, 0202069										<u>Flow</u> <u>NOZZLE</u> to <u>SAFE END</u> Scan Surface: <u>OD</u> Applies to NDE-680 only Skew Angle:				

IND #	<input checked="" type="checkbox"/>	Max % Ref	Mp Max	W Max	L Max	L1	L2	W1	Mp1	W2	Mp2	Beam Dir.	Exam Surf.	Scan	Damps
		DO NOT WRITE IN THIS SPACE				20%dac HMA	20%dac HMA	20%dac HMA	20%dac HMA	20%dac HMA	20%dac HMA		DO NOT WRITE IN THIS SPACE		
						50%dac	50%dac	50%dac	50%dac	50%dac	50%dac				
						100%dac	100%dac	100%dac	100%dac	100%dac	100%dac				
NRI	45°														

Remarks: *FC 97-01, 98-20, 01-05, 02-10			
Limitations: (see NDE-UT-4) <input checked="" type="checkbox"/> 90% or greater coverage obtained: yes <input type="checkbox"/> no <input checked="" type="checkbox"/> 98% 02-23-04			Sheet <u>1</u> of <u>3</u>
Reviewed By: <i>[Signature]</i>	Level: <u>II</u>	Date: <u>10-27-02</u>	Authorized Inspector: <i>[Signature]</i> Date: <u>10/28/02</u> Item No: B05.040.002A

REVIEWED  
 Initial ☒ Final ☐  
 AMT/DA *[Signature]*  
 Date 3/4/04  
 HSBCT

# DUKE POWER COMPANY ISI LIMITATION REPORT

FORM NDE-UT-4

Revision 1

Component/Weld ID: 2-PZR-WP45		Item No: B05.040.002A		Remarks:	
<input type="checkbox"/> NO SCAN <input type="checkbox"/> LIMITED SCAN FROM L <u>    N/A    </u> to L <u>    N/A    </u> INCHES FROM WO <u>    0    </u> to <u>    BEYOND    </u> ANGLE: <input type="checkbox"/> 0 <input type="checkbox"/> 45 <input type="checkbox"/> 60 <input type="checkbox"/> Other <u>          </u> FROM <u>    0    </u> DEG to <u>    360    </u> DEG		SURFACE <input type="checkbox"/> 1 <input type="checkbox"/> 2 BEAM DIRECTION <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> cw <input type="checkbox"/> ccw		TAPER OF NOZZLE 100% COVERAGE BY 1 SCAN FROM SAFE END SIDE.	
<input type="checkbox"/> NO SCAN <input type="checkbox"/> LIMITED SCAN FROM L <u>          </u> to L <u>          </u> INCHES FROM WO <u>          </u> to <u>          </u> ANGLE: <input type="checkbox"/> 0 <input type="checkbox"/> 45 <input type="checkbox"/> 60 <input type="checkbox"/> Other <u>          </u> FROM <u>          </u> DEG to <u>          </u> DEG		SURFACE <input type="checkbox"/> 1 <input type="checkbox"/> 2 BEAM DIRECTION <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> cw <input type="checkbox"/> ccw			
<input type="checkbox"/> NO SCAN <input type="checkbox"/> LIMITED SCAN FROM L <u>          </u> to L <u>          </u> INCHES FROM WO <u>          </u> to <u>          </u> ANGLE: <input type="checkbox"/> 0 <input type="checkbox"/> 45 <input type="checkbox"/> 60 <input type="checkbox"/> Other <u>          </u> FROM <u>          </u> DEG to <u>          </u> DEG		SURFACE <input type="checkbox"/> 1 <input type="checkbox"/> 2 BEAM DIRECTION <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> cw <input type="checkbox"/> ccw			
<input type="checkbox"/> NO SCAN <input type="checkbox"/> LIMITED SCAN FROM L <u>          </u> to L <u>          </u> INCHES FROM WO <u>          </u> to <u>          </u> ANGLE: <input type="checkbox"/> 0 <input type="checkbox"/> 45 <input type="checkbox"/> 60 <input type="checkbox"/> Other <u>          </u> FROM <u>          </u> DEG to <u>          </u> DEG		SURFACE <input type="checkbox"/> 1 <input type="checkbox"/> 2 BEAM DIRECTION <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> cw <input type="checkbox"/> ccw			
Prepared By: <u>Marion T. Weaver</u> Level: <u>II</u> Date: <u>10/23/02</u>		Sketch(s) attached <input type="checkbox"/> yes <input checked="" type="checkbox"/> no Sheet <u>2</u> of <u>3</u>			
Reviewed By: <u>Gay Moss</u> Date: <u>10-27-02</u>		Authorized Inspector: <u>[Signature]</u> Date: <u>10/28/02</u>			



DUKE POWER COMPANY  
UT PROFILE/PLOT SHEET

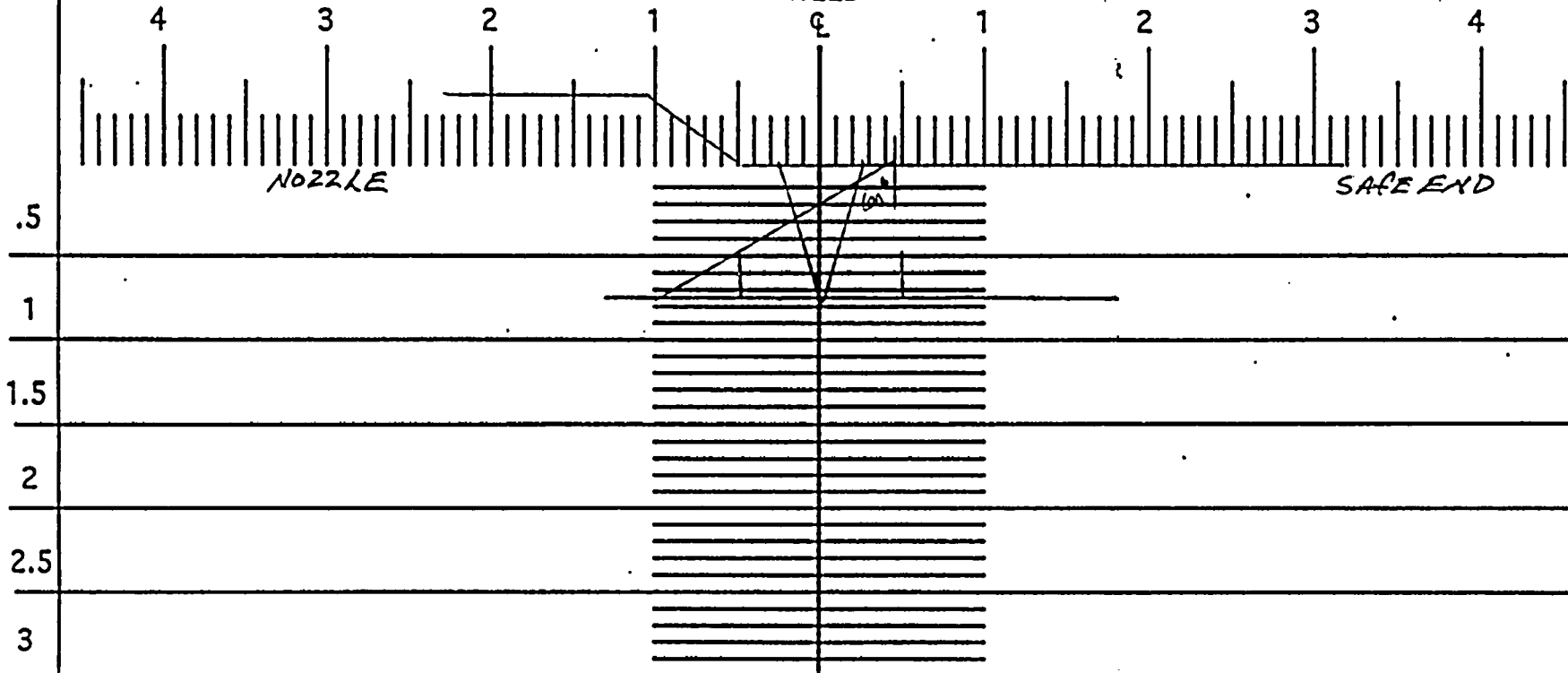
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

WELD

EXAMINATION SURFACE 2



Component ID/Weld No. 2-PZR-WP45

Remarks: 100% coverage from Surface 2 side  
1 sided SCAN

75% coverage Aggregate. JPM 02-23-04

Item No: B05.040.002A

Examiner: Mark T. Weaver

Level: II

Date: 10/23/02

Reviewed By: Nay/Mor

Level: #

Date: 10-27-02

Authorized Inspector: [Signature]

Date: 10/28/02

REVIEWED  
Initial ☐ Final ☒  
ANN'D Date 8/4/04  
HSBCT

270

Profile taken  
at: \_\_\_\_\_

90

180 Sheet 3 of 3

**DUKE POWER COMPANY**  
**ULTRASONIC INDICATION RECORD FOR PIPING**

FORM NDE-UT-10

Revision 0

Station: Oconee		Unit: 2		Component/Weld ID: 2LP-189-15				Date: 10/23/2002				
Surface Condition: GROUND		Item No: B09.011.005										
Examiner: Jay A. Eaton		Level: III		Procedure: NDE-600		Rev: 14		FC: 02-16 02-15				
Examiner: Gayle E. Houser		Level: III		Lo: 9.1.1.1		Configuration:		CIRC.				
Calibration Sheet No: 0202066, 0202067				S2 VALVE		to S1 PIPE		Scan Surface: OD				
IND #		% FSH	Mp Max	W Max	L Max	L1 20 % FSH	L2 20 % FSH	Beam Dir.	Exam Surf.	Scan	Damps	Remarks
1	60°	159	1.8	1.6	RT3	360	INT.	2	1	AXIAL	NO	
2	60°L	141	2.0	.800	RT2	360	INT.	2	1	AXIAL	NO	

Attachment C  
Page 4 of 59

Reviewed By: <i>Gayle Moss</i>	Level: <i>II</i>	Date: 10-23-02	Authorized Inspector: <i>[Signature]</i>	Date: 10/25/02	Sheet 1 of 6
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DUKE POWER COMPANY  
UT PROFILE/PLOT SHEET

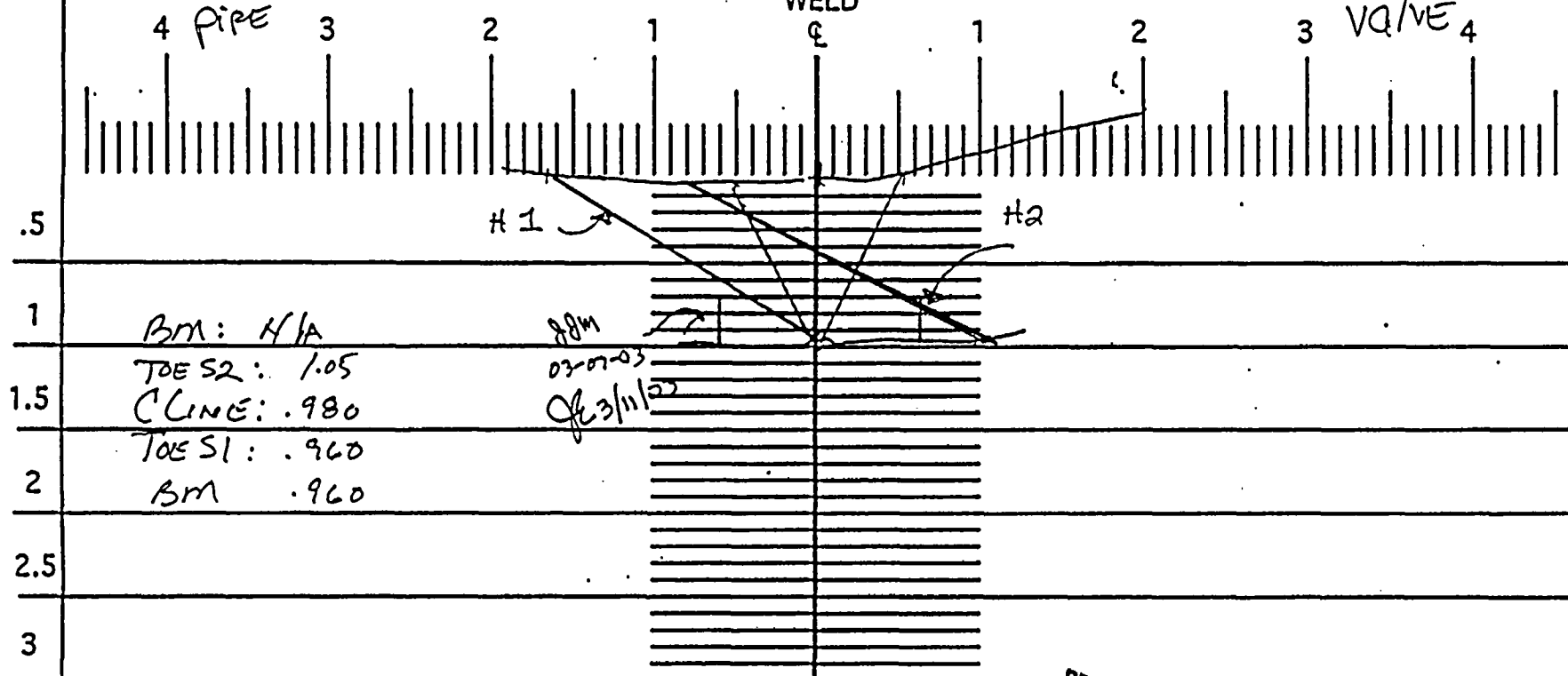
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

EXAMINATION SURFACE 2

WELD



Component ID/Weld No. 2LP-189-15

: Remarks:

Note: Thickness Readings per B&W Past data  
62.575% Aggregate Coverage 88m 02-23-04  
100% COVERAGE PER NDE 91 88m 02-23-04

Item No: 609.011.005

Examiner: DE Houser

Level: III

Date: 10/23/02

Reviewed By: Gay Moss

Level: II

Date: 10-24-02

Authorized Inspector: [Signature]

Date: 11/25/02

REVIEWED  
Initial ☒ Final ☐  
ANN'D Date 3/4/04  
HSBCT

270

Profile taken  
at: 180°

90

180 Sheet 2 of 6

# DUKE POWER COMPANY

## ULTRASONIC INDICATION RESOLUTION SHEET

Form NDE-UT-8

Revision 1

Acceptance Standard:

Serial # 46788 CHS # 0202066 JFM 3-6-03 JZ 3/11/03

INDICATION #1 IS A 360° REFLECTOR DUE TO ROOT GEOMETRY. A 70° SHEAR WAVE AND WSY 70 WAS USED AS CONFIRMATION. ADDITIONAL REVIEW OF RT FILM REVEALED ROOT CONCAVITY.

INDICATION #2 IS A 360° GEOMETRIC REFLECTOR FROM THE ID TAPER DUE TO THE VALVE CONFIGURATION. MANUAL PLOTTING OF THE INDICATION SHOWS THAT IT IS ALSO OUT OF AREA OF INTEREST.

Initial <input type="checkbox"/>	Final <input checked="" type="checkbox"/>
ANII <input checked="" type="checkbox"/>	DATE 3-11-03
HSBCT	

Item No: B09.011.005

Acceptable Indications: IND. #1 & #2

Rejectable Indications: N/A

These indications have been compared with previous ultrasonic data ☒ Yes ☐ No previous data available

Examiner:	Level:	Date:	[REDACTED]	Sheet	3	of	6
Gayle E. Houser	III	10/23/2002					
Reviewer:	Level:	Date:	Authorized Inspector:	Date:			
Harry Moss	II	10-24-02	[Signature]	10/25/02			
	III	3/11/03					

# DUKE POWER COMPANY ISI LIMITATION REPORT

FORM NDE-UT-4

Revision 1

Component/Weld ID: 2LP-189-15

Item No: B09.011.005

Remarks:

☒ NO SCAN                      SURFACE                      BEAM DIRECTION  
☐ LIMITED SCAN                      ☐ 1 ☐ 2                      ☒ 1 ☐ 2 ☐ cw ☐ ccw  
 FROM L   0   to L  33.57  INCHES FROM WO   CL   to  BEYOND   
 ANGLE: ☐ 0 ☐ 45 ☒ 60 ☐ Other            FROM            DEG to            DEG

NO SCAN DUE TO VALVE CONFIGURATION BUT 100% COVERAGE OBTAINED USING MULTIPLE BEAM ANGLE DIRECTIONS.

☐ NO SCAN                      SURFACE                      BEAM DIRECTION  
☐ LIMITED SCAN                      ☐ 1 ☐ 2                      ☐ 1 ☐ 2 ☐ cw ☐ ccw  
 FROM L            to L            INCHES FROM WO            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 WO            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 WO            to             
 ANGLE: ☐ 0 ☐ 45 ☐ 60 ☐ Other            FROM            DEG to            DEG

Prepared By: [Signature] Level: III Date: 10/23/02 Sketch(s) attached ☒ yes ☐ no Sheet 4 of 6

Reviewed By: [Signature] Date: 10.24-02 Authorized Inspector: [Signature] Date: 10/25/02

DUKE POWER COMPANY  
UT PROFILE/PLOT SHEET

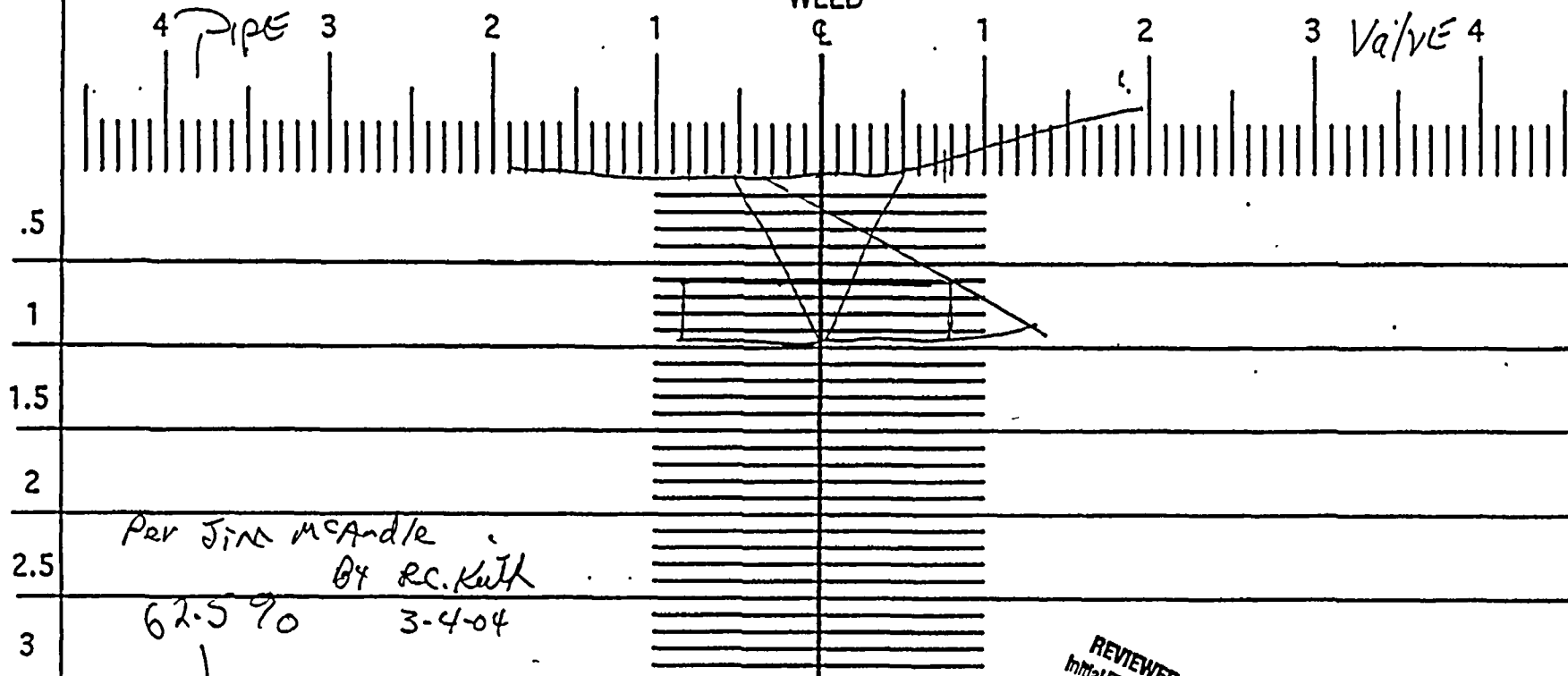
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

WELD

EXAMINATION SURFACE 2



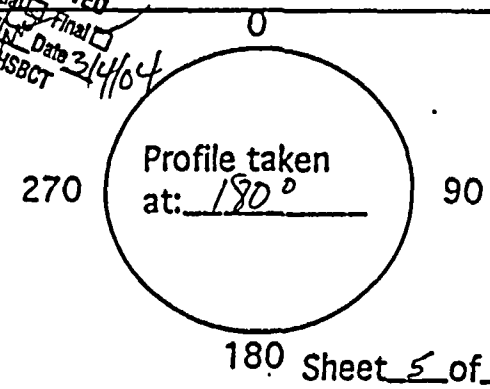
Per Jim McAule  
By R.C. Kulk  
62.5 90 3-4-04

Component ID/Weld No. 2CP-189-15  
Remarks: 100% Coverage obtained using  
3 Beam Angles: 60 Sweep SI BDZ.  
& 45° Sweep CW & CCW. A 60L was  
also used for the far side scan.

Item No: BM.011.005

Examiner: DE Jones Level: JPL Date: 10/23/02  
Reviewed By: Don Mon Level: B Date: 10-24-02  
Authorized Inspector: [Signature] Date: 10/25/02

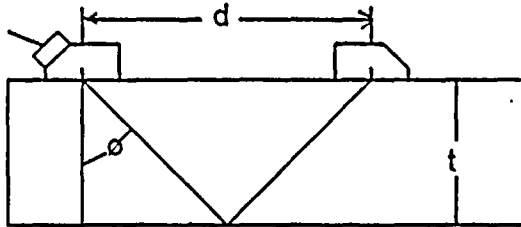
REVIEWED  
Initial ☒ Final ☒  
ANIR Date 3/4/04  
HSBCT



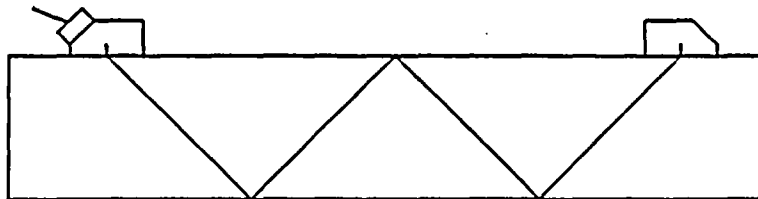
**DUKE POWER COMPANY**  
**ULTRASONIC BEAM ANGLE MEASUREMENT RECORD**

Form NDE-UT-9

Revision 3



$$\tan \phi = \frac{(d/2)}{t}$$



For thin wall pipe use 2nd Vee path

$$\tan \phi = \frac{(d/2)}{2t}$$

1. Take thickness measurements between wedge locations.
2. Place search unit on straight turn of pipe, and peak the signal.
3. Measure distance (d) between exit points.
4. Calculate beam angle with formula as shown using measured wall thickness.
5. Use the measured beam angle to determine coverage and when plotting any indications.

Pipe Size: \_\_\_\_\_ 10" \_\_\_\_\_

Pipe Schedule: \_\_\_\_\_ 1" THICK \_\_\_\_\_

Nominal 45 deg: d=   0   ; t=   0   ; measured angle=   0.00   deg

Nominal 60 deg: d=   3.46   ; t=   1   ; measured angle=   59.97   deg

Nominal 70 deg: d=   0   ; t=   0   ; measured angle=   0.00   deg

Item No.

B09.011.005

Examiner	Level	Date
Gayle E. Houser <i>Gayle E. Houser</i>	III	10/23/2002
Reviewed By	Level	Date
<i>Gayle Moss</i>	<i>G</i>	10-24-02

Examiner	Level	Date
Authorized Inspector		Date
<i>[Signature]</i>		10/25/02

<b>DUKE POWER COMPANY</b>										Exam Start: 1155		Form NDE-UT-2A	
<b>ULTRASONIC EXAMINATION DATA SHEET FOR PLANAR REFLECTORS</b>										Exam Finish: 1221		Revision 4	
Station: Oconee			Unit: 2		Component/Weld ID: 2-SGA-WG23-1						Date: 10/16/202		
Weld Length (in.): 92.0			Surface Condition: AS GROUND			Lo: 9.2.3		Surface Temperature: 109 ° F					
Examiner: David Zimmerman <i>David L. Z</i>			Level: III		Scans: 45 <input checked="" type="checkbox"/> 64.5 dB    70 <input type="checkbox"/> _____ dB 45T <input checked="" type="checkbox"/> 64.5 dB    70T <input type="checkbox"/> _____ dB 60 <input checked="" type="checkbox"/> 73.0 dB 60T <input checked="" type="checkbox"/> 73.0 dB Other: _____ dB					Pyrometer S/N: MCNDE 27227			
Examiner: Winfred C. Leeper <i>Winfred C. Leeper</i>			Level: II							Cal Due: 12/12/2002			
Procedure: NDE-820    Rev: 0			FC: N/A							Configuration: CIRC. EWLD			
Calibration Sheet No: 0202034, 0202035										S2    Flow    S1			
										NOZZLE to SHELL			
										Scan Surface: OD			
										Applies to NDE-680 only			
										Skew Angle: N/A			

IND #	Max % Ref	Mp Max	W Max	L Max	L1	L2	W1	Mp1	W2	Mp2	Beam Dir.	Exam Surf.	Scan	Damps
					20%dac HMA	20%dac HMA	20%dac HMA	20%dac HMA	20%dac HMA	20%dac HMA				
					50%dac	50%dac	50%dac	50%dac	50%dac	50%dac				
					100%dac	100%dac	100%dac	100%dac	100%dac	100%dac				
NRI	45° 60°	3/11/03												

Remarks:			
Limitations: (see NDE-UT-4) <input type="checkbox"/> 90% or greater coverage obtained: yes <input type="checkbox"/> no <input checked="" type="checkbox"/>			Sheet 1 of 5
Reviewed By: <i>Gay Moss</i>	Level: II	Date: 10-18-02	Authorized Inspector: <i>[Signature]</i> Date: 10/21/02 Item No: C02.021.001

*Gay Moss*    *III*    3/11/03    Initial ☐ Final ☒  
 ANII *[Signature]* DATE 3-11-03



# DUKE POWER COMPANY

## ISI LIMITATION REPORT

FORM NDE-UT-4

Revision 1

Component/Weld ID: 2-SGA-WG23-1

Item No: C02.021.001

Remarks:

☒ NO SCAN      SURFACE      BEAM DIRECTION  
☐ LIMITED SCAN      ☐ 1 ☒ 2      ☒ 1 ☐ 2 ☒ cw ☒ ccw  
 FROM L   N/A   to L   N/A   INCHES FROM WO    TOE    to   BEYOND    
 ANGLE: ☐ 0 ☒ 45 ☒ 60 ☐ Other    FROM   0   DEG to   360   DEG

NOZZLE CONFIGURATION

☐ NO SCAN      SURFACE      BEAM DIRECTION  
☐ LIMITED SCAN      ☐ 1 ☐ 2      ☐ 1 ☐ 2 ☐ cw ☐ ccw  
 FROM L    to L    INCHES FROM WO    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 WO    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 WO    to     
 ANGLE: ☐ 0 ☐ 45 ☐ 60 ☐ Other    FROM    DEG to    DEG

Prepared By: David K. Zimmerman *[Signature]* Level: III Date: 10/16/2002 Sketch(s) attached ☒ yes ☐ no Sheet 2 of 6

Reviewed By: *[Signature]* Date: 10-18-02 Authorized Inspector: *[Signature]* Date: 10/21/02

DUKE POWER COMPANY  
Limited Examination Coverage Worksheet

NDE-91-1

Revision 0

## Examination Volume/Area Defined

☒ Base Metal    ☒ Weld    ☐ Near Surface    ☐ Bolting    ☐ Inner Radius

## Area Calculation

2.25 IN. X 4.0 IN. = 9.0 SQ.IN.

## Volume Calculation

9.0 SQ.IN. X 92 IN. = 828 CU.IN.

## Coverage Calculations

Scan #	Angle	Beam Direction	Area Examined (sq.in.)	Length Examined (in.)	Volume Examined (cu.in.)	Volume Required (cu.in.)	Percent Coverage
1	45/60	2	9.0	92	828	828	
2	45/60	1	0.0	92	0	828	
3	45/60	CW	0.0	92	0	828	
4	45/60	CCW	0.0	92	0	828	
5	0	NA	0.0	0	0	3312	

25.00  
22.22% to JHM  
02-23-04

JHM 3/6/03 JHM 3/6/03

SINCE NO AREA WAS EXAMINED IN THE CIRCUMFERENTIAL DIRECTION, NO COVERAGE CAN BE CLAIMED (0%)

REVIEWED  
Initial ☐ Final ☒  
ANII Date 3/6/03  
HSBCTInitial ☐ Final ☒  
ANII ☒ DATE 3-7-03  
HSBCT

Item No: C02.021.001

Prepared By: Larry Mauldin

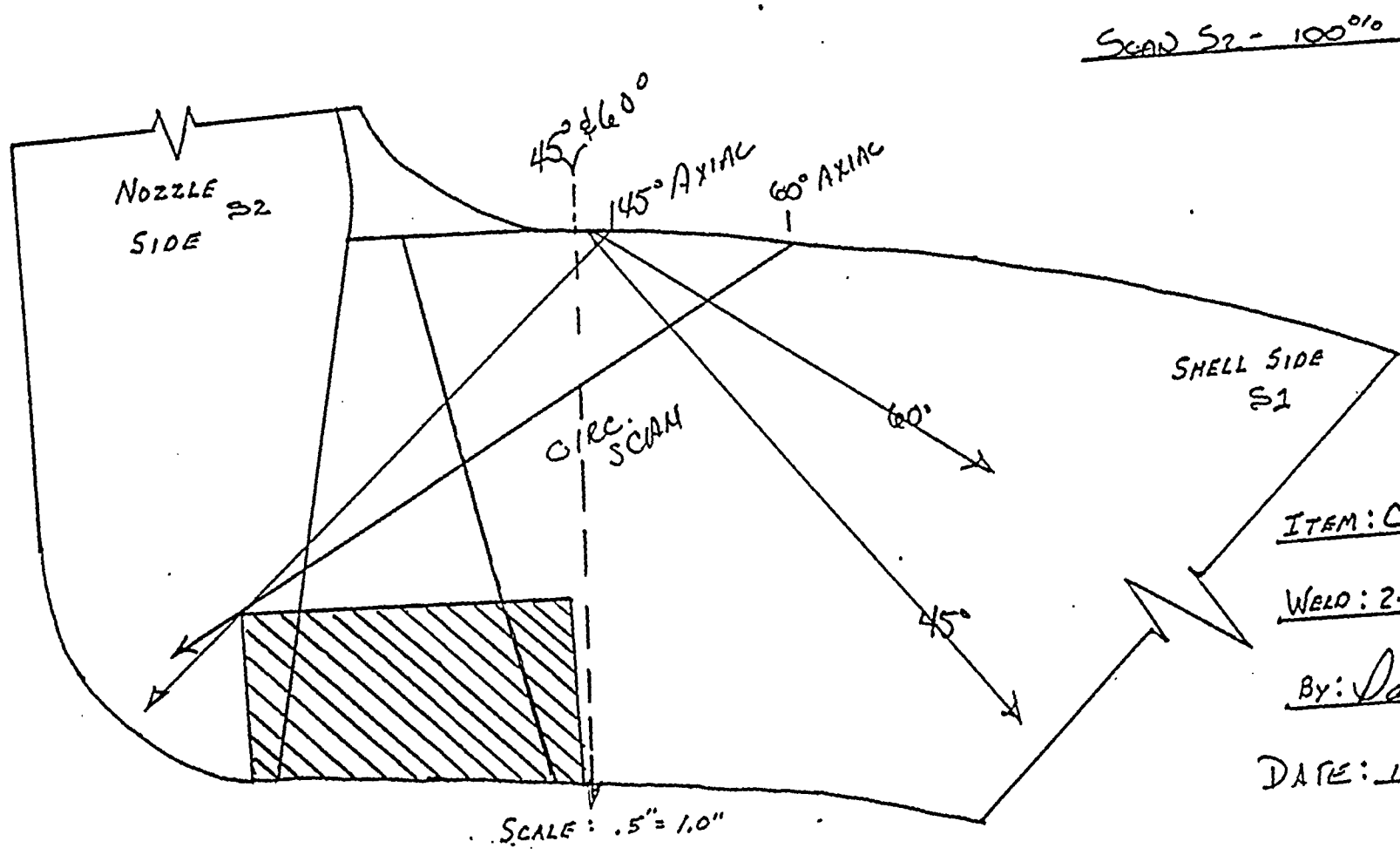
Level: II

Date: 10/16/2002

Reviewed By:

Level: III

Date: 10/18/02



SCAN S2 - 100%

ITEM: C02.021.001

WELD: 2-SGA-WG-23

By: David K. [Signature]

DATE: 10/16/02

NO COVERAGE OBTAINED - 0%

☐ FULL COVERAGE

☒ NO COVERAGE

DUKE POWER COMPANY  
Ultrasonic Beam Spread Measurement Sheet

NDE-1 6

Revision 1

W1 1.6 Mp1 2.02  
1/41 Wmax 2.0 MoMax 2.23  
W2 2.4 Mp2 2.52

W1 3.4 Mp1 4.42  
1/21 Wmax 3.7 MpMax 4.73  
W2 4.3 Mp2 5.21

W1 5.0 Mp1 6.80  
3/41 Wmax 5.6 MoMax 7.22  
W2 6.1 Mp2 7.58

CAL. BK # 40338

45° TRANSDUCER # G14819

20% BEAM SPREAD

SCALE: 1/2" = 1.0"

Calibration Sheet No:

0202034

Examiner:

David L. B.

Level:

III

Date:

10/16/02

Reviewed By:

Nancy Moss

Level:

II

Date:

10-18-02

Authorized Inspector:

[Signature]

Date:

10/21/02

Attachment C  
Page 14 of 57

**DUKE POWER COMPANY**  
**Ultrasonic Beam Spread Measurement Sheet**

NDE-06

Revision 1

W1 2.75 Mp1 2.719  
 1/41 Wmax 3.1 MpMax 3.29  
 W2 4.0 Mp2 3.84

W1 5.6 Mp1 6.02  
 1/21 Wmax 6.4 MpMax 6.96  
 W2 8.0 Mp2 8.38

W1 7.8 Mp1 8.62  
 3/41 Wmax 9.1 MpMax 9.98  
 W2 10.8 Mp2 11.45

CAL. BLK # 40338

60° TRANSDUCER # H 26790

20% BEAM SPREAD

SCALE: 1/2" = 1.0"

Calibration Sheet No:

0202035

Examiner:

*David K. S.*

Level:

III

Date:

10/16/02

Reviewed By:

*Sam Moss*

Level:

IV

Date:

10-18-02

Authorized Inspector:

*[Signature]*

Date:

11/21/02

DUKE POWER COMPANY						Exam Start: 1225		Form NDE-UT-2A	
ULTRASONIC EXAMINATION DATA SHEET FOR PLANAR REFLECTORS						Exam Finish: 1250		Revision 4	
Station: Oconee		Unit: 2	Component/Weld ID: 2-SGA-WG23-2				Date: 10/16/202		
Weld Length (in.): 92.0		Surface Condition: AS GROUND		Lo: 9.2.3		Surface Temperature: 109 ° F			
Examiner: Larry Mauldin <i>Larry Mauldin</i>		Level: II	Scans:			Pyrometer S/N: MCNDE 27227			
Examiner: James L. Panel <i>James L. Panel</i>		Level: II	45 <input checked="" type="checkbox"/> 64.5 dB 70 <input type="checkbox"/> _____ dB			Cal Due: 12/12/2002			
Procedure: NDE-820 Rev: 0		FC: N/A	45T <input checked="" type="checkbox"/> 64.5 dB 70T <input type="checkbox"/> _____ dB			Configuration: CIRC. WELD			
Calibration Sheet No: 0202037, 0202038			60 <input checked="" type="checkbox"/> 73.0 dB			S2 Flow S1			
			60T <input checked="" type="checkbox"/> 73.0 dB			NOZZLE to SHELL			
			Other: _____ dB			Scan Surface: OD			
						Applies to NDE-680 only			
						Skew Angle: N/A			

IND #	<input checked="" type="checkbox"/>	Max % Ref	Mp Max	W Max	L Max	L1	L2	W1	Mp1	W2	Mp2	Beam Dir.	Exam Surf.	Scan	Damps
NRI	45° 60° 50m 3-11-03	DO NOT WRITE IN THIS SPACE				20%dac HMA 50%dac 100%dac	20%dac HMA 50%dac 100%dac	20%dac HMA 50%dac 100%dac	20%dac HMA 50%dac 100%dac	20%dac HMA 50%dac 100%dac	20%dac HMA 50%dac 100%dac	DO NOT WRITE IN THIS SPACE			

Remarks:			
Limitations: (see NDE-UT-4) <input type="checkbox"/> 90% or greater coverage obtained: yes <input type="checkbox"/> no <input checked="" type="checkbox"/>			Sheet 1 of 56
Reviewed By: <i>Sany Moss</i>	Level: <i>II</i>	Date: 10-18-02	Authorized Inspector: <i>[Signature]</i> Date: 10/21/02
			Item No: C02.021.002

*[Signature]* III 3/11/03

Initial ☐ Final ☒  
ANII *[Signature]* DATE 3-11-03

# DUKE POWER COMPANY ISI LIMITATION REPORT

FORM NDE-UT-4

Revision 1

Component/Weld ID: 2-SGA-WG23-2

Item No: C02.021.002

Remarks:

☒ NO SCAN                      SURFACE                      BEAM DIRECTION  
☐ LIMITED SCAN                      ☐ 1 ☒ 2                      ☒ 1 ☐ 2 ☒ cw ☒ ccw  
 FROM L   N/A   to L   N/A   INCHES FROM WO    TOE    to   BEYOND    
 ANGLE: ☐ 0 ☒ 45 ☒ 60 ☐ Other    FROM   0   DEG to   360   DEG

NOZZLE CONFIGURATION

☐ NO SCAN                      SURFACE                      BEAM DIRECTION  
☐ LIMITED SCAN                      ☐ 1 ☐ 2                      ☐ 1 ☐ 2 ☐ cw ☐ ccw  
 FROM L    to L    INCHES FROM WO    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 WO    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 WO    to     
 ANGLE: ☐ 0 ☐ 45 ☐ 60 ☐ Other    FROM    DEG to    DEG

Prepared By: Larry E. Mauldin *Larry E. Mauldin*

Level: II

Date: 10/16/2002

Sketch(s) attached ☒ yes ☐ no

Sheet 2 of 5

Reviewed By: *Harry J. Moss*

Date: 10-18-02

Authorized Inspector: *[Signature]*

Date: 10/21/02

Initial ☐ Final ☒  
 ANII    DATE 3-11-03  
 HSBCT

Attachment  
Page 17 of 54

3 of 5 3/6/03

DUKE POWER COMPANY  
Limited Examination Coverage Worksheet

NDE-91-1

Revision 0

## Examination Volume/Area Defined

☒ Base Metal ☒ Weld ☐ Near Surface ☐ Bolting ☐ Inner Radius

## Area Calculation

2.25 IN. X 4.0 IN. = 9.0 SQ.IN.

## Volume Calculation

9.0 SQ.IN. X 92 IN. = 828 CU.IN.

## Coverage Calculations

Scan #	Angle	Beam Direction	Area Examined (sq.in.)	Length Examined (in.)	Volume Examined (cu.in.)	Volume Required (cu.in.)	Percent Coverage
--------	-------	----------------	------------------------	-----------------------	--------------------------	--------------------------	------------------

1	45/60	Z	9.0	92	828	828	
---	-------	---	-----	----	-----	-----	--

2	45/60	I	0.0	92	0	828	
---	-------	---	-----	----	---	-----	--

3	45/60	CW	0.0	92	0	828	
---	-------	----	-----	----	---	-----	--

4	45/60	CCW	0.0	92	0	828	
					828	3312	

25.00 %  
22.22 % JHM  
02-23

JHM 3/6/03 JHM 3/6/03

~~SINCE NO AREA WAS EXAMINED IN THE CIRCUMFERENTIAL DIRECTION, NO COVERAGE CAN BE CLAIMED (0%)~~

5	0	N/A	0	0	0	828	
---	---	-----	---	---	---	-----	--

JHM 02-23-04

REVIEWED  
Initial ☐ Final ☒  
AND Date 3/6/04  
HSBCTInitial ☐ Final ☒  
ANII ☒ DATE 3-11-03  
HSBCT

Item No: C02.021.002

Prepared By: Larry Mauldin

Level: II

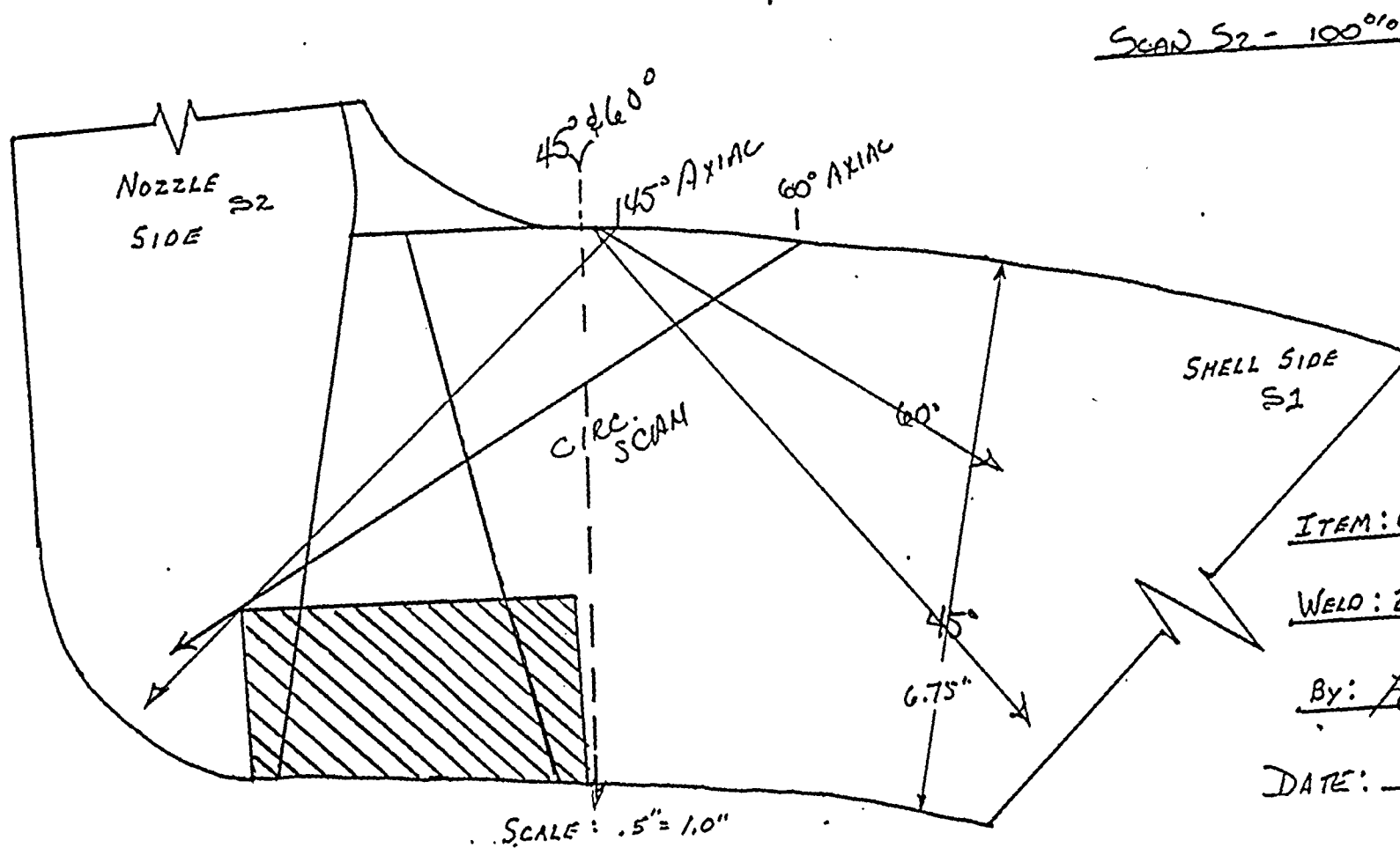
Date: 10/16/2002

Reviewed By:

Level: III

Date: 10/18/02





ITEM: C02.021.002

WELD: 2-SGA-WG.23

By: Larry Mauds

DATE: 10.16.02

NO COVERAGE OBTAINED - 0%

☐ FULL COVERAGE

☒ NO COVERAGE

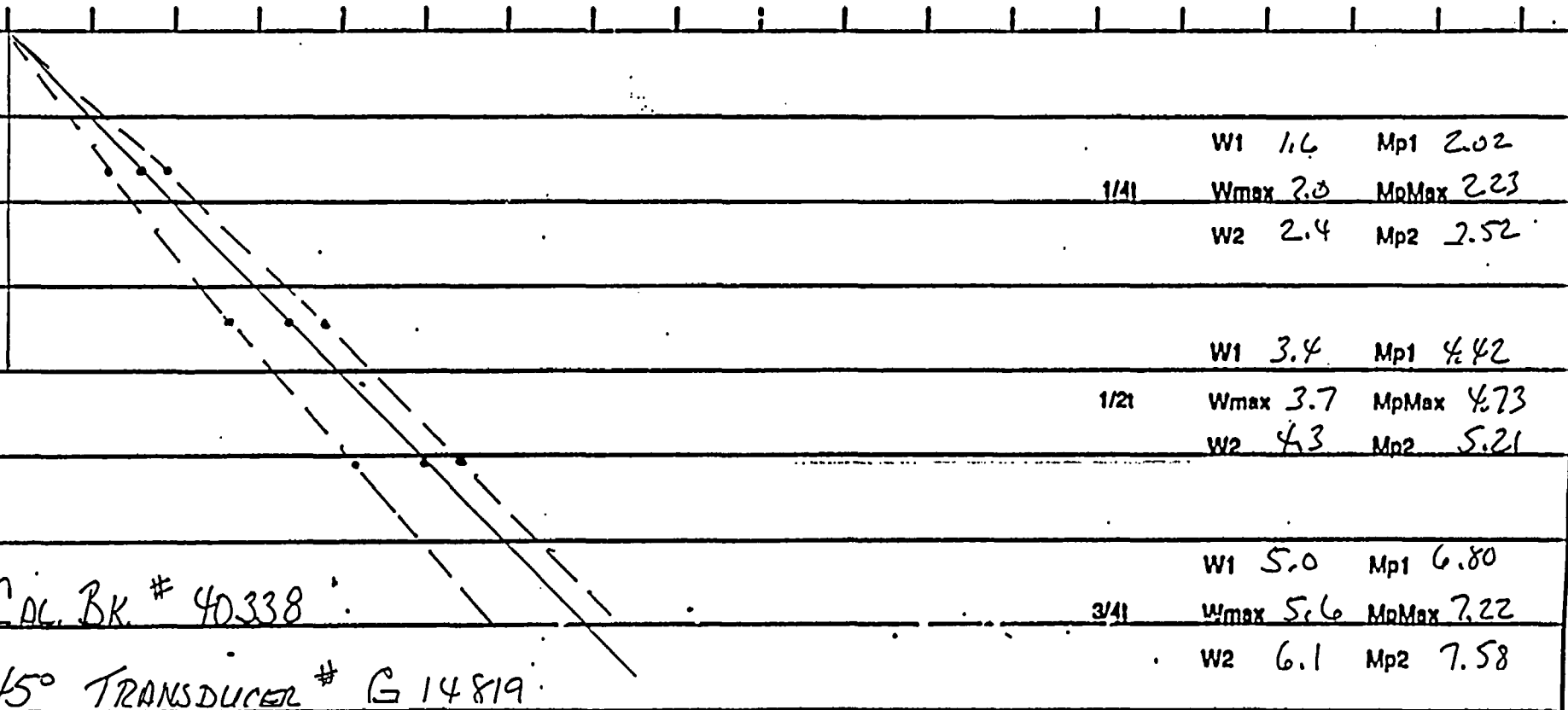
Initial ☐ Final ☒  
 ANII ☒ DATE 11-03  
 HSBCT

Attachment C  
 Page 19 of 59

6  
 4 OF 5 35.0

**DUKE POWER COMPANY**  
**Ultrasonic Beam Spread Measurement Sheet**

NDE-UT  
Revision 1



	W1	1.6	Mp1	2.02
1/41	Wmax	2.0	MpMax	2.23
	W2	2.4	Mp2	2.52
	W1	3.4	Mp1	4.42
1/21	Wmax	3.7	MpMax	4.73
	W2	4.3	Mp2	5.21
	W1	5.0	Mp1	6.80
3/41	Wmax	5.6	MpMax	7.22
	W2	6.1	Mp2	7.58

SCALE: 1/2" = 1.0"

Calibration Sheet No: 0202037

Examiner:	Level:	Date:	Reviewed By:	Level:	Date:	Authorized Inspector:	Date:
Long Maulder	II	10-16-02	Gay/Moss	D	10-18-02	[Signature]	10/21/02

Initial ☐ Final ☒  
ANII ☒ DATE 3-11-03  
HSRCT

6  
5 OF 5 PAGES  
8.803

Attachment C  
Page 2 of 57

## Ultrasonic Beam Spread Measurement Sheet

NDE-UT-3

Revision 1

W1 2.75 Mp1 2.719

1/41 Wmax 3.1 MpMax 3.29

W2 4.0 Mp2 3.84

W1 5.6 Mp1 6.02

1/21 Wmax 6.4 MpMax 6.96

W2 8.0 Mp2 8.38

CAL. BLK # 40338

60° TRANSDUCER # H26790

20% BEAM SPREAD

W1 7.8 Mp1 8.62

3/41 Wmax 9.1 MpMax 9.98

W2 10.8 Mp2 11.45

SCALE: 1/2" = 1.0"

Calibration Sheet No: 0202038

Examiner:

Level:

Date:

Reviewed By:

Level:

Date:

Authorized Inspector:

Date:

Larry Traylor

II 10-16-02

Gary Morris

D 10-18-02

[Signature]

10/21/02

<b>DUKE POWER COMPANY</b>										Exam Start: 1211		Form NDE-UT-2A		
<b>ULTRASONIC EXAMINATION DATA SHEET FOR PLANAR REFLECTORS</b>										Exam Finish: 1239		Revision 4		
Station: Ocone			Unit: 2		Component/Weld ID: 2-SGA-WG23-1						Date: 10/16/2002			
Weld Length (in.): N/A			Surface Condition: AS GROUND			Lo: 9.2.3		Surface Temperature: <u>109</u> ° <u>F</u>						
Examiner: David Zimmerman <i>David Zimmerman</i>			Level: III		Scans: 45 <input type="checkbox"/> _____ dB    70 <input checked="" type="checkbox"/> <u>75.0</u> dB 45T <input type="checkbox"/> _____ dB    70T <input checked="" type="checkbox"/> <u>75.0</u> dB 60 <input checked="" type="checkbox"/> <u>73.0</u> dB 60T <input checked="" type="checkbox"/> <u>73.0</u> dB Other: _____ dB					Pyrometer S/N: <u>MCNDE 27227</u>				
Examiner: Winfred C. Leeper <i>Winfred C. Leeper</i>			Level: II							Cal Due: <u>12/12/2002</u>				
Procedure: NDE-680			Rev: 2							Configuration: <u>INNER RADIUS</u>				
Calibration Sheet No: 0202036, 0202040			FC: *							<u>N/A</u> Flow <u>N/A</u> <u>N/A</u> to <u>N/A</u> Scan Surface: <u>OD</u> <b>Applies to NDE-680 only</b> Skew Angle:				

IND #	<input checked="" type="checkbox"/>	Max % Ref	Mp Max	W Max	L Max	L1	L2	W1	Mp1	W2	Mp2	Beam Dir.	Exam Surf.	Scan	Damps
		DO NOT WRITE IN THIS SPACE				20%dac HMA	20%dac HMA	20%dac HMA	20%dac HMA	20%dac HMA	20%dac HMA		DO NOT WRITE IN THIS SPACE		
						50%dac	50%dac	50%dac	50%dac	50%dac	50%dac				
						100%dac	100%dac	100%dac	100%dac	100%dac	100%dac				
NRI															

Remarks: * 02-03, 02-08				
Limitations: (see NDE-UT-4) <input type="checkbox"/> 90% or greater coverage obtained: yes <input type="checkbox"/> no <input checked="" type="checkbox"/>				Sheet <u>1</u> of <u>4</u>
Reviewed By:	Level:	Date:	Authorized Inspector:	Date:
<i>Gay Moss</i>	<i>B</i>	<i>10-18-02</i>	<i>Colin Smith</i>	<i>10/21/02</i>
Item No:				C02.022.001

2002

<b>DUKE POWER COMPANY</b> <b>Limited Examination Coverage Worksheet</b>						NDE-91-1 Revision 0	
<b>Examination Volume/Area Defined</b>							
<input type="checkbox"/> Base Metal <input type="checkbox"/> Weld <input type="checkbox"/> Near Surface <input type="checkbox"/> Bolting <input checked="" type="checkbox"/> Inner Radius							
<b>Area Calculation</b>				<b>Volume Calculation</b>			
SEE DRWG.                      18.5 SQ.IN.				18.5 SQ.IN. X 92 IN. = 1702 CU.IN.			
<b>Coverage Calculations</b>							
Scan #	Angle	Beam Direction	Area Examined (sq.in.)	Length Examined (in.)	Volume Examined (cu.in.)	Volume Required (cu.in.)	Percent Coverage
1	60/70	CW	16.3	92	1499.6	1702	
2	60/70	CCW	16.3	92	1499.6	1702	
					2999.2	3404	88.11

Item No: C02.022.001		
Prepared By: Larry Mauldin <i>Larry Mauldin</i>	Level: II	Date: 10/16/2002
Reviewed By: <i>[Signature]</i>	Level: III	Date: 10/18/02

# OCONEE JAM GENERATOR STEAM OUTLET NOZZLE

INSPECTION AREA

ABC-BDE :  $\frac{6.5" \times 6.5"}{2} - \frac{2.3" \times 2.3"}{2} = \underline{\underline{18.5 \text{ sq. in.}}}$

AREA INSPECTED

$18.5 - AFG =$   
 $18.5 - \frac{1.9 \times 2.3}{2} = \underline{\underline{16.3 \text{ sq. in.}}}$

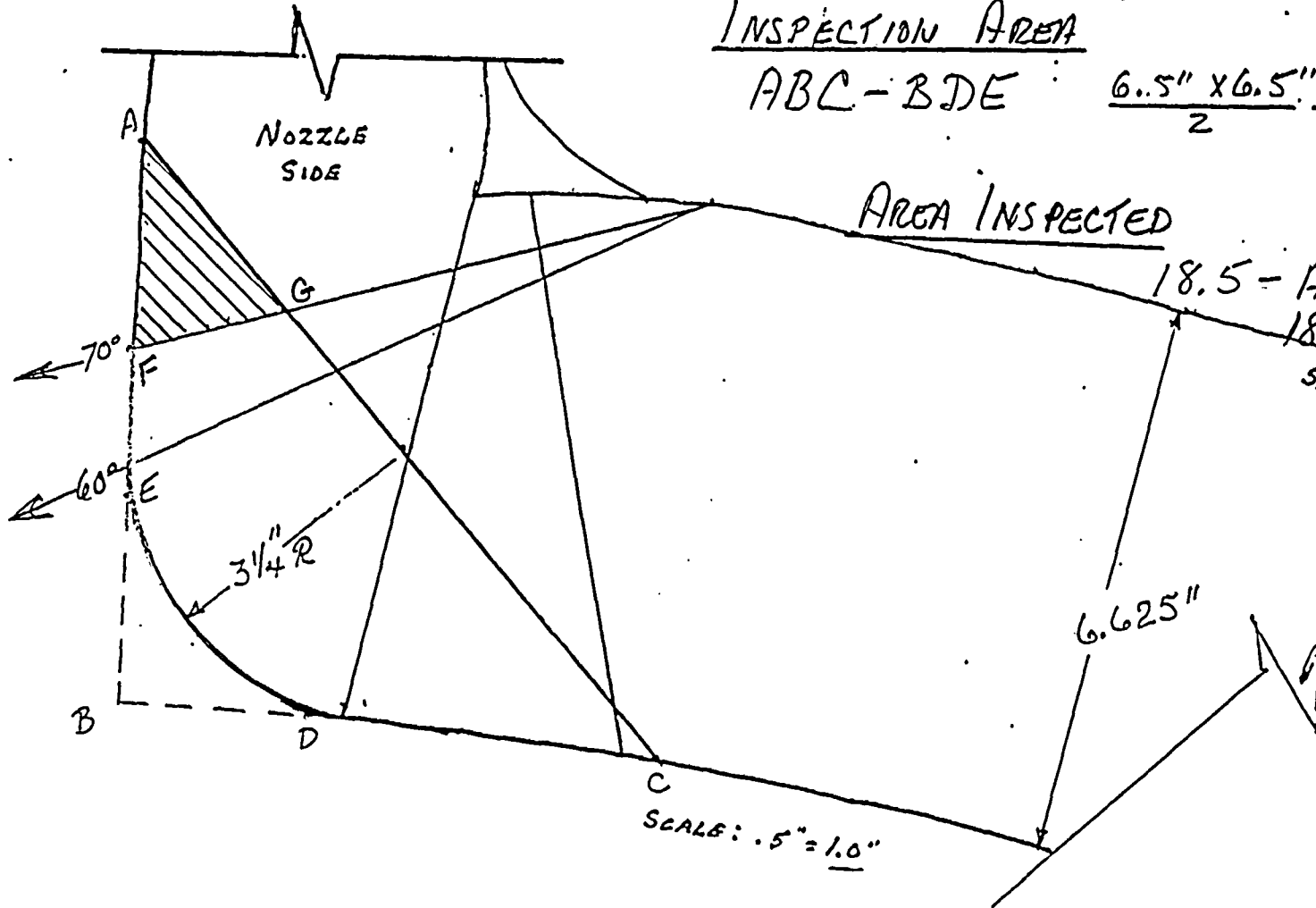
SHELL SIDE

ITEM: C02.022.001

WELD: 2-SGA-WB23-1

By: David K. B.

DATE: 10/16/2002



AREA NOT SCANNED

PERCENT OF COVERAGE

$16.3 \div 18.5 \times 100 = \underline{\underline{88.1 \%}}$

Station CRANE Unit \_\_\_\_\_ Rev. \_\_\_\_\_ File No. \_\_\_\_\_ Sheet 4 of 4  
 Subject CALCULATIONS FOR SOUND PATH DISTANCE TO I.D. SURFACE  
STEAM GEN. - STEAM OUTLET NOZZLE Date \_\_\_\_\_  
 Prob No. \_\_\_\_\_ Checked by \_\_\_\_\_ Date \_\_\_\_\_

$$Q^2 = R_2^2 + R_1^2 - 2 R_2 R_1 \cos[\sin^{-1}(R_2/R_1 \times \sin B) - B]$$

$$60^\circ$$

$$Q^2 = (75.5625)^2 + (68.9375)^2 - 2(75.5625)(68.9375) \cos[\sin^{-1}(\frac{75.5625}{68.9375} \times \sin 60) - 60]$$

$$Q^2 = 5709.6914 + 4752.3789 - 10418.18 \cos[\sin^{-1}(0.9492518) - 60]$$

$$Q^2 = 5709.6914 + 4752.3789 - 10418.18 \times 0.9793348$$

$$Q^2 = 10462.07 - 10418.18 \times 0.9793348$$

$$Q^2 = 10462.07 - 10202.886$$

$$Q^2 = 259.18377$$

$$Q = \sqrt{259.18377}$$

$$Q = 16.099185 = 16.1" \text{ SOUND PATH TO COMPONENT I.D. SURFACE}$$

$$70^\circ$$

$$Q^2 = 5709.6914 + 4752.3789 - 10418.18 \cos[\sin^{-1}(1.0299985) - 70]$$

ERROR: 70° BEAM ANGLE WILL NOT REACH THE I.D. SURFACE.  
 USED 70° TO INSPECT THE UPPER PORTION OF INSPECTION AREA.

$Q$  = SOUND PATH TO I.D.

$R_2$  = OUTSIDE RADIUS

$R_1$  =  $R_2$  - THICKNESS ( $t$ )

$t$  = THICKNESS

$B$  = REFRACTED ANGLE

16.1"

75.5625"

68.9375"

6.625"

60° & 70°

ITEM # C02.022.001

I.D. # 2-SCA-WG 23-1

BY: David J.

DATE: 10/16/02

<b>DUKE POWER COMPANY</b>										Exam Start: 1208		Form NDE-UT-2A	
<b>ULTRASONIC EXAMINATION DATA SHEET FOR PLANAR REFLECTORS</b>										Exam Finish: 1237		Revision 4	
Station: Oconee			Unit: 2		Component/Weld ID: 2-SGA-WG23-2						Date: 10/16/2002		
Weld Length (in.): N/A			Surface Condition: AS GROUND			Lo: 9.2.3		Surface Temperature: 109 ° F					
Examiner: Larry Mauldin <i>Larry Mauldin</i> Level: II			Scans: 45 <input type="checkbox"/> _____ dB    70 <input checked="" type="checkbox"/> 75.0 dB 45T <input type="checkbox"/> _____ dB    70T <input checked="" type="checkbox"/> 75.0 dB 60 <input checked="" type="checkbox"/> 73.0 dB 60T <input checked="" type="checkbox"/> 73.0 dB Other: _____ dB			Pyrometer S/N: MCNDE 27227							
Examiner: James L. Panel <i>James L. Panel</i> Level: II						Cal Due: 12/12/2002							
Procedure: NDE-680    Rev: 2    FC: *						Configuration: INNRE RADIUS							
Calibration Sheet No: 0202039, 0202041						N/A    Flow    N/A N/A    to    N/A Scan Surface: OD Applies to NDE-680 only Skew Angle:							

IND #	<i>4</i>	Max % Ref	Mp Max	W Max	L Max	L1	L2	W1	Mp1	W2	Mp2	Beam Dir.	Exam Surf.	Scan	Damps
		DO NOT WRITE IN THIS SPACE				20%dac HMA	20%dac HMA	20%dac HMA	20%dac HMA	20%dac HMA	20%dac HMA		DO NOT WRITE IN THIS SPACE		
						50%dac	50%dac	50%dac	50%dac	50%dac	50%dac				
						100%dac	100%dac	100%dac	100%dac	100%dac	100%dac				
NRI															

Remarks: * 02-03, 02-08			
Limitations: (see NDE-UT-4) <input type="checkbox"/> 90% or greater coverage obtained: yes <input type="checkbox"/> no <input checked="" type="checkbox"/>			Sheet <u>1</u> of <u>4</u>
Reviewed By: <i>Gary Moss</i>	Level: <i>5</i>	Date: <i>10-18-02</i>	Authorized Inspector: <i>[Signature]</i> Date: <i>10/21/02</i> Item No: C02.022.002

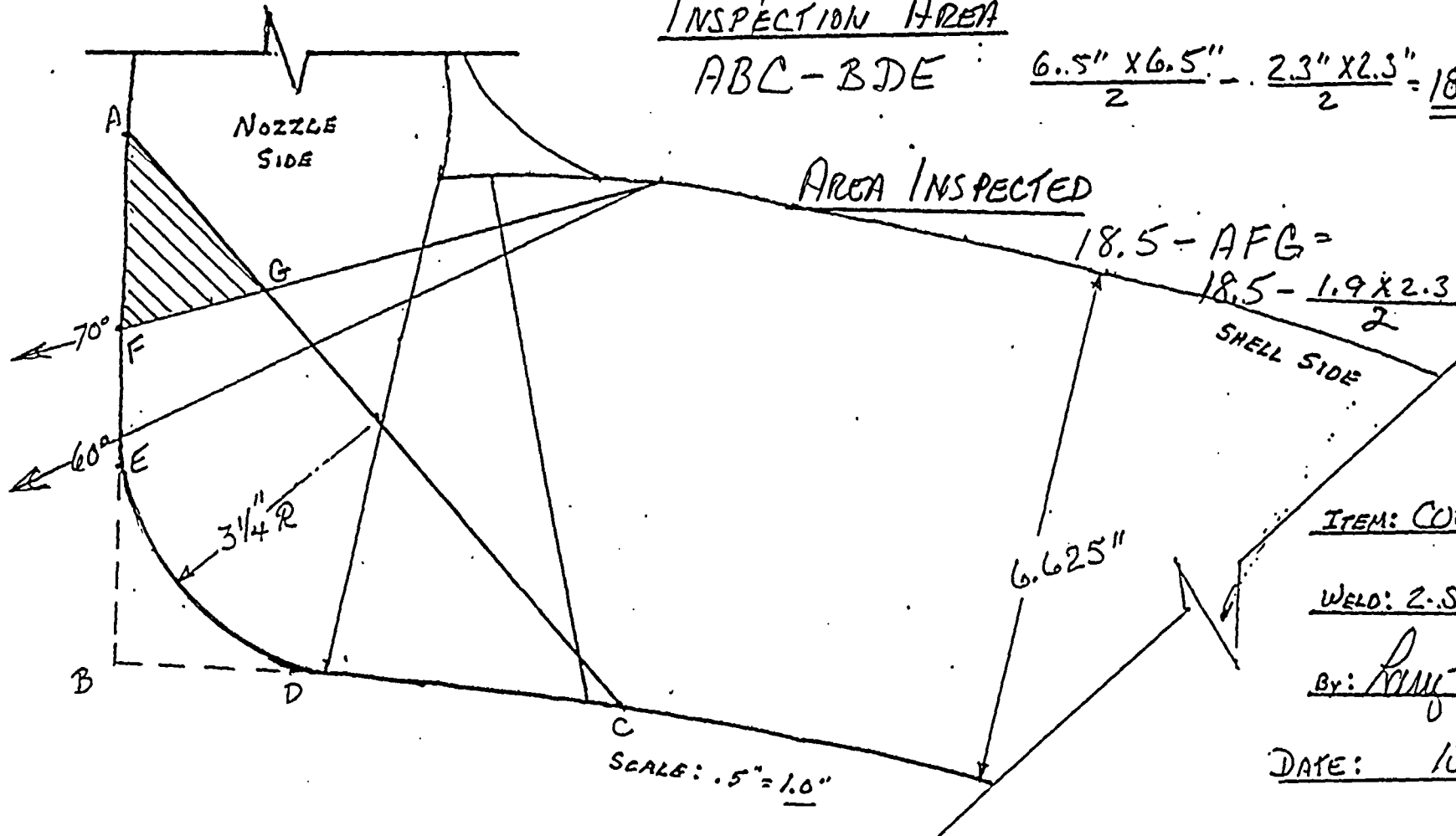


		Item No:	C02.022.002
Prepared By: Larry Mauldin	<i>Larry Mauldin</i>	Level: II	Date: 10/16/2002
Reviewed By:	<i>[Signature]</i>	Level: III	Date: 10/18/02

# O'CONNOR JAM GENERATOR STEAM OUTLET NOZZLE

INSPECTION AREA

$$ABC - BDE = \frac{6.5" \times 6.5"}{2} - \frac{2.3" \times 2.3"}{2} = \underline{\underline{18.5 \text{ sq. in.}}}$$




$$18.5 - AFG = 18.5 - \frac{1.9 \times 2.3}{2} = \underline{\underline{16.3 \text{ sq. in.}}}$$

ITEM: COZ.022.002

WELD: Z-SGA-WG23-2

By: Romy Truller

DATE: 10-16-02

 AREA NOT SCANNED

PERCENT OF COVERAGE

$$16.3 \div 18.5 \times 100 = \underline{\underline{88.1 \%}}$$

Station CRANE Unit \_\_\_\_\_ Rev. \_\_\_\_\_ File No. \_\_\_\_\_ Sheet 4 of 4  
Subject CALCULATIONS FOR SOUND PATH DISTANCE TO I.D. SURFACE  
STEAM GEN. - STEAM OUTLET NOZZLE Date \_\_\_\_\_  
Prob No. \_\_\_\_\_ Checked by \_\_\_\_\_ Date \_\_\_\_\_

$$Q^2 = R_2^2 + R_1^2 - 2 R_2 R_1 \cos[\sin^{-1}(R_2/R_1 \times \sin B) - B]$$

$$60^\circ$$
$$Q^2 = (75.5625)^2 + (68.9375)^2 - 2(75.5625)(68.9375) \cos[\sin^{-1}(\frac{75.5625}{68.9375} \times \sin 60) - 60]$$

$$Q^2 = 5709.6914 + 4752.3789 - 10418.18 \cos[\sin^{-1}(.9492518) - 60]$$

$$Q^2 = 5709.6914 + 4752.3789 - 10418.18 \times 0.9793348$$

$$Q^2 = 10462.07 - 10418.18 \times 0.9793348$$

$$Q^2 = 10462.07 - 10202.886$$

$$Q^2 = 259.18377$$

$$Q = \sqrt{259.18377}$$

$$Q = 16.099185 = 16.1" \text{ SOUND PATH TO COMPONENT I.D. SURFACE}$$

$$70^\circ$$
$$Q^2 = 5709.6914 + 4752.3789 - 10418.18 \cos[\sin^{-1}(1.0299985) - 70]$$

ERROR: 70° BEAM ANGLE WILL NOT REACH THE I.D. SURFACE.  
USED 70° TO INSPECT THE UPPER PORTION OF INSPECTION AREA.

$Q$  = SOUND PATH TO I.D.

$R_2$  = OUTSIDE RADIUS

$R_1$  =  $R_2$  - THICKNESS ( $t$ )

$t$  = THICKNESS

$B$  = REFRACTED ANGLE

16.1"

75.5625"

68.9375"

6.625"

60° & 70°

ITEM # CO2 022.002

I.D. # 2.SGA-WB23-2

BY: Russ Thaulder

DATE: 10-16-02

# Oconee Unit #2

## EOC19

### NO DATA

CALIBRATION SHEET # 0202003- 45° + 60°

# 0202008- 60° L

# \_\_\_\_\_

COMPONENT I.D.# ZLP-150-70

ITEM # C05.011.012

Initial <input type="checkbox"/>	Final <input checked="" type="checkbox"/>
ANII <u>CH</u>	DATE <u>3-11-03</u>
HSBCT	

Attachment C  
Page 30 of 59

HSBCT  
8-15-  
6  
SHEET 1 OF 11

DUKE POWER COMPANY										Exam Start: 1050		NDE-UT-3A		
ULTRASONIC EXAMINATION DATA SHEET FOR LAMINAR REFLECTORS										Exam Finish: 1054		Revision 2		
Station: Oconee			Unit: 2		Component/Weld ID: 2LP-150-70						Date: 8/5/2002			
Nominal Material Thickness (in): 1.312				Weld Length (in.): 40.1				Surface Temperature: 93 Deg F						
Measured Material Thickness (in): 1.26				Lo: 9.1.1.1				Pyrometer S/N: MCNDE 27228						
Surface Condition: AS GROUND				Calibration Sheet No: 0202002				Cal Due: 12/12/2002						
Examiner: David Zimmerman <i>David K. Z</i> Level: III								Configuration: Circ. Weld						
Examiner: James L. Panel <i>James L. Panel</i> Level: II								S2 Flow S1						
Procedure: NDE-640 Rev: 1 FC: *								VALVE to RED.						
IND NO.	4	Ampl ≥ rem BW LOB	L1 ≥ rem BW LOB	W1 ≥ rem BW LOB	Mp1 ≥ rem BW LOB	W2 ≥ rem BW LOB	Mp2 ≥ rem BW LOB	L2 ≥ rem BW LOB	W1 ≥ rem BW LOB	Mp1 ≥ rem BW LOB	W2 ≥ rem BW LOB	Mp2 ≥ rem BW LOB	Exam Surf.	Damps
NRI	0													

Remarks: * 95-18, 95-19				Limitations: see NDE-UT-4 <input checked="" type="checkbox"/> None: <input checked="" type="checkbox"/>				Sheet <u>2</u> of <u>4201 3603</u> <sup>7</sup>	
Reviewed By: <i>Gay Moss</i>		Level: II		Date: 8-7-02		Authorized Inspector: <i>J. Longmeyer</i>		Date: 8-15-02	
				Item No: C05.011.012					

Initial <input type="checkbox"/>	Final <input checked="" type="checkbox"/>
ANII <u>W</u>	DATE <u>8-11-03</u>
HSBCT	

DUKE POWER COMPANY  
UT PROFILE/PLOT SHEET

NDE-UT-5

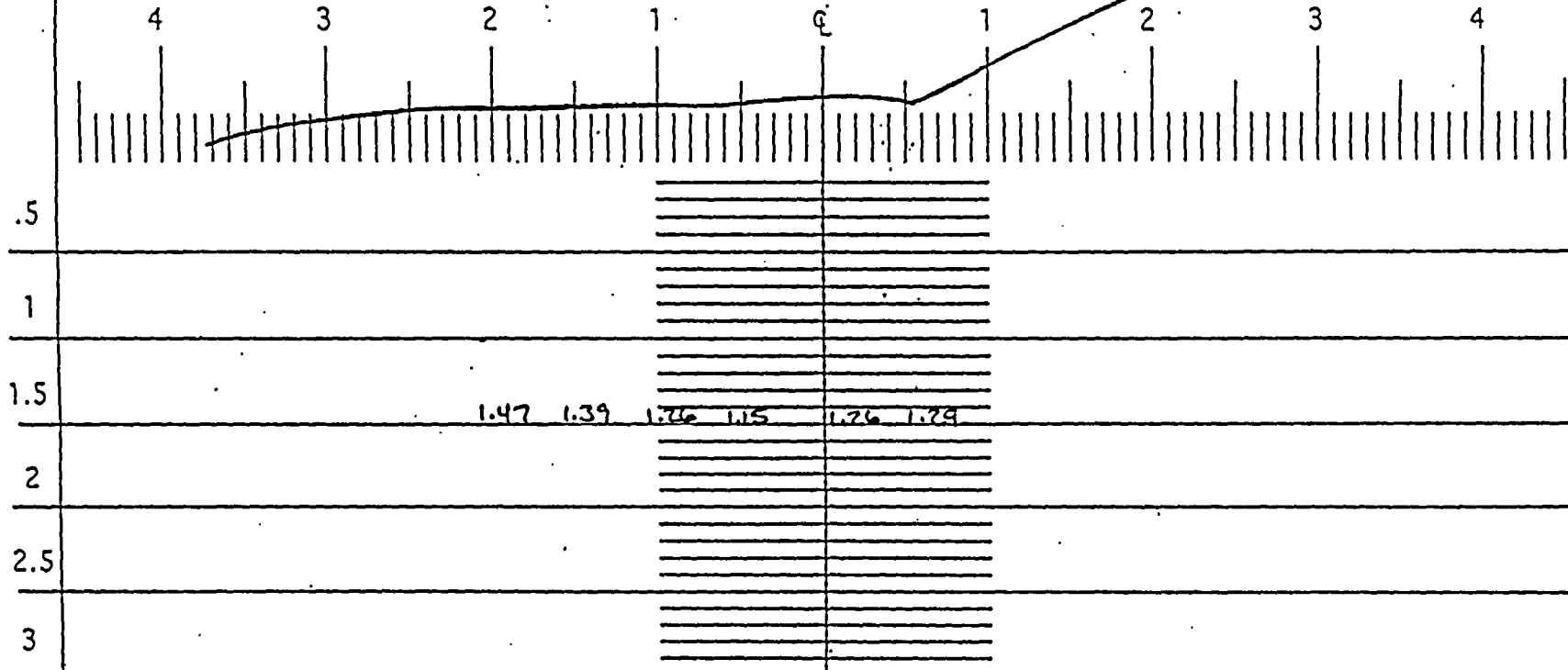
Revision 1

EXAMINATION SURFACE 1 REO.

WELD

VALVE

EXAMINATION SURFACE 2



Component ID/Weld No. 2LP-150-70

Remarks: VALVE 2LP-17

Item No: 605.011.017

Examiner: David K. B.

Level: III

Date: 8/05/02

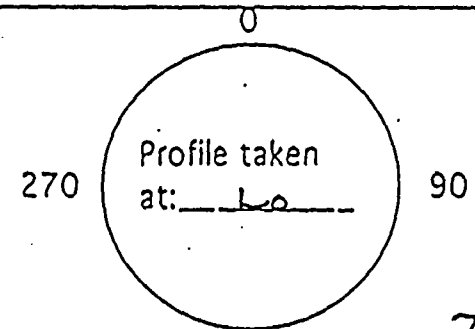
Reviewed By: David P. Moss

Level: II

Date: 8-7-02

Authorized Inspector: J. Longenbach

Date: 8-15-02



180 Sheet 3 of 4 7-603R 3-603

Attachment C  
Page 32 of 59

Initial	Final
DATE	DATE
HSBCT	HSBCT

# DUKE POWER COMPANY ISI LIMITATION REPORT

FORM NDE-UT-4

Revision 1

Component/Weld ID: 2LP-150-70

Item No: C05.011.012

Remarks:

☒ NO SCAN      SURFACE      BEAM DIRECTION  
☐ LIMITED SCAN      ☐ 1 ☒ 2      ☒ 1 ☐ 2 ☐ cw ☐ ccw  
 FROM L   N/A   to L   N/A   INCHES FROM WO   C/L   to   BEYOND    
 ANGLE: ☐ 0 ☐ 45 ☒ 60 ☐ Other        FROM   0   DEG to   360   DEG

Valve Configuration

☐ NO SCAN      SURFACE      BEAM DIRECTION  
☐ LIMITED SCAN      ☐ 1 ☐ 2      ☐ 1 ☐ 2 ☐ cw ☐ ccw  
 FROM L        to L        INCHES FROM WO        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 WO        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 WO        to         
 ANGLE: ☐ 0 ☐ 45 ☐ 60 ☐ Other        FROM        DEG to        DEG

Prepared By: David K. Zimmerman *David K. Zimmerman* Level: III Date: 8/5/2002 Sketch(s) attached ☒ yes ☐ no Sheet 4 of 4

Reviewed By: *Ray Moss* Date: 8-7-02 Authorized Inspector: *J. Longhyn* Date: 8-15-02

Initial ☐ Final ☒  
 ANII   W   DATE 8-11-02  
 HSRCT

DUKE POWER COMPANY  
UT PROFILE/PLOT SHEET

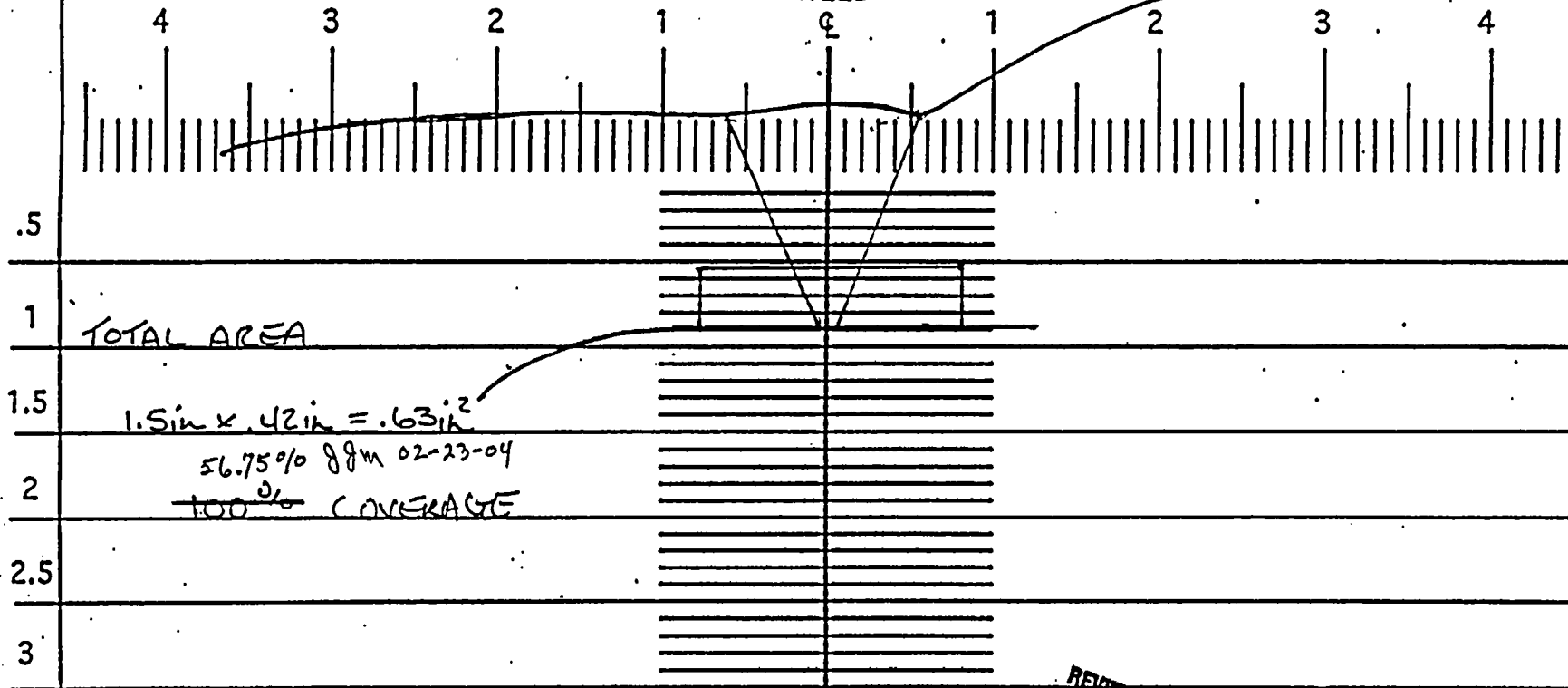
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

WELD

EXAMINATION SURFACE 2



Component ID/Weld No. 2LP-150-70

: Remarks: VALVE 2LP-17

Item No: 605.011.012

Examiner: Daniel J. [Signature]

Level: III

Date: 10/28/02

Reviewed By: [Signature]

Level: II

Date: 3-5-03

Authorized Inspector: [Signature]

Date: 3-11-03

REVIEWED  
Initial ☒ Final ☒  
ANVT Date 2/4/04  
HSBCT

270

Profile taken  
at: 60

90

180 Sheet 5 of 7



## Revision 1

**EXAMINATION SURFACE 2**



Date: 3-11-03

Profile taken  
at: 60

180 Sheet 6 of 7

DUKE POWER COMPANY  
UT PROFILE/PLOT SHEET

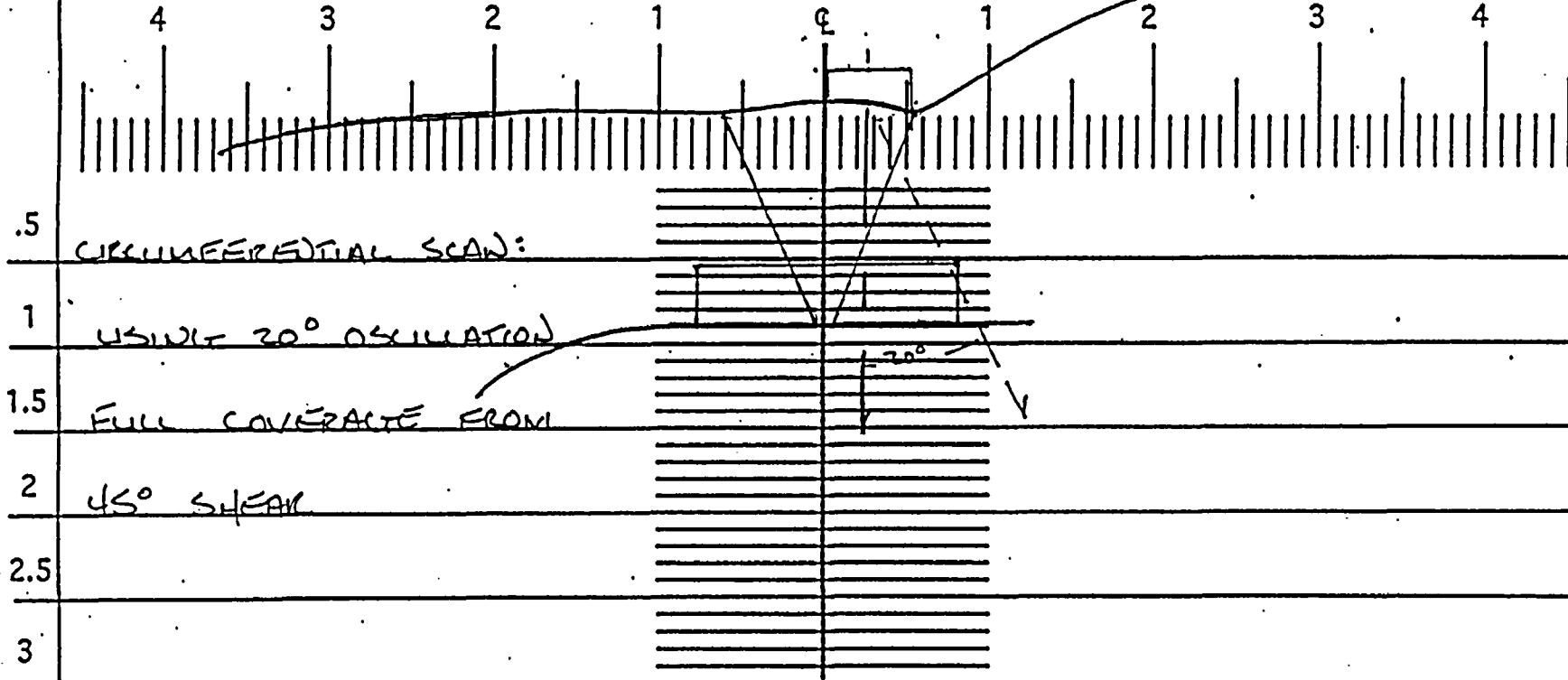
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

WELD

EXAMINATION SURFACE 2



Component ID/Weld No. 2LP-150-70

: Remarks: VALVE 2LP-17

Item No: 605.011.012

Examiner: Daniel K. 3

Level: III

Date: 10/28/02

Reviewed By: Dan/More

Level: II

Date: 3-5-03

Authorized Inspector: C. T. [Signature]

Date: 3-11-03

270

Profile taken  
at: 60

90

180 Sheet 7 of 7

# Oconee Unit #2

## EOC19

### NO DATA

CALIBRATION SHEET # 0202019 — 38° + 60°

# 0202020 — 60L

# \_\_\_\_\_

COMPONENT I.D.# 2HP-219-14

ITEM # C05.021.013

Initial <input type="checkbox"/>	Final <input checked="" type="checkbox"/>
ANII <u>11</u>	DATE <u>3-11-03</u>
HSBCT	

*[Signature]* 3/11/03

SHEET 1 OF 5

Attachment C  
Page 37 of 59

HSBCT  
*[Signature]*  
8-15-05

DUKE POWER COMPANY										Exam Start: 0920		NDE-UT-3A		
ULTRASONIC EXAMINATION DATA SHEET FOR LAMINAR REFLECTORS										Exam Finish: 0923		Revision 2		
Station: Ocone			Unit: 2		Component/Weld ID: 2HP-219-14						Date: 8/7/2002			
Nominal Material Thickness (in): 0.674				Weld Length (in.): 14.1				Surface Temperature: 91 Deg F						
Measured Material Thickness (in): .682				Lo: 9.1.1.2				Pyrometer S/N: MCNDE 27218						
Surface Condition: AS GROUND				Calibration Sheet No: 0202018				Cal Due: 12/10/2002						
Examiner: Marion T. Weaver <i>Marion T. Weaver</i> Level: II								Configuration: Circ. Weld						
Examiner: Winfred C. Leeper <i>Winfred C. Leeper</i> Level: II								S2 Flow S1						
Procedure: NDE-640 Rev: 1 FC: *								Valve to Pipe						
IND NO.		Ampl ≥ rem BW LOB	L1 ≥ rem BW LOB	W1 ≥ rem BW LOB	Mp1 ≥ rem BW LOB	W2 ≥ rem BW LOB	Mp2 ≥ rem BW LOB	L2 ≥ rem BW LOB	W1 ≥ rem BW LOB	Mp1 ≥ rem BW LOB	W2 ≥ rem BW LOB	Mp2 ≥ rem BW LOB	Exam Surf.	Damps
NRI	0													

Remarks: * 95-18, 95-19					
		Limitations: see NDE-UT-4 <input type="checkbox"/> None: <input checked="" type="checkbox"/>		Sheet <u>2</u> of <u>23</u>	
Reviewed By: <i>Harry Moss</i>		Level: <i>II</i>		Date: <i>8-12-02</i>	
		Authorized Inspector: <i>J. Longmeyer</i>		Date: <i>8-15-02</i>	
				Item No: C05.021.013	

*JKH* 3/11/03

Initial <input type="checkbox"/>	Final <input checked="" type="checkbox"/>
ANII: <i>LO</i>	DATE: <i>3-11-03</i>
HSBCT	

# DUKE POWER COMPANY ISI LIMITATION REPORT

FORM NDE-UT-4

Revision 1

Component/Weld ID: 2HP-219-14

Item No: C05.021.013

Remarks:

☒ NO SCAN      SURFACE      BEAM DIRECTION  
☐ LIMITED SCAN      ☐ 1 ☒ 2      ☐ 1 ☐ 2 ☐ cw ☐ ccw  
 FROM L   N/A   to L   N/A   INCHES FROM WO   C/L   to   BEYOND    
 ANGLE: ☐ 0 ☐ 45 ☒ 60 ☐ Other        FROM   0   DEG to   360   DEG

VALVE CONFIGURATION

☐ NO SCAN      SURFACE      BEAM DIRECTION  
☐ LIMITED SCAN      ☐ 1 ☐ 2      ☐ 1 ☐ 2 ☐ cw ☐ ccw  
 FROM L        to L        INCHES FROM WO        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 WO        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 WO        to         
 ANGLE: ☐ 0 ☐ 45 ☐ 60 ☐ Other        FROM        DEG to        DEG

Prepared By: Winfred C. Leeper *Winfred C. Leeper* Level: II Date: 8/7/2002 Sketch(s) attached ☒ yes ☐ no

Sheet 3 of 6

Reviewed By: *Gary J. Moss* Date: 8-12-02

Authorized Inspector: *J. Longmeyer* Date: 8-15-02

Initial ☐ Final ☒  
 ANII   4   DATE   5-11-03    
 HSBCT

*HS III 3/11/03*

Page 39 of 59

DUKE POWER COMPANY  
UT PROFILE/PLOT SHEET

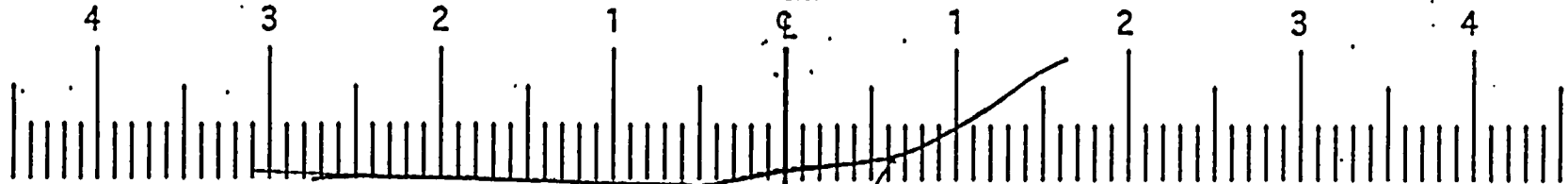
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

WELD

EXAMINATION SURFACE 2



.5

1

TOTAL AREA

1.5

$$1.5 \text{ in} \times .23 \text{ in} = .35 \text{ in}^2$$

2

2.5

37.5% gfm 02-23-04

100% COVERAGE

3

Component ID/Weld No. ZHP-219-14

Remarks:

REVIEWED  
Initial ☒ Final ☒  
ANNEX Date 3/4/04  
HSBCT

270

Profile taken  
at: 60

90

Item No: 105.021.013

Examiner: David L. B.

Level: III

Date: 10/18/02

Reviewed By: David L. B.

Level: II

Date: 3-5-03

Authorized Inspector: E. J. Smith

Date: 3-11-03

180 Sheet 4 of 6

Attachment C  
Page 4 of 59

DUKE POWER COMPANY  
UT PROFILE/PLOT SHEET

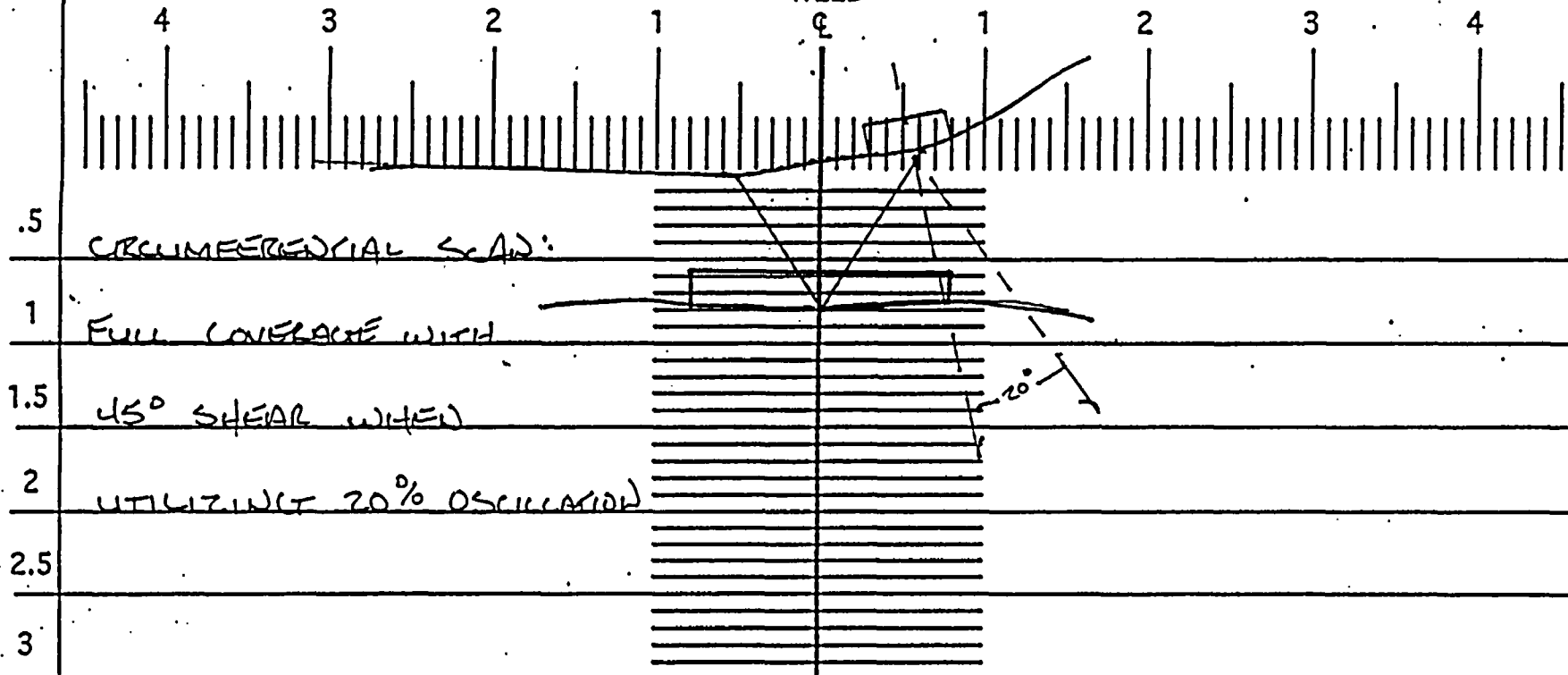
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

WELD

EXAMINATION SURFACE 2



Component ID/Weld No. 2HP-219-14

Remarks:

Item No: 105.021.013

Examiner: David K. B.

Level: TII

Date: 10/28/02

Reviewed By: David P. Moss

Level: II

Date: 3-5-03

Authorized Inspector: C. G. [Signature]

Date: 3-11-03

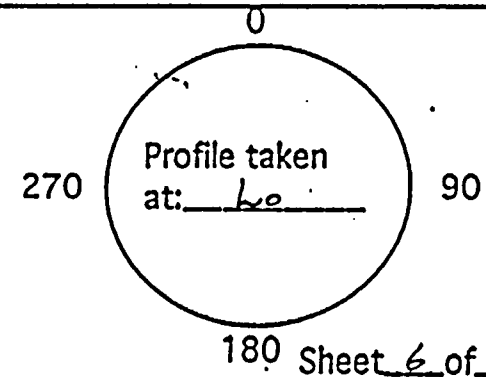
270

Profile taken  
at: 60

90

180 Sheet 5 of 6

DUKE POWER COMPANY UT PROFILE/PLOT SHEET		NDE-UT-5
		Revision 1
EXAMINATION SURFACE 1	WELD	EXAMINATION SURFACE 2
4 3 2 1	1 2 3 4	
.5		
1		
Axial Scan:		
1.5		
Full Coverage Using		
2		
60° Shear		
2.5		
3		
Component ID/Weld No. <u>2HP-219-14</u> : Remarks:    		
<div style="display: flex; justify-content: space-between;"> <div>             Examiner: <u>David K. [Signature]</u>              Reviewed By: <u>[Signature]</u>              Authorized Inspector: <u>[Signature]</u> </div> <div>             Item No: <u>105.021.013</u>              Level: <u>III</u>              Level: <u>IV</u>              Date: <u>10/28/02</u>              Date: <u>3-5-03</u>              Date: <u>3-11-03</u> </div> </div>		



180 Sheet 6 of 6



# Oconee Unit #2

## EOC19

### NO DATA

CALIBRATION SHEET # 0202024 — 45° + 60°

# 0202025 — 60°L

# \_\_\_\_\_

COMPONENT I.D.# 2HP-396-5

ITEM # 005.021.093

Initial <input type="checkbox"/>	Final <input checked="" type="checkbox"/>
ANII: <u>16</u>	DATE <u>3/1/03</u>
HSBCT	

Attachment C  
Page 43 of 59

*[Signature]* 3/1/03

HSBCT  
8-15-02  
DIRECT 1 OF 6

DUKE POWER COMPANY										Exam Start: 1424		NDE-UT-3A		
ULTRASONIC EXAMINATION DATA SHEET FOR LAMINAR REFLECTORS										Exam Finish: 1428		Revision 2		
Station: Ocone			Unit: 2		Component/Weld ID: 2HP-396-5						Date: 8/7/2002			
Nominal Material Thickness (in): 0.531				Weld Length (in.): 14.1				Surface Temperature: 107 Deg F						
Measured Material Thickness (in): .559				Lo: 9.1.1.2				Pyrometer S/N: MCNDE 27218						
Surface Condition: AS GROUND				Calibration Sheet No: 0202023				Cal Due: 12/10/2002						
Examiner: Marion T. Weaver <i>Marion T. Weaver</i> Level: II								Configuration: Circ. Weld						
Examiner: Winfred C. Leeper <i>Winfred C. Leeper</i> Level: II								S2 Flow S1						
Procedure: NDE-640 Rev: 1 FC: *								Valve to Pipe						
IND NO.		Ampl ≥ rem BW LOB	L1 ≥ rem BW LOB	W1 ≥ rem BW LOB	Mp1 ≥ rem BW LOB	W2 ≥ rem BW LOB	Mp2 ≥ rem BW LOB	L2 ≥ rem BW LOB	W1 ≥ rem BW LOB	Mp1 ≥ rem BW LOB	W2 ≥ rem BW LOB	Mp2 ≥ rem BW LOB	Exam Surf.	Damps
NRI	0													

Remarks: * 95-18, 95-19		
Limitations: see NDE-UT-4 <input type="checkbox"/> None: <input checked="" type="checkbox"/>		Sheet <u>2</u> of <u>7-6<sup>2</sup> 3-6-03</u>
Reviewed By: <i>Larry Moss</i> Level: <u>II</u> Date: <u>8-12-02</u>	Authorized Inspector: <i>J. Longmire</i> Date: <u>8-15-02</u>	Item No: C05.021.093

*John III* 3/11/03

Initial <input type="checkbox"/>	Final <input checked="" type="checkbox"/>
ANII <u>II</u>	DATE <u>3-11-03</u>
H33CT	

DUKE POWER COMPANY  
UT PROFILE/PLOT SHEET

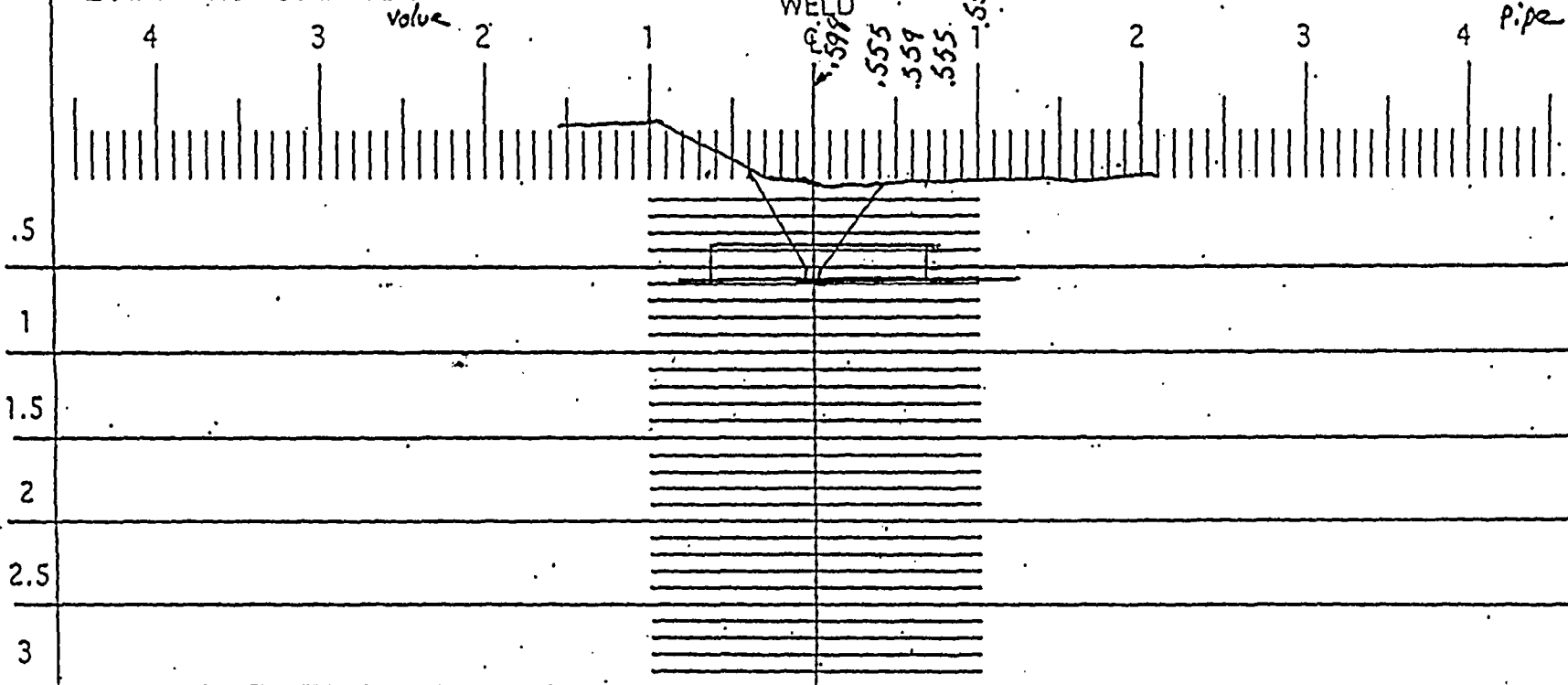
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

WELD

EXAMINATION SURFACE 2



Component ID/Weld No. 2-HP-0396-5

Remarks:

Item No: C05.021.093

Examiner: Mason T. J. Leaver

Level: II

Date: 8-7-02

Reviewed By: Ray Moss

Level: B

Date: 8-12-02

Authorized Inspector: J. Longmire

Date: 8-15-02

270

Profile taken  
at: 0

90

180 Sheet 3 of 7

Attachment C  
Page 45 of 59

Initial ☐ Final ☒  
ANII-DATE: 8-15-02  
HSBCT

# DUKE POWER COMPANY ISI LIMITATION REPORT

FORM NDE-UT-4

Revision 1

Component/Weld ID: 2HP-396-5		Item No: C05.021.093		Remarks:	
<input checked="" type="checkbox"/> NO SCAN <input type="checkbox"/> LIMITED SCAN		SURFACE <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2		BEAM DIRECTION <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> cw <input type="checkbox"/> ccw	
FROM L <u>    </u> N/A <u>    </u> to L <u>    </u> N/A <u>    </u>		INCHES FROM WO <u>    </u> C/L <u>    </u> to <u>    </u> BEYOND <u>    </u>		VALVE CONFIGURATION	
ANGLE: <input type="checkbox"/> 0 <input type="checkbox"/> 45 <input checked="" type="checkbox"/> 60 <input type="checkbox"/> Other <u>    </u>		FROM <u>    </u> 0 <u>    </u> DEG to <u>    </u> 360 <u>    </u> DEG			
<input type="checkbox"/> NO SCAN <input type="checkbox"/> LIMITED SCAN		SURFACE <input type="checkbox"/> 1 <input type="checkbox"/> 2		BEAM DIRECTION <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> cw <input type="checkbox"/> ccw	
FROM L <u>    </u> to L <u>    </u>		INCHES FROM WO <u>    </u> to <u>    </u>			
ANGLE: <input type="checkbox"/> 0 <input type="checkbox"/> 45 <input type="checkbox"/> 60 <input type="checkbox"/> Other <u>    </u>		FROM <u>    </u> DEG to <u>    </u> DEG			
<input type="checkbox"/> NO SCAN <input type="checkbox"/> LIMITED SCAN		SURFACE <input type="checkbox"/> 1 <input type="checkbox"/> 2		BEAM DIRECTION <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> cw <input type="checkbox"/> ccw	
FROM L <u>    </u> to L <u>    </u>		INCHES FROM WO <u>    </u> to <u>    </u>			
ANGLE: <input type="checkbox"/> 0 <input type="checkbox"/> 45 <input type="checkbox"/> 60 <input type="checkbox"/> Other <u>    </u>		FROM <u>    </u> DEG to <u>    </u> DEG			
<input type="checkbox"/> NO SCAN <input type="checkbox"/> LIMITED SCAN		SURFACE <input type="checkbox"/> 1 <input type="checkbox"/> 2		BEAM DIRECTION <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> cw <input type="checkbox"/> ccw	
FROM L <u>    </u> to L <u>    </u>		INCHES FROM WO <u>    </u> to <u>    </u>			
ANGLE: <input type="checkbox"/> 0 <input type="checkbox"/> 45 <input type="checkbox"/> 60 <input type="checkbox"/> Other <u>    </u>		FROM <u>    </u> DEG to <u>    </u> DEG			
Prepared By: Winfred C. Leeper		Level: II		Date: 8/7/2002	
Reviewed By: <i>Gayle Moss</i>		Date: 8-7-02		Sketch(s) attached <input checked="" type="checkbox"/> yes <input type="checkbox"/> no Date: 8-15-02	

*III* 3/11/03

Initial <input type="checkbox"/>	Final <input checked="" type="checkbox"/>
ANII <u>10</u>	DATE 8-11-03
HSBCT	

Attachment C  
Page 46 of 59

DUKE POWER COMPANY  
UT PROFILE/PLOT SHEET

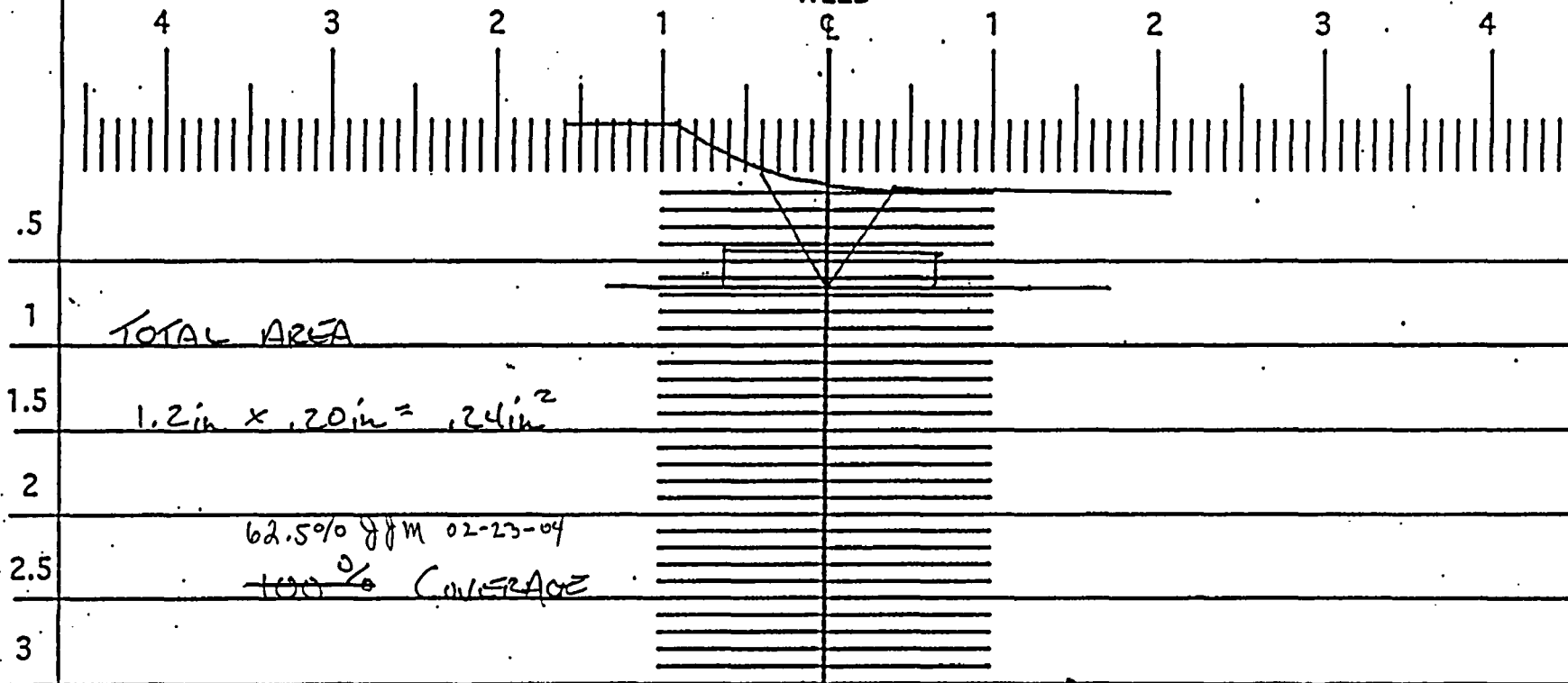
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

WELD

EXAMINATION SURFACE 2



Component ID/Weld No. ZHP-0396-S

: Remarks: VALVE ZHP-140

REVIEWED  
Initials Final  
ANIR Date 3/4/04  
HSBCT

270

Profile taken  
at: Lo

90

Item No: C05.021.093

Examiner: Daniel K. B.

Level: TL

Date: 10/18/02

Reviewed By: Rainy Mors

Level: IF

Date: 3-5-03

Authorized Inspector: E. J. S.

Date: 3-11-03

180 Sheet 5 of 7

DUKE POWER COMPANY  
UT PROFILE/PLOT SHEET

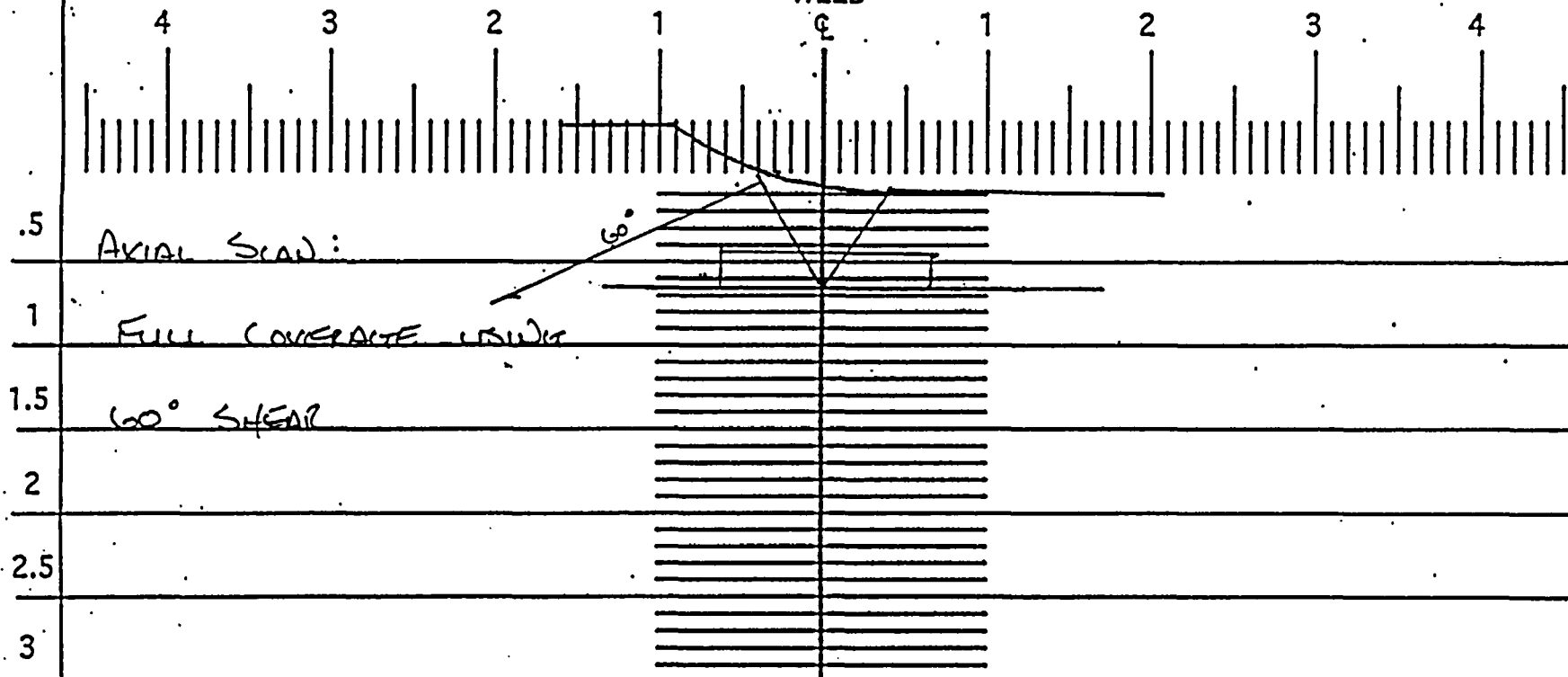
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

WELD

EXAMINATION SURFACE 2



Component ID/Weld No. 2HP-0396-5

Remarks: VALVE 2HP-140

Item No: 105.021.093

Examiner: Dennis K. 3

Level: III

Date: 10/28/02

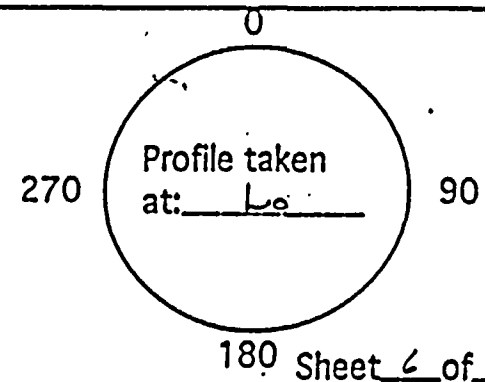
Reviewed By: Gary Moss

Level: IV

Date: 3-5-03

Authorized Inspector: C. T. Smith

Date: 3-11-03



180 Sheet 6 of 7

DUKE POWER COMPANY  
UT PROFILE/PLOT SHEET

NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

WELD

EXAMINATION SURFACE 2



.5

CIRCUMFERENTIAL SCAN:

1

FULL COVERAGE USING

1.5

45° SHEAR

2

2.5

3

Component ID/Weld No. 2HP-0396-5

Remarks: VALVE 2HP-140

Item No: 605.021.093

Examiner: David R. [Signature]

Level: TL

Date: 10/28/02

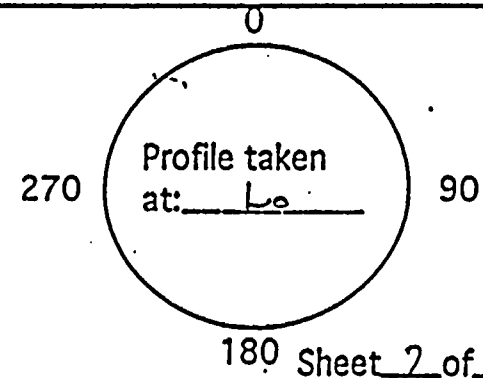
Reviewed By: John A. [Signature]

Level: IF

Date: 3-5-03

Authorized Inspector: [Signature]

Date: 3-11-05



180 Sheet 2 of 7

# Oconee Unit #2

## EOC19

### NO DATA

CALIBRATION SHEET # 0202013-45°+80°

# 0202014-60L

# \_\_\_\_\_

COMPONENT I.D.# 2HP-221-22

ITEM # C05.021.115

Initial <input type="checkbox"/>	Final <input checked="" type="checkbox"/>
ANII <input checked="" type="checkbox"/>	DATE 3/11/03
HSECT	

glt III 3/11/03  
HSECT  
8-15-02  
SHEET 10 of 20



DUKE POWER COMPANY										Exam Start: 1004		NDE-UT-3A		
ULTRASONIC EXAMINATION DATA SHEET FOR LAMINAR REFLECTORS										Exam Finish: 1008		Revision 2		
Station: Oconee			Unit: 2		Component/Weld ID: 2HP-221-22						Date: 8/7/2002			
Nominal Material Thickness (in): 0.531			Weld Length (in.): 14.1			Surface Temperature: 92 Deg F								
Measured Material Thickness (in): 0.540			Lo: 9.1.1.2			Pyrometer S/N: MCNDE 27218								
Surface Condition: AS GROUND			Calibration Sheet No: 0202015			Cal Due: 12/10/2002								
Examiner: David Zimmerman <i>David Zimmerman</i> Level: III						Configuration: Circ. Weld								
Examiner: James L. Panel <i>James L. Panel</i> Level: II						S2 Flow S1								
Procedure: NDE-640 Rev: 1 FC: *						Elbow to Valve								
IND NO.	4	Ampl ≥ rem BW LOB	L1 ≥ rem BW LOB	W1 ≥ rem BW LOB	Mp1 ≥ rem BW LOB	W2 ≥ rem BW LOB	Mp2 ≥ rem BW LOB	L2 ≥ rem BW LOB	W1 ≥ rem BW LOB	Mp1 ≥ rem BW LOB	W2 ≥ rem BW LOB	Mp2 ≥ rem BW LOB	Exam Surf.	Damps
NRI	0													

Remarks: * 95-18, 95-19					
		Limitations: see NDE-UT-4 <input type="checkbox"/> None: <input checked="" type="checkbox"/>		Sheet 2 of 2	
Reviewed By: <i>Sam Mop</i>		Level: <i>II</i> Date: <i>8-7-02</i>		Authorized Inspector: <i>J. Longmeyer</i> Date: <i>8-15-02</i>	
				Item No: C05.021.115	

*III 3/11/03*

Initial <input type="checkbox"/>	Final <input checked="" type="checkbox"/>
ANII <i>6</i>	DATE <i>3-11-03</i>
HSBCT	

DUKE POWER COMPANY  
UT PROFILE/PLOT SHEET.

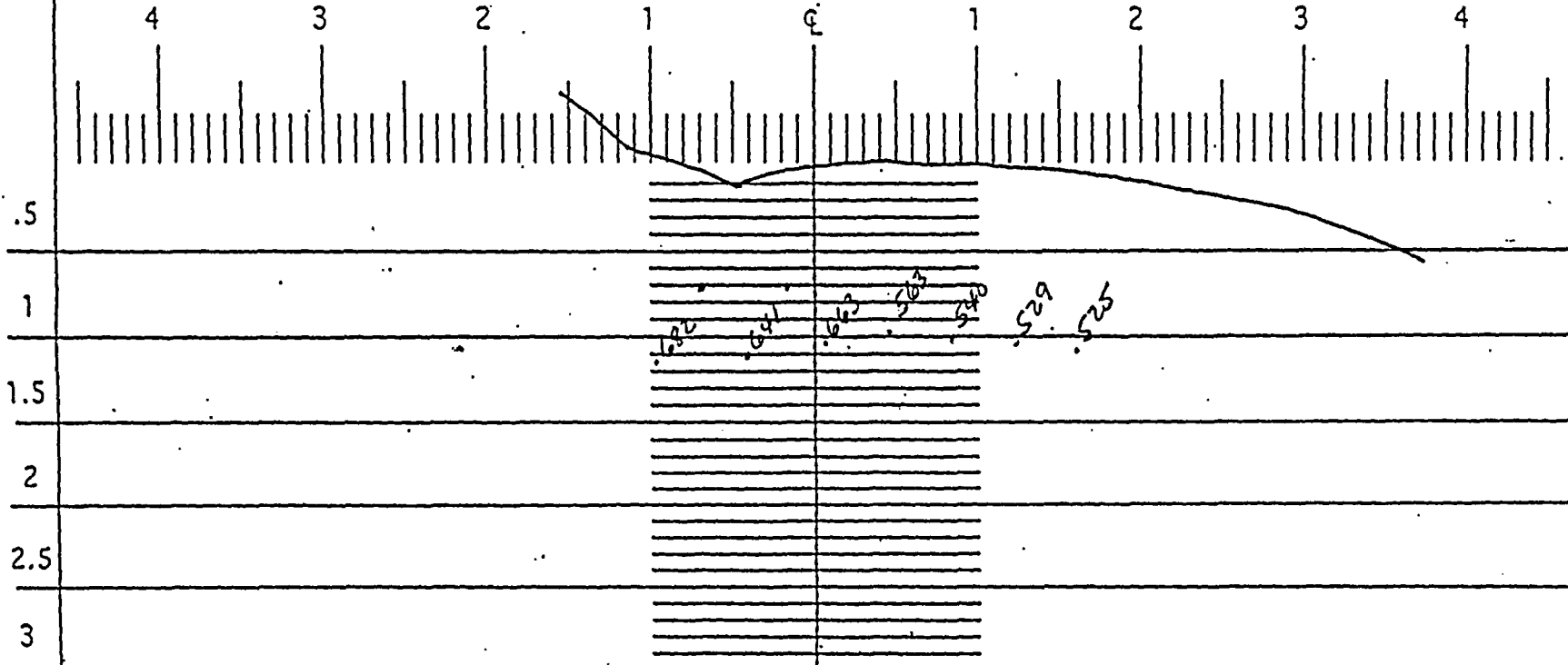
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

WELD

EXAMINATION SURFACE 2



Component ID/Weld No. 2-HP-221-22

Remarks:

Item No: COS. 021. 115

Examiner: James J. Lane Level: II Date: 8/7/02

Reviewed By: Harry Moss Level: IV Date: 8-7-02

Authorized Inspector: J. Longmire Date: 8-15-02

270

Profile taken  
at: 0

90

180 Sheet 3 of 8

Attachment C  
Page 52 of 59

Initial ☐ Final ☒  
ANII DATE: 8-7-02  
HSBCT

# DUKE POWER COMPANY ISI LIMITATION REPORT

FORM NDE-UT-4

Revision 1

Component/Weld ID: 2HP-221-22		Item No: C05.021.115		Remarks:	
<input checked="" type="checkbox"/> NO SCAN <input type="checkbox"/> LIMITED SCAN FROM L _____ to L _____ INCHES FROM WO _____ C/L _____ to _____ BEYOND _____ ANGLE: <input type="checkbox"/> 0 <input type="checkbox"/> 45 <input checked="" type="checkbox"/> 60 <input type="checkbox"/> Other _____ FROM _____ 0 _____ DEG to _____ 360 _____ DEG		SURFACE <input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 BEAM DIRECTION <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> cw <input type="checkbox"/> ccw		VALVE CONFIGURATION	
<input type="checkbox"/> NO SCAN <input type="checkbox"/> LIMITED SCAN FROM L _____ to L _____ INCHES FROM WO _____ to _____ ANGLE: <input type="checkbox"/> 0 <input type="checkbox"/> 45 <input type="checkbox"/> 60 <input type="checkbox"/> Other _____ FROM _____ DEG to _____ DEG		SURFACE <input type="checkbox"/> 1 <input type="checkbox"/> 2 BEAM DIRECTION <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> cw <input type="checkbox"/> ccw			
<input type="checkbox"/> NO SCAN <input type="checkbox"/> LIMITED SCAN FROM L _____ to L _____ INCHES FROM WO _____ to _____ ANGLE: <input type="checkbox"/> 0 <input type="checkbox"/> 45 <input type="checkbox"/> 60 <input type="checkbox"/> Other _____ FROM _____ DEG to _____ DEG		SURFACE <input type="checkbox"/> 1 <input type="checkbox"/> 2 BEAM DIRECTION <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> cw <input type="checkbox"/> ccw			
<input type="checkbox"/> NO SCAN <input type="checkbox"/> LIMITED SCAN FROM L _____ to L _____ INCHES FROM WO _____ to _____ ANGLE: <input type="checkbox"/> 0 <input type="checkbox"/> 45 <input type="checkbox"/> 60 <input type="checkbox"/> Other _____ FROM _____ DEG to _____ DEG		SURFACE <input type="checkbox"/> 1 <input type="checkbox"/> 2 BEAM DIRECTION <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> cw <input type="checkbox"/> ccw			

Prepared By: James L. Panel	Level: II	Date: 8/7/2002	Sketch(s) attached <input checked="" type="checkbox"/> yes <input type="checkbox"/> no	Sheet <u>4</u> of <u>120</u>
Reviewed By: <i>Harry J. Moss</i>	Date: <i>8-7-02</i>	Authorized Inspector: <i>J. Loggins</i>		Date: <i>8-15-02</i>

*III* 3/11/03

Initial ☐ Final ☒  
 ANII *W* DATE *3-11-03*  
 HSBCT

Attachment C  
Page 53 of 57

<b>DUKE POWER COMPANY</b> Limited Examination Coverage Worksheet						NDE-91-1 Revision 0	
<b>Examination Volume/Area Defined</b>							
<input checked="" type="checkbox"/> Base Metal <input checked="" type="checkbox"/> Weld <input type="checkbox"/> Near Surface <input type="checkbox"/> Bolting <input type="checkbox"/> Inner Radius							
Area Calculation				Volume Calculation			
SEE DRWG.				SEE DRWG.			
<b>Coverage Calculations</b>							
Scan #	Angle	Beam Direction	Area Examined (sq.in.)	Length Examined (in.)	Volume Examined (cu.in.)	Volume Required (cu.in.)	Percent Coverage

508

ALL	45°/60°	AXIAL/CIRC.	.285	14.1	<del>4.02</del> 2.64 88m 02-23-04	4.23	<del>95.04</del> 62.5% ggm 02-23-04
-----	---------	-------------	------	------	--	------	---

REVIEWED  
 Initial ☐ Final ☒  
 ANI Date 3/4/04  
 HSBC

Prepared By: David K. Zimmerman <i>David K. Z</i>		Level: III	Date: 10/28/2002
Reviewed By: <i>Gayl Moss</i>		Level: II	Date: 10-29-02

Item No: C05.021.115

DUKE POWER COMPANY  
UT PROFILE/PLOT SHEET

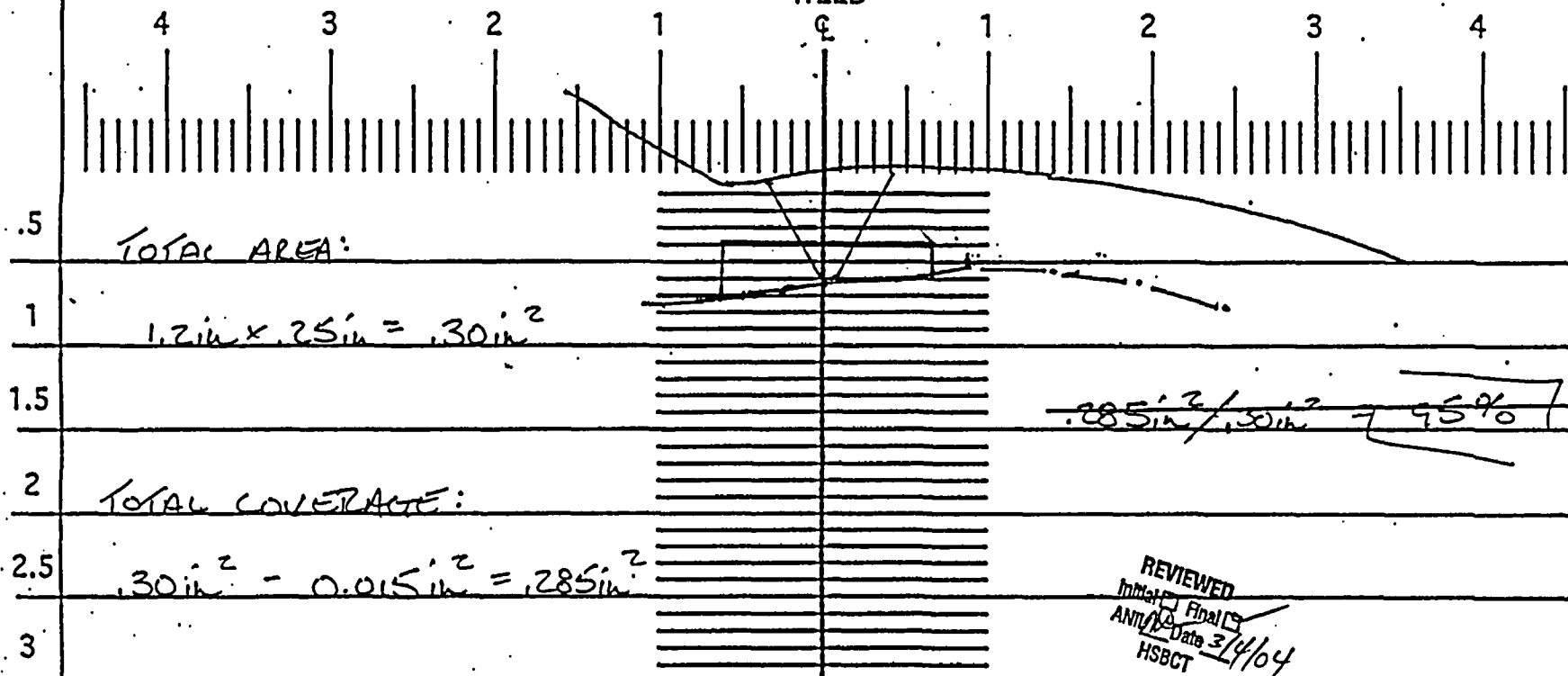
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

WELD

EXAMINATION SURFACE 2



Component ID/Weld No. 2-4P-221-22

Remarks:

Item No: 005.021.115  
Examiner: David K. Z. Level: III Date: 10/28/02  
Reviewed By: David Moss Level: II Date: 3-5-03  
Authorized Inspector: C. T. Smith Date: 3-11-03

Profile taken at: 60°  
270 90 180 Sheet 6 of 7

DUKE POWER COMPANY  
UT PROFILE/PLOT SHEET

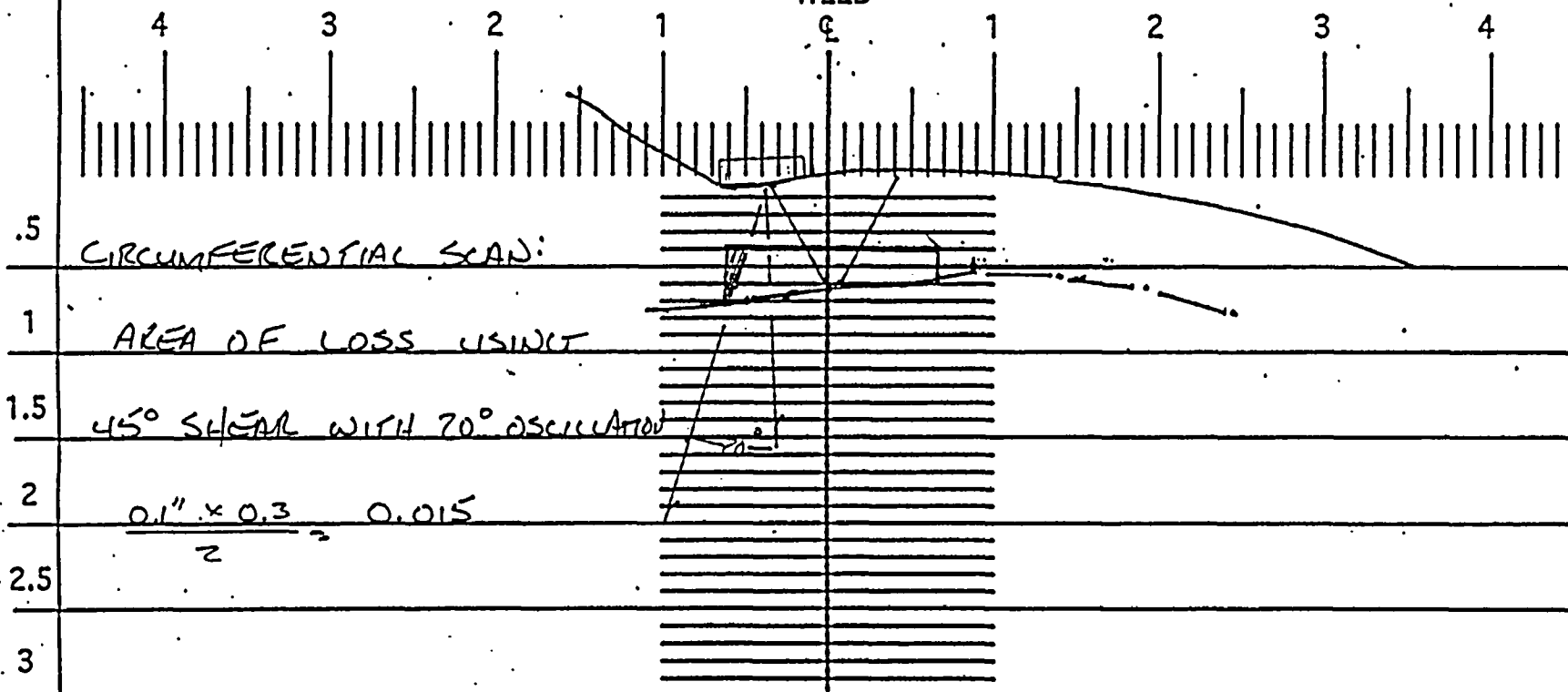
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

WELD

EXAMINATION SURFACE 2



Component ID/Weld No. 2-HP-221-22

Remarks:

Item No: 105.021.115

Examiner: Daniel K. [Signature]

Level: III

Date: 10/28/02

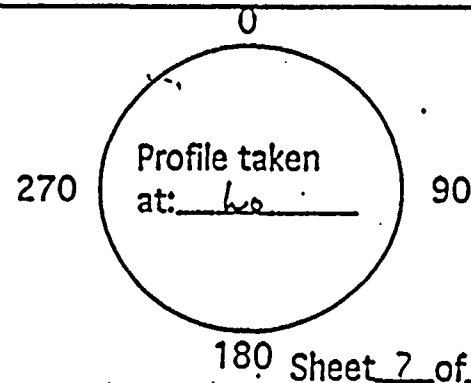
Reviewed By: David A. [Signature]

Level: D

Date: 3-5-03

Authorized Inspector: C. T. [Signature]

Date: 3-11-03



DUKE POWER COMPANY  
UT PROFILE/PLOT SHEET

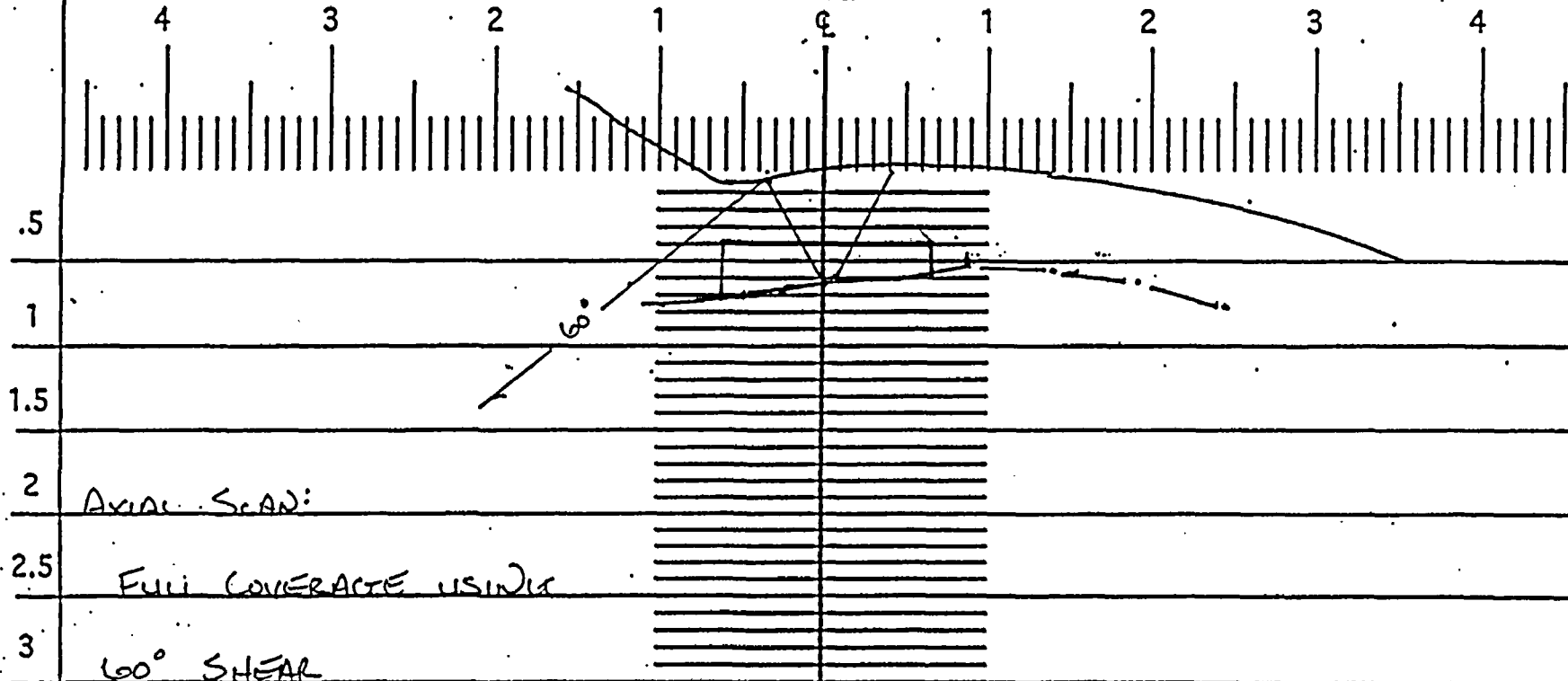
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

WELD

EXAMINATION SURFACE 2



Component ID/Weld No. 2-HP-221-22

Remarks:

Examiner: Daniel K. [Signature]

Reviewed By: [Signature]

Authorized Inspector: [Signature]

Item No: 605.021.093-115

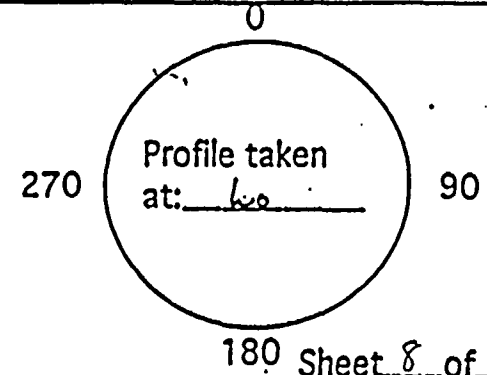
Level: TIL

Date: 10/28/02

Level: JB

Date: 3-5-03

Date: 3-11-03



180 Sheet 8 of 8

Form NDE-35A		Revision 3	
<b>DUKE POWER COMPANY</b>			
STATION <u>Oconee</u> UNIT <u>2</u>			
<b>LIQUID PENETRANT EXAMINATION REPORT</b>			
Weld/ID No. <u>2-BWST-OUT-2</u>		Material Type: <input type="checkbox"/> SS <input checked="" type="checkbox"/> CS <input type="checkbox"/> Inconel	
Diameter <u>14</u>	Schedule/Thickness <u>1.375</u>	<input checked="" type="checkbox"/> ISI <input type="checkbox"/> PSI <input type="checkbox"/> Other	
Procedure Rev. No. <u>19</u>		Field Change No.(s) <u>N/A</u>	
W/O No. <u>98473656</u>	SKETCH OF ITEM EXAMINED		
Surface Temperature <u>84°</u>			
M&TE S/N: <u>MCNDE 27227</u>			
Penetrant Materials Category: A <input checked="" type="checkbox"/> A(SE) <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> A(SE) Approved _____			
Penetrant Materials Data: Batch Numbers Cleaner <u>01B07K</u> Penetrant <u>00J07K</u> Developer <u>98J07K</u> Emulsifier _____ Fluorescent <input type="checkbox"/> Nonfluorescent <input checked="" type="checkbox"/>			
Black Light Intensity Verified Time <u>N/A</u> Date <u>N/A</u> Light Meter S/N: <u>N/A</u>	Acceptance Standard: A <input type="checkbox"/> D <input type="checkbox"/> G <input type="checkbox"/> K <input type="checkbox"/> Other: B <input type="checkbox"/> E <input type="checkbox"/> H <input type="checkbox"/> L <input type="checkbox"/> C <input type="checkbox"/> F <input checked="" type="checkbox"/> J <input type="checkbox"/> M <input type="checkbox"/>		
Ind. No.	Indication Type/Dimensions	Reference Documents	Recordable Reportable

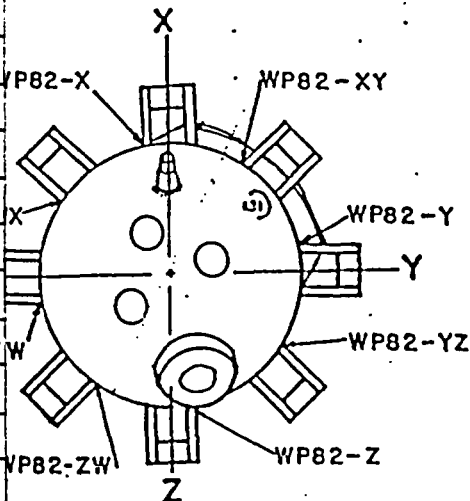
PIP S/N:		Rejectable <input type="checkbox"/>	Acceptable <input checked="" type="checkbox"/>
Exam Limitations: <input checked="" type="checkbox"/> Yes <u>63.66</u> % Examined		<input type="checkbox"/> No (100% Examined)	
Comments:			
Examiner: Daryl L. Robinson <i>D.L. Robinson</i>		Level: <u>II</u>	Date: <u>8/2/2002</u>
Examiner:		Level:	Date:
Reviewed By: <i>Daryl Moss</i>		Level: <u>ID</u>	Date: <u>8-13-02</u>
Final Review	Date	ANII Review	Date
<i>T.J. Colman</i>	<u>8-14-02</u>	<i>James Longmeyer</i>	<u>8-14-02</u>
			Item No. C05.070.001



<b>DUKE POWER COMPANY</b> Limited Examination Coverage Worksheet						NDE-91-1 Revision 0			
<b>Examination Volume/Area Defined</b>									
<input checked="" type="checkbox"/> Base Metal		<input checked="" type="checkbox"/> Weld		<input type="checkbox"/> Near Surface		<input type="checkbox"/> Bolting		<input type="checkbox"/> Inner Radius	
Area Calculation				Volume Calculation					
* Surface Examination( NDE-35 )  Required area - 1.375 in.(w) X 43.98 in.(l) = 60.47 in. sq.  Area inspected - 1.375 in.(w) X 28.0 in.(l) = 38.5 in. sq.									
<b>Coverage Calculations</b>									
Scan #	Angle	Beam Direction	Area Examined (sq.in.)	Length Examined (in.)	Volume Examined (cu.in.)	Volume Required (cu.in.)	Percent Coverage		
N/A	N/A	N/A	38.5/60.47	N/A	N/A	<del>31</del> 60.47	63.66		

				Weld# 2-BWST-OUT-2	
				Item No: C05.070.001	
Prepared By: Daryl L Robinson <i>D.L. Robinson</i>		Level: II		Date: 8/2/2002	
Reviewed By: <i>RT</i>		Level: III		Date: 8/13/02	

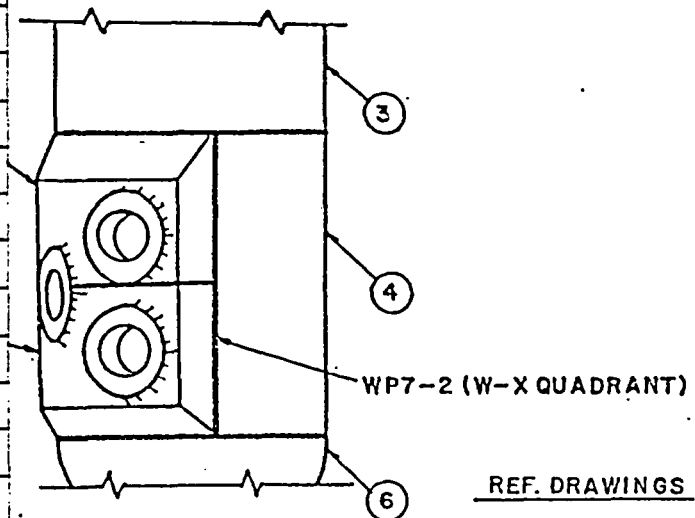
IDENT NO.	PIECE NO.	DIAM.	THICK.	PC. NO.	QT.
WPI-1	1 TO 1	N/A	6.188	1	1
WPI-2	2 TO 2	N/A	6.188	2	1
WPI-3	3 TO 3	N/A	6.188	3	1
WP3-1	1 TO 2	84" I.D.	6.188	4	1
WP3-2	2 TO 3	84" I.D.	6.188	5	1
WP4	3 TO 4 & 41	84" I.D.	6.188	6	1
WP6	40 TO 41	84" I.D.	13.563	8	1
WP7-1	4 TO 40 & 41	N/A	6.188	9	1
WP7-2	4 TO 40 & 41	N/A	6.188	30	6
WPI5	6 TO 8		4.750	31	3
WP23	8 TO 37	10" NPS	1.063	32	3
WP26-1	30 TO 4		6.188	37	1
WP26-2	30 TO 4		6.188	40	1
WP26-3	30 TO 4		6.188	41	1
WP26-4	30 TO 1		6.188	42	6
WP26-5	30 TO 1		6.188	45	1
WP26-6	30 TO 1		6.188	110	8
WP26-7	30 TO 4		6.188		
WP28	6 TO 4 & 40	84" I.D.	4.750		
WP33-1	31 TO 5		4.750		
WP33-2	31 TO 5		4.750		
WP33-3	31 TO 5		4.750		
WP34	9 TO 5		4.750		
WP45	45 TO 9	4" NPS	0.750		
WP63-1	42 TO 30		1.1875		
WP63-2	42 TO 30		1.1875		
WP63-3	42 TO 30		1.1875		
WP63-4	42 TO 30		1.1875		
WP63-5	42 TO 30		1.1875		
WP63-6	42 TO 30		1.1875		
WP76	1 TO 5	84" I.D.	4.750		
WP82-X	110 TO 3	N/A	3.500		
WP82-XY	110 TO 3	N/A	3.500		WE
WP82-Y	110 TO 3	N/A	3.500		I.D. NO
WP82-YZ	110 TO 3	N/A	3.500		WP91-1
WP82-Z	110 TO 3	N/A	3.500		WP91-2
WP82-ZW	110 TO 3	N/A	3.500		WP91-3
WP82-W	110 TO 3	N/A	3.500		WP63-
WP82-WX	110 TO 3	N/A	3.500		



TOP VIEW

WP63-4 (W-X QUADRANT)  
WP63-5 (Y-Z QUADRANT)  
WP63-6 (Z-W QUADRANT)

WP26-4 (W-X QUADRANT)  
WP26-5 (Y-Z QUADRANT)  
WP26-6 (Z-W QUADRANT)



REF. DRAWINGS  
OM 1201-456

10-7-79	10-15-79
TLT	JEC
9-26-81	9-28-87
4-54	JOB
7-14-81	7-23-81
RVWD	APPD
DATE	DATE

TITLE
-------

# PRESSURIZER WELD OUTLINE

DWG NO. ISI-OCN2-002 REV. 2

Request for Relief

04-ON-003

Limited Examinations  
Associated With  
Reactor Vessel Welds

2EOC 19

**Proposed Relief in Accordance with 10 CFR 50.55a(g)(5)(iii)**  
**Inservice Inspection Impracticality**

**Duke Energy Corporation**

**Oconee Nuclear Station – Unit 2 (EOC-19)**

**Third 10-Year Interval – Inservice Inspection Plan**

**Interval Start Date= 12-16-1994    Interval End Date=9-9-2004**

**ASME Section XI Code – 1989 Edition with No Addenda**

	I.	II. & III.	IV.	V.	VI.	VII.
Limited Area/Weld I.D. Number	System / Component for Which Relief is Requested: Area or Weld to be Examined	Code Requirement from Which Relief is Requested: 100% Exam Volume Coverage Exam Category Item No. Fig. No. Limitation Percentage	Basis for Relief	Alternate Examinations or Testing	Justification for Granting Relief	Implementation Schedule
2-RPV-WR34	NC System Reactor Vessel Lower Shell to Lower Head Ring Circumferential Weld	Exam Category B-A Item No. B01.011.004 Fig. IWB-2500-1 36% Volume Coverage due to limited scanning.	See Paragraph "A"	See Paragraph "F"	See Paragraph "G"	See Paragraph "J"
2-RPV-WR35	NC System Reactor Vessel Lower Head Cap to Lower Head Ring Circumferential Weld	Exam Category B-A Item No. B01.021.003 Fig. IWB-2500-3 42% Volume Coverage due to limited scanning.	See Paragraph "A"	See Paragraph "F"	See Paragraph "G"	See Paragraph "J"
2-RPV-WR13	NC System Reactor Vessel Outlet Nozzle-to-Vessel Weld @ 90°	Exam Category B-D Item No. B03.090.001 Fig. IWB-2500-7(a) 82% Volume Coverage due to limited scanning. (UT from vessel I.D.)	See Paragraph "B"	See Paragraph "F"	See Paragraph "H"	See Paragraph "J"
2-RPV-WR13A	NC System Reactor Vessel Outlet Nozzle-to-Vessel Weld @ 270°	Exam Category B-D Item No. B03.090.002 Fig. IWB-2500-7(a) 82% Volume Coverage due to limited scanning. (UT from vessel I.D.)	See Paragraph "B"	See Paragraph "F"	See Paragraph "H"	See Paragraph "J"

	I.	II. & III.	IV.	V.	VI.	VII.
Limited Area/Weld I.D. Number	System / Component for Which Relief is Requested: Area or Weld to be Examined	Code Requirement from Which Relief is Requested: 100% Exam Volume Coverage Exam Category Item No. Fig. No. Limitation Percentage	Basis for Relief	Alternate Examinations or Testing	Justification for Granting Relief	Implementation Schedule
2-RPV-WR54	NC System Reactor Vessel Core Flood Nozzle-to-Vessel Weld @ 0°	Exam Category B-D Fig. IWB-2500-7(a) Item No. B03.090.007 (UT from vessel I.D.) 81% Volume Coverage due to limited scanning.	See Paragraph "C"	See Paragraph "F"	See Paragraph "H"	See Paragraph "J"
2-RPV-WR54A	NC System Reactor Vessel Core Flood Nozzle-to-Vessel Weld @ 180°	Exam Category B-D Fig. IWB-2500-7(a) Item No. B03.090.008 (UT from vessel ID) 81% Volume Coverage due to limited scanning.	See Paragraph "C"	See Paragraph "F"	See Paragraph "H"	See Paragraph "J"
2-RPV-WR54	NC System Reactor Vessel Core Flood Nozzle Inside Radius Section @ 0°	Exam Category B-D Item No. B03.100.007 Fig. IWB-2500-7(a) 52% Volume Coverage due to limited scanning.	See Paragraph "D"	See Paragraph "F"	See Paragraph "H"	See Paragraph "J"
2-RPV-WR54A	NC System Reactor Vessel Core Flood Nozzle Inside Radius Section @ 180°	Exam Category B-D Item No. B03.100.008 Fig. IWB-2500-7(a) 52% Volume Coverage due to limited scanning.	See Paragraph "D"	See Paragraph "F"	See Paragraph "H"	See Paragraph "J"
2-53A-8-63	NC System Reactor Vessel Core Flood Safe-End to Pipe Circumferential Weld @ 0°	Exam Category B-J Item No. B09.011.011 Fig. IWB-2500-8(c) 76% Volume Coverage due to limited scanning.	See Paragraph "E"	See Paragraph "F"	See Paragraph "H"	See Paragraph "J"

	I.	II. & III.	IV.	V.	VI.	VII.
Limited Area/Weld I.D. Number	System / Component for Which Relief is Requested: Area or Weld to be Examined	Code Requirement from Which Relief is Requested: 100% Exam Volume Coverage Exam Category Item No. Fig. No. Limitation Percentage	Basis for Relief	Alternate Examinations or Testing	Justification for Granting Relief	Implementation Schedule
2-53A-8-63	NC System Reactor Vessel Core Flood Safe-End to Pipe Circumferential Weld @ 0°	Exam Category B-J Item No. B09.011.011A Fig. IWB-2500-8(c) 76% Volume Coverage due to limited scanning. (UT from nozzle I.D. in lieu of PT from O.D.)	See Paragraph "E"	See Paragraph "F"	See Paragraph "H"	See Paragraph "J"
2-53A-8-64	NC System Reactor Vessel Core Flood Safe-End to Pipe Circumferential Weld @ 180°	Exam Category B-J Item No. B09.011.013 Fig. IWB-2500-8(c) 71% Volume Coverage due to limited scanning.	See Paragraph "E"	See Paragraph "F"	See Paragraph "H"	See Paragraph "J"
2-53A-8-64	NC System Reactor Vessel Core Flood Safe-End to Pipe Circumferential Weld @ 180°	Exam Category B-J Item No. B09.011.013A Fig. IWB-2500-8(c) 71% Volume Coverage due to limited scanning. (UT from nozzle I.D. in lieu of PT from O.D.)	See Paragraph "E"	See Paragraph "F"	See Paragraph "H"	See Paragraph "J"

Note: The welds in the above table were inspected in October of 2002.

Note: See Attachment A for a drawing on all the welds listed above.

**IV. Basis for Relief** (See Attachment A for area/weld locations.)

**Paragraph A:**

During the ultrasonic examination of welds 2-RPV-WR34 and 2-RPV-WR35, 100% coverage of the required examination volume could not be obtained. The examination coverage was limited to 36% and 42% respectively. Limitations were caused by the core guide lugs & flow stabilizers for WR34 and incore nozzles & flow stabilizers for WR35 that restrict the scanning surface as shown on the Attachment A, B, and C drawings. The percentage of coverage reported represents the aggregate coverage from all scans. Some areas received no coverage at all while some areas were completely covered from four directions. 13.3% of the near surface (inner 15 % of wall thickness) volume of the weld and base material was covered in four scan directions using a 70° beam angle. 76.6% of the near surface volume of the weld and base material was covered with a 70° beam angle from one axial and circumferential direction. Only 10.1% of the near surface volume of the weld and base material received no coverage. There were no recordable indications found in the areas that were examined for either of these two welds. In order to achieve more coverage the core guide lugs, incore nozzles and flow stabilizers would have to be moved to allow greater access for scanning, which is impractical.

(See Attachment B for drawings on Weld 1-RPV-WR34)

(See Attachment C for a drawing on Weld 1-RPV-WR35)

**Paragraph B:**

During the ultrasonic examination of welds 2-RPV-WR13 and 2-RPV-WR13A, 100% coverage of the required examination volume could not be obtained. The examination coverage was limited to 82%. Limitations were caused by the outlet nozzle boss that restricts the scanning surface both from the nozzle I.D. and the vessel I.D. The percentage of coverage reported represents the aggregate coverage from all scans. The weld and adjacent base material received 100% coverage from the nozzle bore with 15° and 45° beam angles. Scans from the vessel shell side resulted in 42% coverage of the weld and base material with a 45° beam angle of the outer 85% of the vessel wall and coverage of the inner 15% with a 70° beam angle. There were no recordable indications found in the areas that were examined for item number B03.090.001. There were 21 recordable indications found during examination of item number B03.090.002. All of the indications were detected from the nozzle bore and were determined to be acceptable, sub-surface flaws. In order to achieve more coverage, the outlet nozzle boss would have to be moved to allow greater access for scanning, which is impractical.

(See Attachment D for drawing on both welds)

**Paragraph C:**

During the ultrasonic examination of welds 2-RPV-WR54 and 2-RPV-WR54A, 100% coverage of the required examination volume could not be obtained. The examination coverage was limited to 81% of the required volume. The Core Flood Nozzles of a B&W 177 plant have several obstructions which limit ultrasonic examination coverage. In order of significance these are:

- The flow restrictor which is welded to the inner bore of the nozzle.
- The inlet nozzles located 30° on either side of each core flood nozzle.
- The taper above the core flood nozzles associated with the Core Support Ledge.

The percentage of exam volume coverage reported represents the aggregate coverage as follows:

- Weld and adjacent base material = 81% scanned parallel to the weld centerline in two directions and perpendicular to the weld centerline from one direction.
- Inner 15% from the vessel ID = 97%, in four orthogonal directions.

There were no recordable indications found in the areas that were examined for item number B03.090.007. There was one recordable indication found during examination of item number B03.090.008. This indication was detected from the vessel ID and was determined to be an acceptable, sub-surface flaw. In order to achieve more coverage, the inlet nozzles would have to be moved and the taper on the flange would have to be redesigned to allow greater access for scanning, which is impractical. In addition, because of the proximity of the flow restrictors no scanning was performed from the nozzle I.D. (0% examination coverage). In order to achieve more coverage, the flow restrictor would have to be moved to allow access for scanning, which is impractical.

(See Attachment E for a drawing on the core flood nozzle)

#### **Paragraph D:**

During the ultrasonic examination of inside radius sections 2-RPV-WR54 and 2-RPV-WR54A, 100% coverage of the required examination volume could not be obtained. The examination coverage was limited to 52%. Limitations were caused by the flow restrictor that prevents scanning from the nozzle bore surface. The percentage of coverage reported represents the aggregate coverage from all scans. There were no recordable indications found in the areas that were examined for either of these inside radius sections. In order to achieve more coverage, the flow restrictor would have to be moved to allow greater access for scanning, which is impractical.

(See Attachment E for a drawing on the core flood nozzle)

#### **Paragraph E:**

During the ultrasonic examination of welds 2-53A-8-63 and 2-53A-8-64, 100% coverage of the required examination volume could not be obtained. The examination coverage was limited to 76% and 71%, respectively. Limitations were caused by air at the top of nozzle that prevented the transducer from making contact for scanning the surface. The reactor vessel inspection services vendor made two attempts to evacuate the air with equipment made for the purpose but additional air was reintroduced from an unknown source. After the second attempt was unsuccessful and the source for the air could not be determined, a decision was made to perform the scan and obtain as much coverage as possible (the percentages shown above). The vendor noted that similar problems with eliminating trapped air have been experienced on other reactor vessels with small diameter piping.

Alternatively, it is impractical to perform this exam from the outside nozzle surface due to the excessive personnel radiation exposure. Approximately 40 man-hours would be required to prepare each safe-end to pipe weld for examination from the outside surface. The preparation involves removing the refueling canal seal plate, shielding bricks, shielding supports in the nozzle area and insulation. The radiation levels in this area are expected to be 0.51 R/hr. An alternative path would be to enter from the bottom of the reactor vessel and build scaffolding approximately 30 feet high to reach the core flood nozzles. This activity would require approximately 80 man-hours. 40 man-hours in a 0.51/hr radiation field and 40 man-hours in a 1-2 R/hr radiation field. Total estimated exposure would be 80-140 man-rem. Shielding in this area is impractical. Any remote inspection would require the same preparatory work.

The percentage of coverage reported represents the aggregate coverage. There were no recordable indications found in the volumes that were examined for either of these two welds. In order to achieve more coverage, the air would have to be eliminated which proved to be impractical during the subject inspection.

(See Attachment F for a drawing on safe-end to pipe welds)



**V. Alternate Examinations or Testing**

**Paragraph F:**

The scheduled 10-year code examination was performed on the referenced area/weld and it resulted in the noted limited scanning and coverage of the required ultrasonic volume. No additional examinations are planned for the area/weld during the current inspection interval.

**VI. Justification for Granting Relief**

**Paragraph G:**

Ultrasonic examination of welds for item numbers B01.011 and B01.021 were conducted using personnel, equipment and procedures qualified in accordance with ASME Section XI, Appendix VIII, Supplements 4 and 6, 1995 Edition with the 1996 Addenda as administered through the Performance Demonstration Initiative (PDI) Program. Although limited scanning prevented 100% coverage of the examination volume, the amount of coverage obtained for these examinations along with the additional volumetric and visual examinations (listed in the next paragraph) provides an acceptable level of quality and integrity. (See Paragraph I for additional justification.)

In addition to the Category B-A welds that relief is being sought for, there were 4 circumferential Category B-A welds that were inspected and all obtained greater than 90 % coverage and there were no reportable indications found during the inspections. Visual examinations were also performed as part of the reactor vessel inspections (item number B13.010.001 and B13.050.001) and were found to be without any reportable indications.

**Paragraph H:**

Ultrasonic examination of areas/welds for item numbers B03.090, B03.100, and B09.011 were conducted using personnel, equipment and procedures qualified in accordance with ASME Section XI, Appendix I, 1989 Edition with no Addenda. Inspection of B09.011 welds from the outside diameter is not a viable alternate due to the dose that would be received to prepare and perform the inspections. Relief Requests ONS-001 and ONS-002 were written to perform UT from the ID surface in lieu of a surface exam from the OD surface of all reactor vessel nozzles to pipe welds due to the radiation exposure that is involved with performing inspections from the OD surface. Relief for ONS-001 and ONS-002 was granted on an SER dated 11-15-95. Although limited scanning prevented 100% coverage of the examination volume, the amount of coverage obtained for these examinations provides an acceptable level of quality and integrity. (See Paragraph I for additional justification.)

**Paragraph I:**

Duke Energy will use the Code required pressure testing and VT-2 visual examination to compliment the limited examination coverage. The Code requires (reference Table IWB-2500-1, item numbers B15.010 and B15.050) that a system leakage test be performed after each refueling outage for Class 1. Additionally a system hydrostatic test (reference Table IWB-2500-1, item numbers B15.011 and B15.051) is required once during each 10-year inspection interval. These tests require a VT-2 visual examination for evidence of leakage. This testing provides adequate additional assurance of pressure boundary integrity.

Duke Energy will use VT-3 visual examination to compliment the limited examination coverage. The Code requires (reference Table IWB-2500-1, item number B13.010) that a VT-3 examination be performed after the first refueling outage and subsequent refueling outages at approximately 3 year periods. During the first and second periods of an interval a VT-3 examination is performed on areas above and below the reactor core that are made accessible for examination by removal of components during normal refueling outages. During the third period of an interval the VT-3 examination is performed on all of the reactor vessel interior surfaces at the same time that the automated UT exams are performed on the reactor vessel welds. These examinations provide adequate additional assurance of pressure boundary integrity.

In addition to the above Code required examinations (volumetric, pressure test, and VT-3), there are other activities which provide a high level of confidence that, in the unlikely case that leakage did occur through these welds, it would be detected and isolated. Specifically, leakage from these welds would be detected by monitoring of the

Reactor Coolant System (RCS), which is performed once each shift under procedure PT/1,2,3/A/0600/10, "RCS Leakage". This RCS leakage monitoring is a requirement of Technical Specification 3.4.13, "Reactor Coolant System Leakage". Leakage is also evaluated in accordance with this Technical Specification. The leakage could also be detected through several other methods. One is the RCS mass balance calculation. A second is the Reactor Building air particulate monitor. This monitor is sensitive to low leak rates; the iodine monitor, gaseous monitor and area monitor are capable of detecting any fission products in the coolant and will be activated by coolant leakage. A third is the level indicator in the Reactor Building normal sump. A fourth is a loss of level in the Letdown Storage Tank.

Duke Energy Corporation has examined the welds/components referenced in this request to the maximum extent possible utilizing the latest in examination techniques and equipment. These welds were rigorously inspected by volumetric NDE methods during construction and verified to be free from unacceptable fabrication defects. Based on the portions and results of the required volumetric and visual examinations performed during this outage, it is Duke's belief that this combination of elements provides a reasonable assurance of component integrity.

#### **VII. Implementation Schedule**

##### **Paragraph J**

The scheduled third 10-year interval plan code examination was performed on the referenced area/weld resulting in limited scanning and volumetric coverage. No additional examinations are planned for the area/weld during the current inspection interval. The same area/weld may be examined again as part of the next (fourth) 10-year interval plan, depending on the applicable code year edition and addenda requirements adopted in the future.

#### **VIII. Other Information**

The following individuals contributed to the development of this relief request:

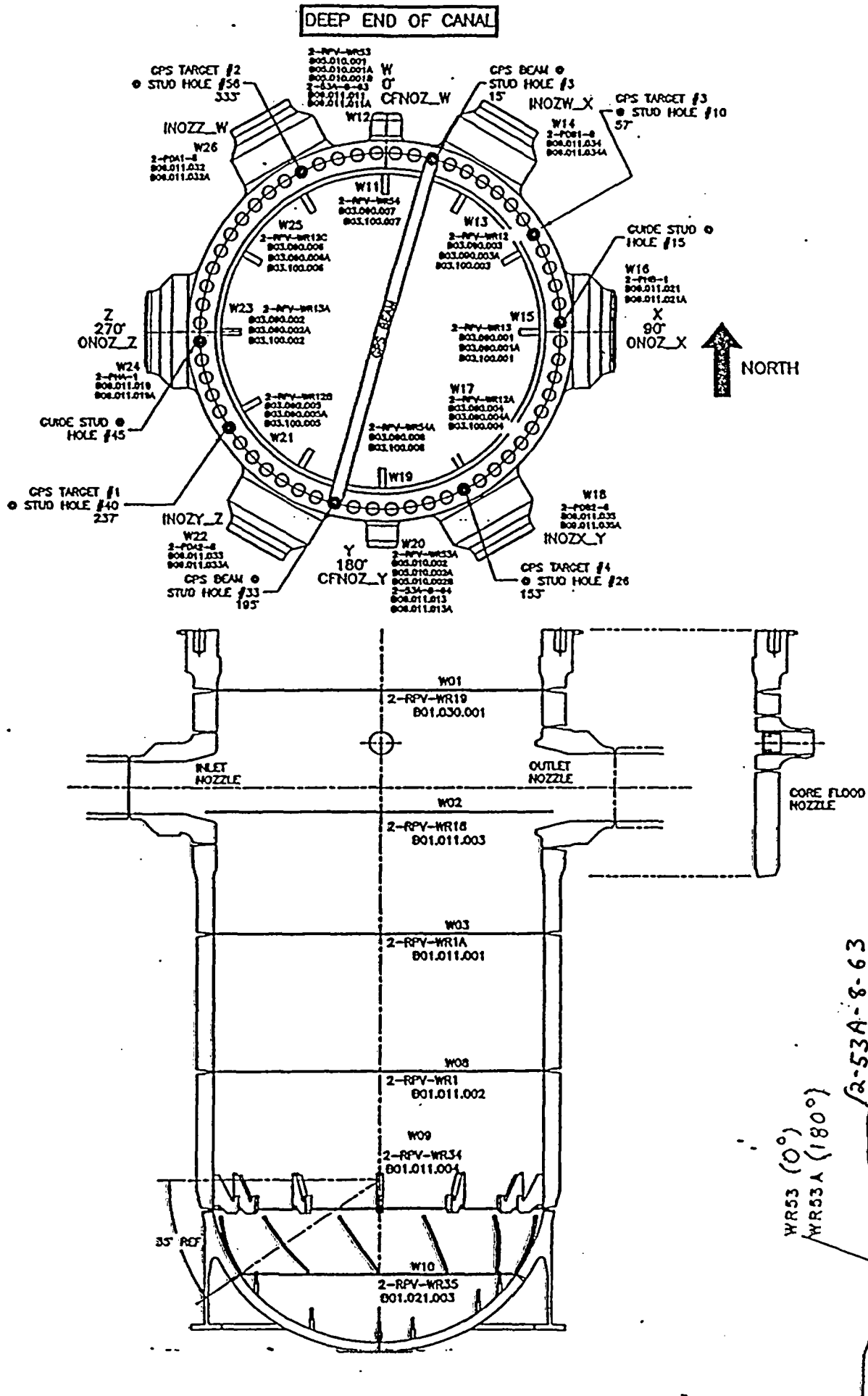
James J. McArdle (Principal NDE Level III Inspector) provided Sections II through V and part of Section VI.

B. W. Carney, Jr. (Oconee Engineering) provided part of Section VI.

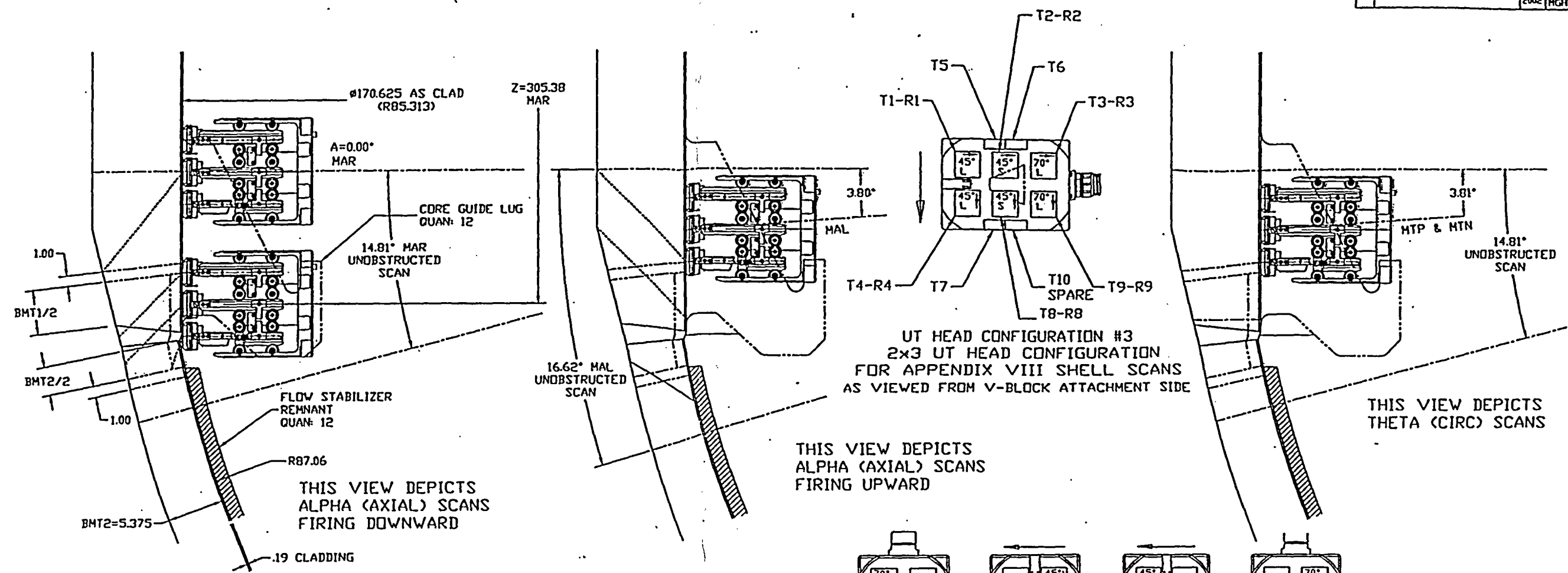
Larry C. Keith (Oconee ISI Plan Manager) compiled the remaining sections.

Sponsored By: Larry C. Keith Date 3-8-04

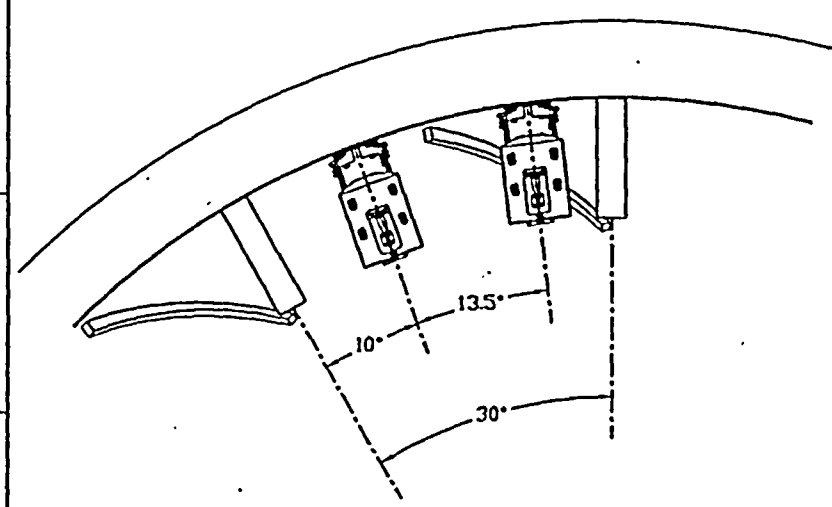
Approved By: L. Kevin Rhyme Date 3/8/04



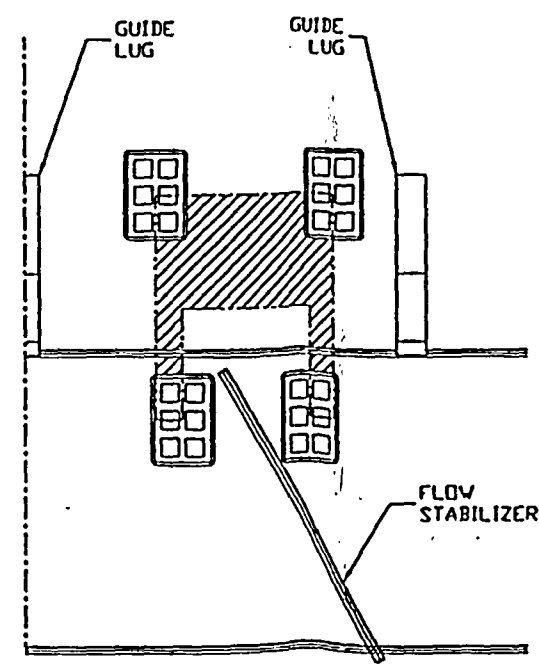
REVISIONS			
REV	DESCRIPTION	DATE	BY
2	NO CHANGE.	11-15-2002	RHR/HGI



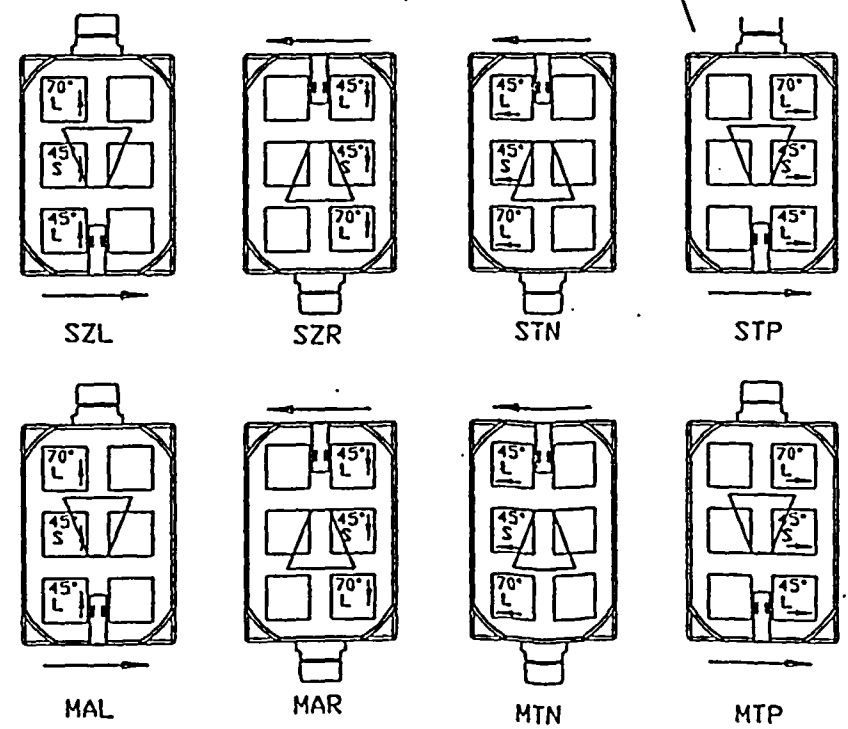
SCAN INDEX = 0.50° FOR DETECTION  
0.20° FOR SIZING



PARTIAL KEY PLAN  
NOTE: CAD FILE .5 SIZE



DEVELOPED VIEW DEPICTING TYP SCAN PATCH  
NOTE: CAD FILE .5 SIZE



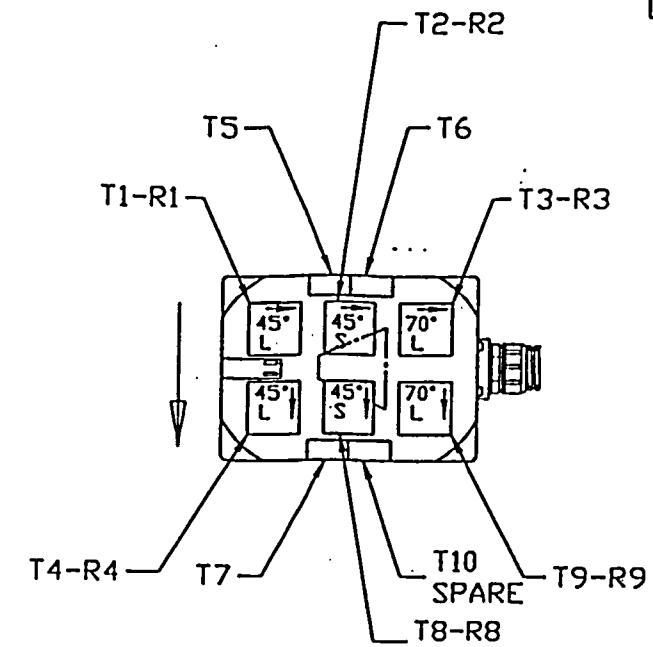
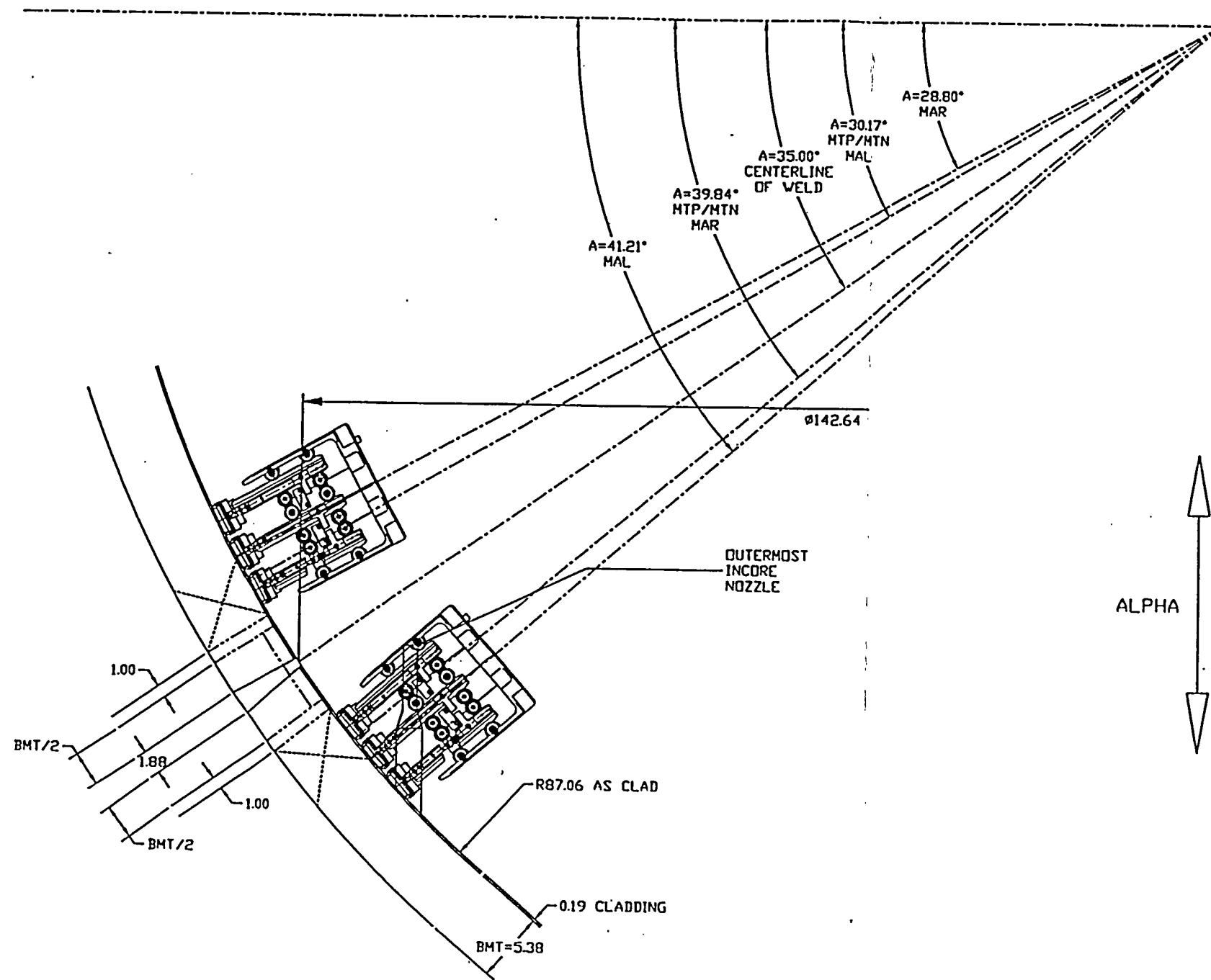
HEAD ORIENTATION FOR VARIOUS SCANS

W09  
OCONEE-2  
2-RPV-WR34  
B01.011.004

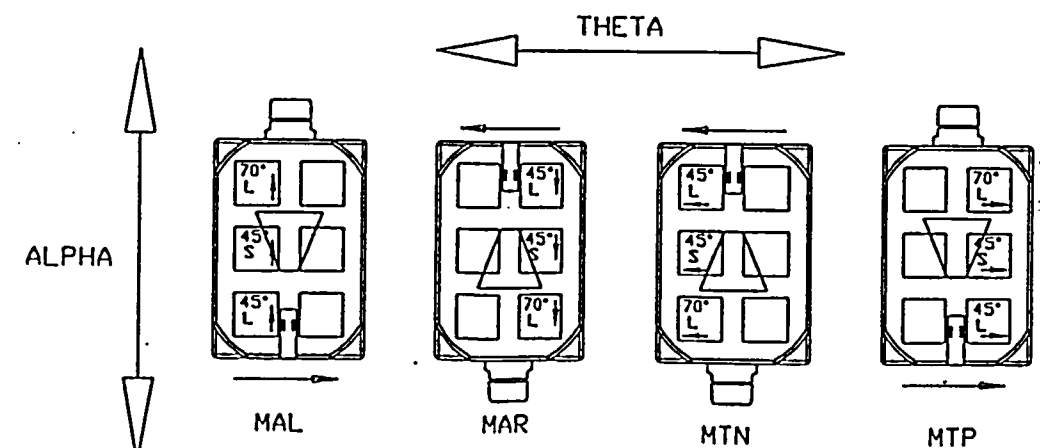
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1. OCONEE-2 10 YEAR RV ISI LWR SHELL-T0-TORUS URSULA EXAMINATION SHEET 7 OF 12		2. 6014932 E 2	
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REVISIONS			
REV	DESCRIPTION	DATE	BY
2	NO CHANGE.	11-15 2002	RHR HGH



UT HEAD CONFIGURATION #3  
2x3 UT HEAD CONFIGURATION  
FOR APPENDIX VIII SHELL SCANS  
AS VIEWED FROM V-BLOCK ATTACHMENT SIDE



HEAD ORIENTATION FOR VARIOUS SCANS

SCAN INDEX = 0.50° FOR DETECTION  
0.20° FOR SIZING

W10  
OCONEE-2  
2-RPV-WR35  
B01.021.003

FILENAME: .DWG  
DISK No.: OPTICAL

REVISIONS			
REV	DESCRIPTION	DATE	BY
1	REVISION TO BE BY THE LINE DRAFTER		
2	REVISION TO BE BY THE LINE DRAFTER		
3	REVISION TO BE BY THE LINE DRAFTER		
4	REVISION TO BE BY THE LINE DRAFTER		
5	REVISION TO BE BY THE LINE DRAFTER		
6	REVISION TO BE BY THE LINE DRAFTER		
7	REVISION TO BE BY THE LINE DRAFTER		
8	REVISION TO BE BY THE LINE DRAFTER		
9	REVISION TO BE BY THE LINE DRAFTER		
10	REVISION TO BE BY THE LINE DRAFTER		
11	REVISION TO BE BY THE LINE DRAFTER		
12	REVISION TO BE BY THE LINE DRAFTER		
13	REVISION TO BE BY THE LINE DRAFTER		
14	REVISION TO BE BY THE LINE DRAFTER		
15	REVISION TO BE BY THE LINE DRAFTER		
16	REVISION TO BE BY THE LINE DRAFTER		
17	REVISION TO BE BY THE LINE DRAFTER		
18	REVISION TO BE BY THE LINE DRAFTER		
19	REVISION TO BE BY THE LINE DRAFTER		
20	REVISION TO BE BY THE LINE DRAFTER		

OCONEE-2  
10 YEAR RV ISI  
TORUS-TO-HEAD  
URSULA EXAMINATION  
SHEET 8 OF 12

6014933 E	2
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OCONEE-2  
EXAMINATION COVERAGE FOR OUTLET NOZZLES:  
SCAN PLAN DWG NO.: 6014935E-02

OCONEE-2	
W15	2-RPV-WR13
	B03.090.001
	B03.090.001A
	B03.100.001
W23	2-RPV-WR13A
	B03.090.002
	B03.090.002A
	B03.100.002

AGGREGATE COVERAGE OBTAINED FOR WELD:

82%

AGGREGATE COVERAGE OBTAINED FOR INSIDE RADIUS:

98%

COVERAGE FROM BORE AND SHELL

Zone Coverage Obtained			
Weld & Adjacent Base Metal:	100%	Inner 15% BMT	42%
		Inside Radius:	98%

HORIZONTAL SECTION EVALUATION								
Examination Volume Definition								
Weld Diameter:			60 in.		Nozzle Bore Diameter:		36 in.	
Area Measurement				Volume Calculation				
Weld & Adjacent		55.18 sq. in.		Weld & Adjacent		5200.6 cu. in.		
Base Metal (Bore)				Base Metal				
Inner 15% BMT		7.08 sq. in.		Near Surface		667.3 cu. in.		
Inside Radius		7.87 sq. in.		Inside Radius		445.0 cu. in.		
Examination Coverage Calculations								
Weld and Adjacent Base Metal								
Exam.	Area	Degrees	Volume	Volume				
Angle	Beam	Examined	Examined	Required	Percent			
(deg.)	Direction	(sq. in.)	(in.)	(cu. in.)	Examined			
Entry #								
1	15/45	bore	55.18	180.0	5200.6	5200.6	100%	
Totals:				5200.6	5200.6	100%		
Inner 15% BMT								
Exam.	Area	Degrees	Volume	Volume				
Angle	Beam	Examined	Examined	Required	Percent			
(deg.)	Direction	(sq. in.)	(in.)	(cu. in.)	Examined			
Entry #								
1	45S/45L/70L	shell/7	1.71	180.0	161.2	667.3	24%	
2.	45S/45L/70L	shell/8	0.00	180.0	0.0	667.3	0%	
3	45S/45L/70L	shell/9	0.45	180.0	42.4	667.3	6%	
4	45S/45L/70L	shell/10	1.97	180.0	185.7	667.3	28%	
Totals:				389.3	2669.1	15%		
Inside Radius								
Exam.	Area	Degrees	Volume	Volume				
Angle	Beam	Examined	Examined	Required	Percent			
(deg.)	Direction	(sq. in.)	(in.)	(cu. in.)	Examined			
Entry #								
1	70	circ	7.61	180.0	430.3	445.0	97%	
Totals:				430.3	445.0	97%		

Note: The horizontal section coverage requirement is considered to be 180° total; 45° each side of 90° and 270°.

VERTICAL SECTION EVALUATION							
Examination Volume Definition							
Weld Diameter: 60 in.				Nozzle Bore Diameter: 36 in.			
Area Measurement				Volume Calculation			
Weld & Adjacent		63.74 sq. in.		Weld & Adjacent		6007.4 cu. in.	
Base Metal (Bore)				Base Metal			
Inner 15% BMT		8.34 sq. in.		Near Surface		786.0 cu. in.	
Inside Radius		7.10 sq. in.		Inside Radius		401.5 cu. in.	
Examination Coverage Calculations							
Weld and Adjacent Base Metal							
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Degrees Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined
1	15/45	bore	63.74	180.0	6007.4	6007.4	100%
Totals:					6007.4	6007.4	100%
Inner 15% BMT							
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Degrees Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined
1	45S/45L/70L	shell/7	7.64	180.0	720.1	786.0	92%
2	45S/45L/70L	shell/8	2.69	180.0	253.5	786.0	32%
3	45S/45L/70L	shell/9	5.68	180.0	535.3	786.0	68%
4	45S/45L/70L	shell/10	7.09	180.0	668.2	786.0	85%
Totals:					2177.1	3144.1	69%
Inside Radius							
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Degrees Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined
1	70	circ	7.10	180.0	401.5	401.5	100%
Totals:					401.5	401.5	100%

Note: The vertical section coverage requirement is considered to be 180° total; 45° each side of 0° and 180°.

**OCONEE-2 APPENDIX VIII**  
**EXAMINATION COVERAGE FOR WELD: W09**  
**2-RPV-WR34**  
**B01.011.004**  
**SCAN PLAN DWG NO.: 6014932E-02**  
**AGGREGATE COVERAGE OBTAINED: 36%**

Zone Coverage Obtained

Weld: 30%

Adjacent Base Metal: 38%

Examination Volume Definition

Weld Length: 536.03 in.

Area Measurement

Weld: Near Surface

4.12 sq. in.

Weld: Balance of Volume

7.17 sq. in.

Base Metal: Near Surface

8.05 sq. in.

Base Metal: Balance of Volume

39.54 sq. in.

Volume Calculation

Weld: Near Surface

2208.4 cu. in.

Weld: Balance of Volume

3843.3 cu. in.

Base Metal: Near Surface

4315.0 cu. in.

Base Metal: Balance of Volume

21194.6 cu. in.

Examination Coverage Calculations

WELD

Weld ( Near Surface Region B-C-H-I)

Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined
1	70L	11	4.12	71.47	294.5	294.5	100%
2	70L	12	4.12	71.47	294.5	294.5	100%
3	70L	3	4.12	71.47	294.5	294.5	100%
4	70L	4	4.12	71.47	294.5	294.5	100%
5	70L	11	4.12	205.48	846.6	846.6	100%
6	70L	12	0.00	205.48	0.0	846.6	0%
7	70L	3	4.12	205.48	846.6	846.6	100%
8	70L	4	0.00	205.48	0.0	846.6	0%
9	70L	11	0.00	259.08	0.0	1067.4	0%
10	70L	12	0.00	259.08	0.0	1067.4	0%
11	70L	3	0.00	259.08	0.0	1067.4	0%
12	70L	4	0.00	259.08	0.0	1067.4	0%
Totals:					2871.0	8833.8	33%

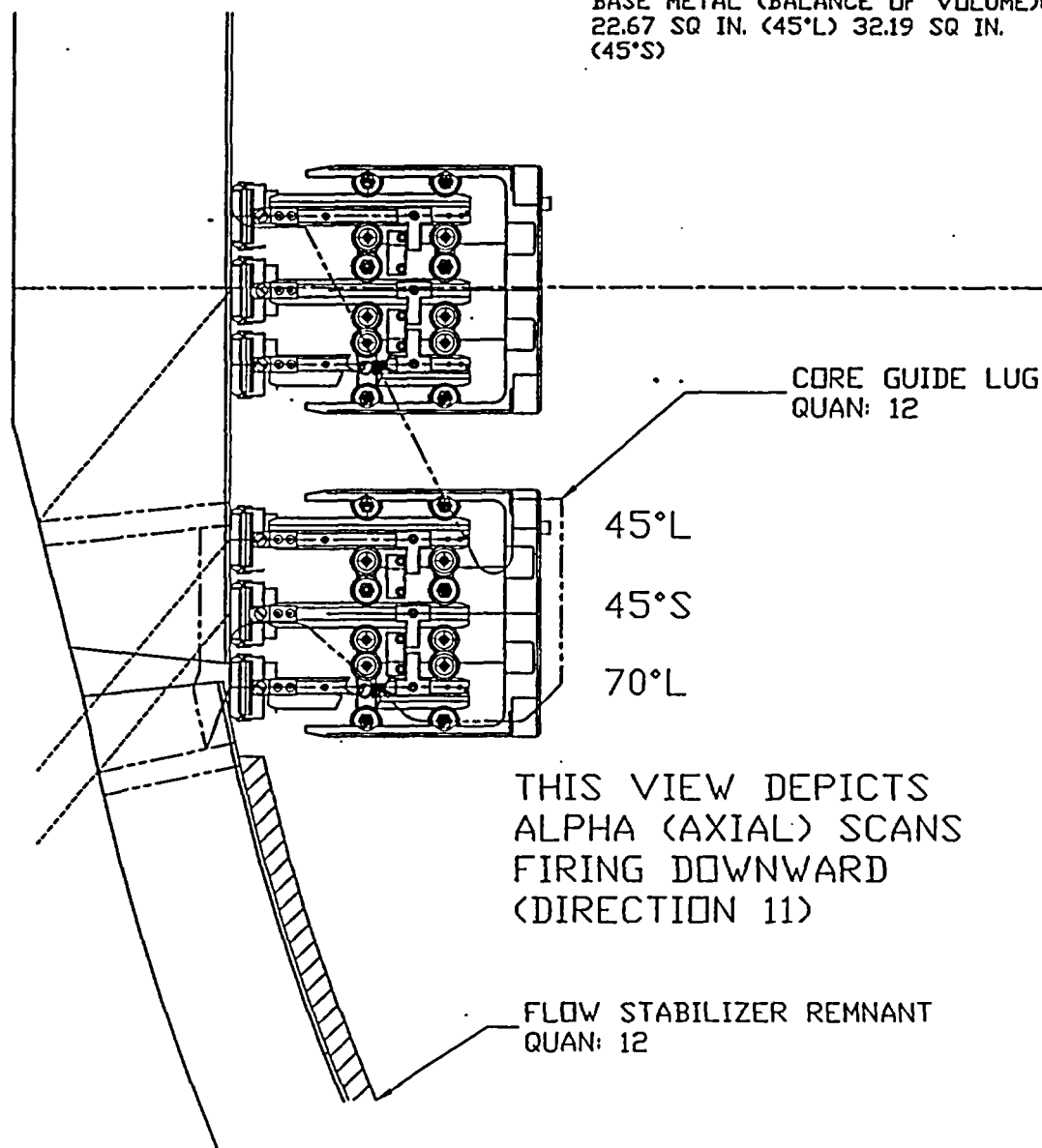
Weld ( Balance of Volume Region G-H-I-J)

Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined
1	45L	11	7.17	71.47	512.4	512.4	100%
2	45L	12	7.17	71.47	512.4	512.4	100%
3	45L	3	7.17	71.47	512.4	512.4	100%
4	45L	4	7.17	71.47	512.4	512.4	100%
5	45L	11	3.03	205.48	622.6	1473.3	42%
6	45L	12	0.00	205.48	0.0	1473.3	0%
7	45L	3	0.00	205.48	0.0	1473.3	0%
8	45L	4	7.17	205.48	1473.3	1473.3	100%
9	45L	11	0.00	259.08	0.0	1857.6	0%
10	45L	12	0.00	259.08	0.0	1857.6	0%
11	45L	3	0.00	259.08	0.0	1857.6	0%
12	45L	4	0.00	259.08	0.0	1857.6	0%
13	45S	11	7.17	71.47	512.4	512.4	100%
14	45S	12	7.17	71.47	512.4	512.4	100%
15	45S	3	7.17	71.47	512.4	512.4	100%
16	45S	4	7.17	71.47	512.4	512.4	100%
17	45S	11	6.42	205.48	1319.2	1473.3	90%
18	45S	12	0.00	205.48	0.0	1473.3	0%
19	45S	3	0.00	205.48	0.0	1473.3	0%
20	45S	4	7.17	205.48	1473.3	1473.3	100%
21	45S	11	0.00	259.08	0.0	1857.6	0%
22	45S	12	0.00	259.08	0.0	1857.6	0%
23	45S	3	0.00	259.08	0.0	1857.6	0%
24	45S	4	0.00	259.08	0.0	1857.6	0%
Totals:					8988.0	30746.7	29%

BASE METAL							
SHEET - 2							
Adjacent Base Metal (Near Surface Region A-B-I-L and C-D-E-H)							
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined
1	70L	11	8.05	71.47	575.3	575.3	100%
2	70L	3	8.05	71.47	575.3	575.3	100%
3	70L	11	7.31	205.48	1502.1	1654.1	91%
4	70L	3	5.62	205.48	1154.8	1654.1	70%
5	70L	11	0.00	259.08	0.0	2085.6	0%
6	70L	3	0.00	259.08	0.0	2085.6	0%
Totals:					3807.5	8630.1	44%
Adjacent Base Metal (Balance of Volume Region E-F-G-H and I-J-K-L)							
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined
1	45L	11	39.54	71.47	2825.9	2825.9	100%
2	45L	3	39.54	71.47	2825.9	2825.9	100%
3	45S	11	39.54	71.47	2825.9	2825.9	100%
4	45S	3	39.54	71.47	2825.9	2825.9	100%
5	45L	11	22.67	205.48	4658.2	8124.7	57%
6	45L	3	26.88	205.48	5523.3	8124.7	68%
7	45S	11	32.19	205.48	6614.4	8124.7	81%
8	45S	3	18.25	205.48	3750.0	8124.7	46%
9	45L	11	0.00	259.08	0.0	10244.0	0%
10	45L	3	0.00	259.08	0.0	10244.0	0%
11	45S	11	0.00	259.08	0.0	10244.0	0%
12	45S	3	0.00	259.08	0.0	10244.0	0%
Totals:					31849.7	84778.5	38%



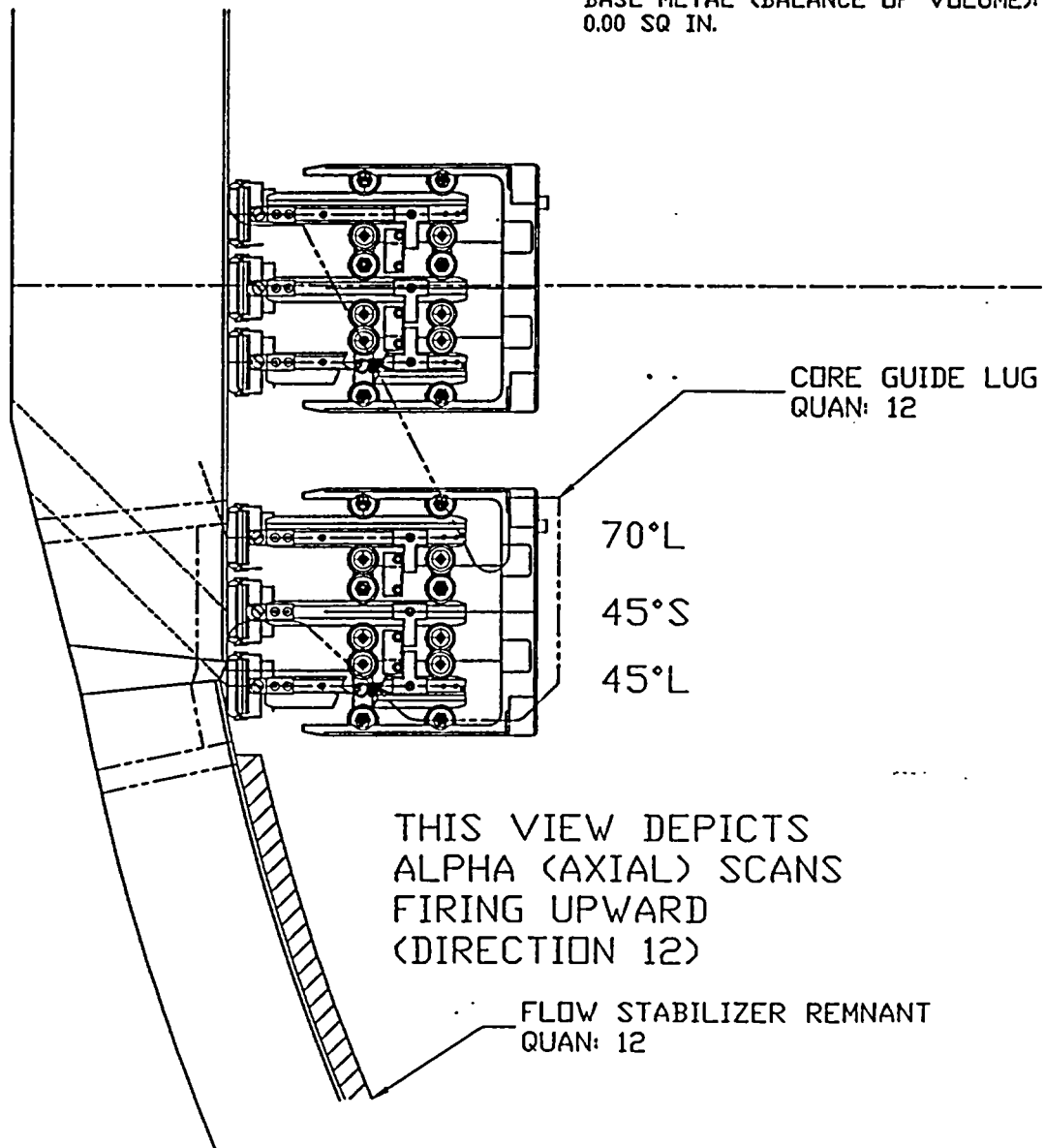
WELD (NEAR SURFACE):  
4.12 SQ IN. (70°L)  
WELD (BALANCE OF VOLUME):  
3.03 SQ IN. (45°L) 6.42 SQ IN. (45°S)  
BASE METAL (NEAR SURFACE):  
7.31 SQ IN. (70°L)  
BASE METAL (BALANCE OF VOLUME):  
22.67 SQ IN. (45°L) 32.19 SQ IN. (45°S)



PARTIAL SCANS DUE TO GUIDE  
LUGS AND FLOW STABILIZER  
REMNANTS

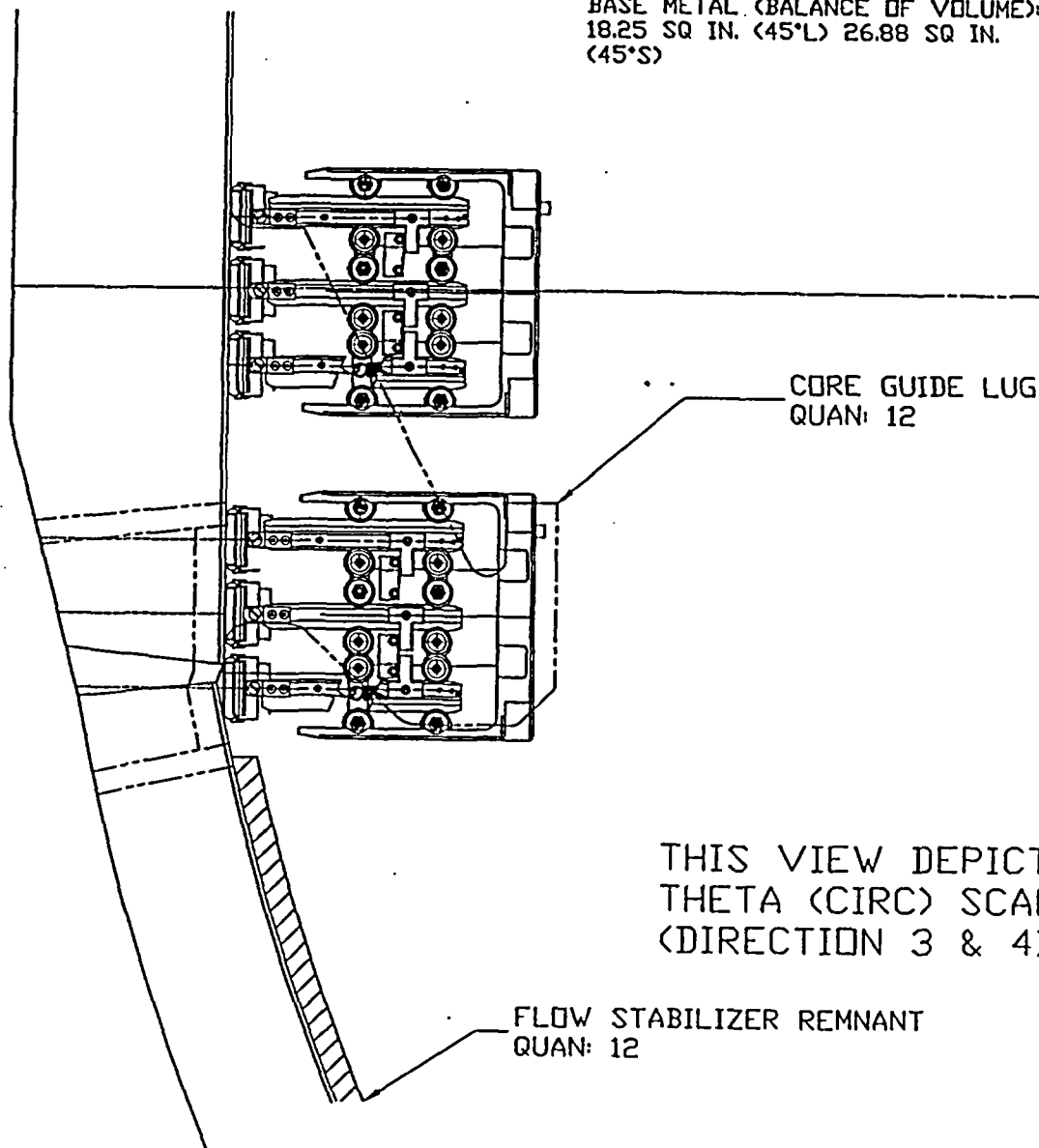
W09  
2-RPV-WR34  
B01.011.004

WELD (NEAR SURFACE):  
0.00 SQ IN.  
WELD (BALANCE OF VOLUME):  
0.00 SQ IN.  
BASE METAL (NEAR SURFACE):  
0.00 SQ IN.  
BASE METAL (BALANCE OF VOLUME):  
0.00 SQ IN.



W09  
2-RPV-WR34  
B01.011.004

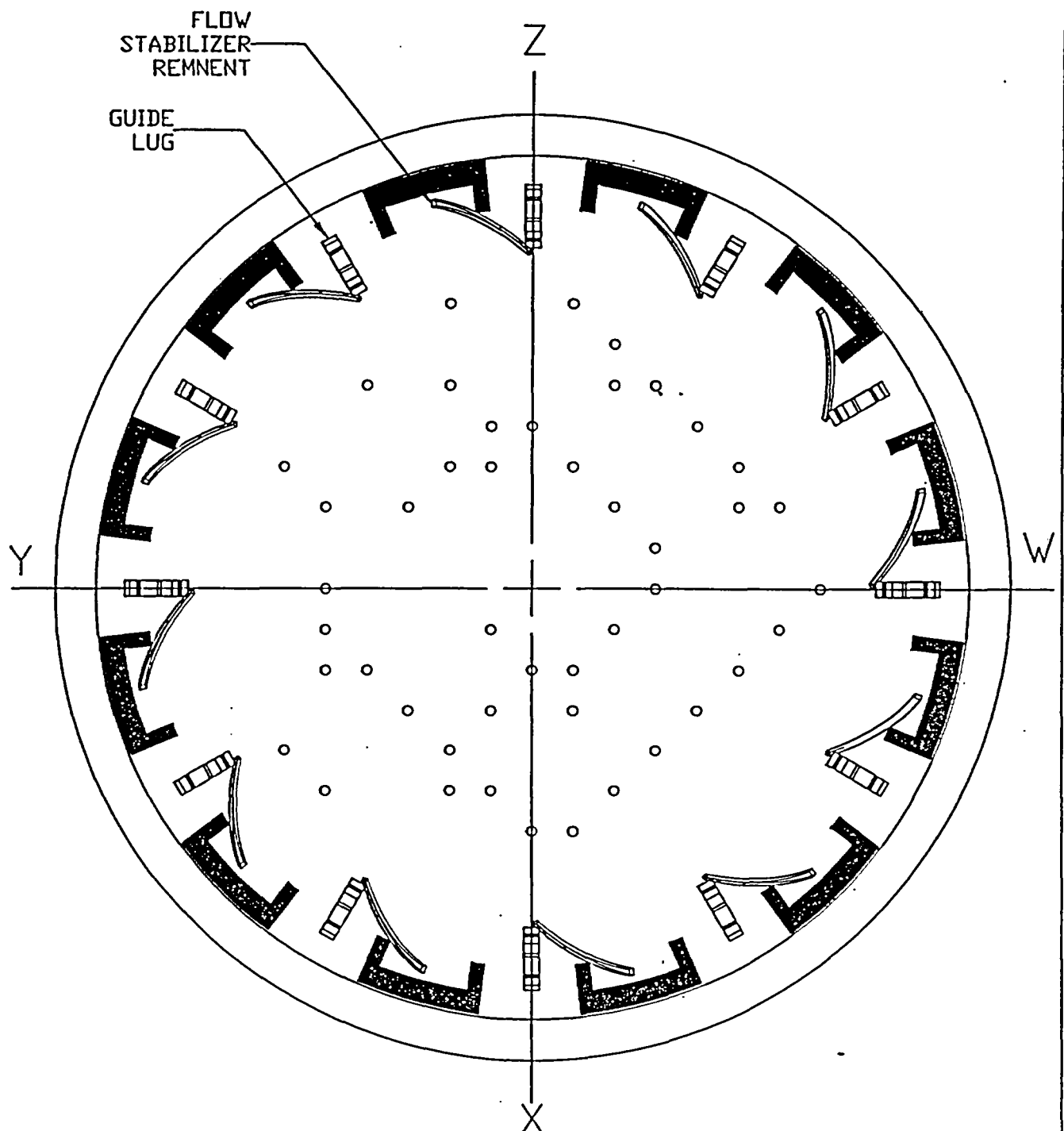
WELD (NEAR SURFACE):  
4.12 SQ IN. (70°L)  
WELD (BALANCE OF VOLUME):  
7.17 SQ IN. (45°L & 45°S)  
BASE METAL (NEAR SURFACE):  
5.62 SQ IN. (70°L)  
BASE METAL (BALANCE OF VOLUME):  
18.25 SQ IN. (45°L) 26.88 SQ IN.  
(45°S)



THIS VIEW DEPICTS  
THETA (CIRC) SCANS  
(DIRECTION 3 & 4)

PARTIAL SCANS DUE TO GUIDE  
LUGS AND FLOW STABILIZER  
REMNANTS

W09  
2-RPV-WR34  
B01.011.004



W09  
2-RPV-WR34  
B01.011.004

**OCONEE-2 APPENDIX VIII**  
**EXAMINATION COVERAGE FOR WELD: W10**  
**2-RPV-WR35**  
**B01.021.003**  
**SCAN PLAN DWG NO.: 6014933E-02**  
**AGGREGATE COVERAGE OBTAINED: 42%**

Zone Coverage Obtained

Weld: 40%

Adjacent Base Metal: 43%

Examination Volume Definition

Weld Length: 448.12 in.

Area Measurement

Volume Calculation

Weld: Near Surface 0.99 sq. in.

Weld: Near Surface 443.6 cu. in.

Weld: Balance of Volume 6.21 sq. in.

Weld: Balance of Volume 2782.8 cu. in.

Base Metal: Near Surface 6.02 sq. in.

Base Metal: Near Surface 2697.7 cu. in.

Base Metal: Balance of Volume 24.78 sq. in.

Base Metal: Balance of Volume 11104.4 cu. in.

Examination Coverage Calculations

WELD

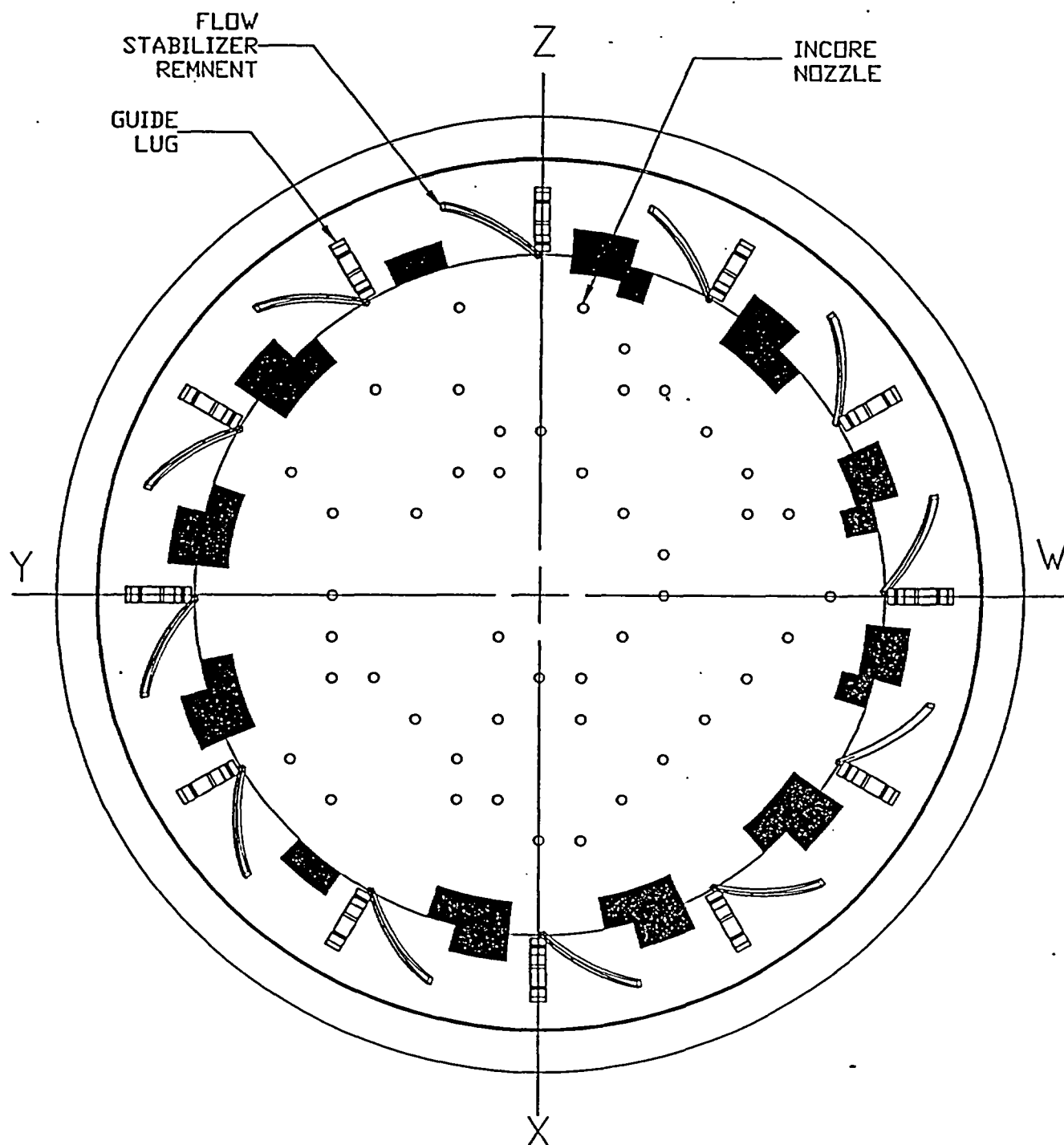
Weld (Near Surface Region B-C-H-I)

Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined	
1	70L	11	0.99	168.05	166.4	166.4	100%	FULL
2	70L	11	0.00	56.01	0.0	55.4	0%	PARTIAL
3	70L	11	0.00	224.06	0.0	221.8	0%	NONE
4	70L	12	0.99	168.05	166.4	166.4	100%	FULL
5	70L	12	0.00	56.01	0.0	55.4	0%	PARTIAL
6	70L	12	0.00	224.06	0.0	221.8	0%	NONE
7	70L	3	0.99	168.05	166.4	166.4	100%	FULL
8	70L	3	0.00	56.01	0.0	55.4	0%	PARTIAL
9	70L	3	0.00	224.06	0.0	221.8	0%	NONE
10	70L	4	0.99	168.05	166.4	166.4	100%	FULL
11	70L	4	0.00	56.01	0.0	55.4	0%	PARTIAL
12	70L	4	0.00	224.06	0.0	221.8	0%	NONE
Totals:					665.5	1774.5	38%	

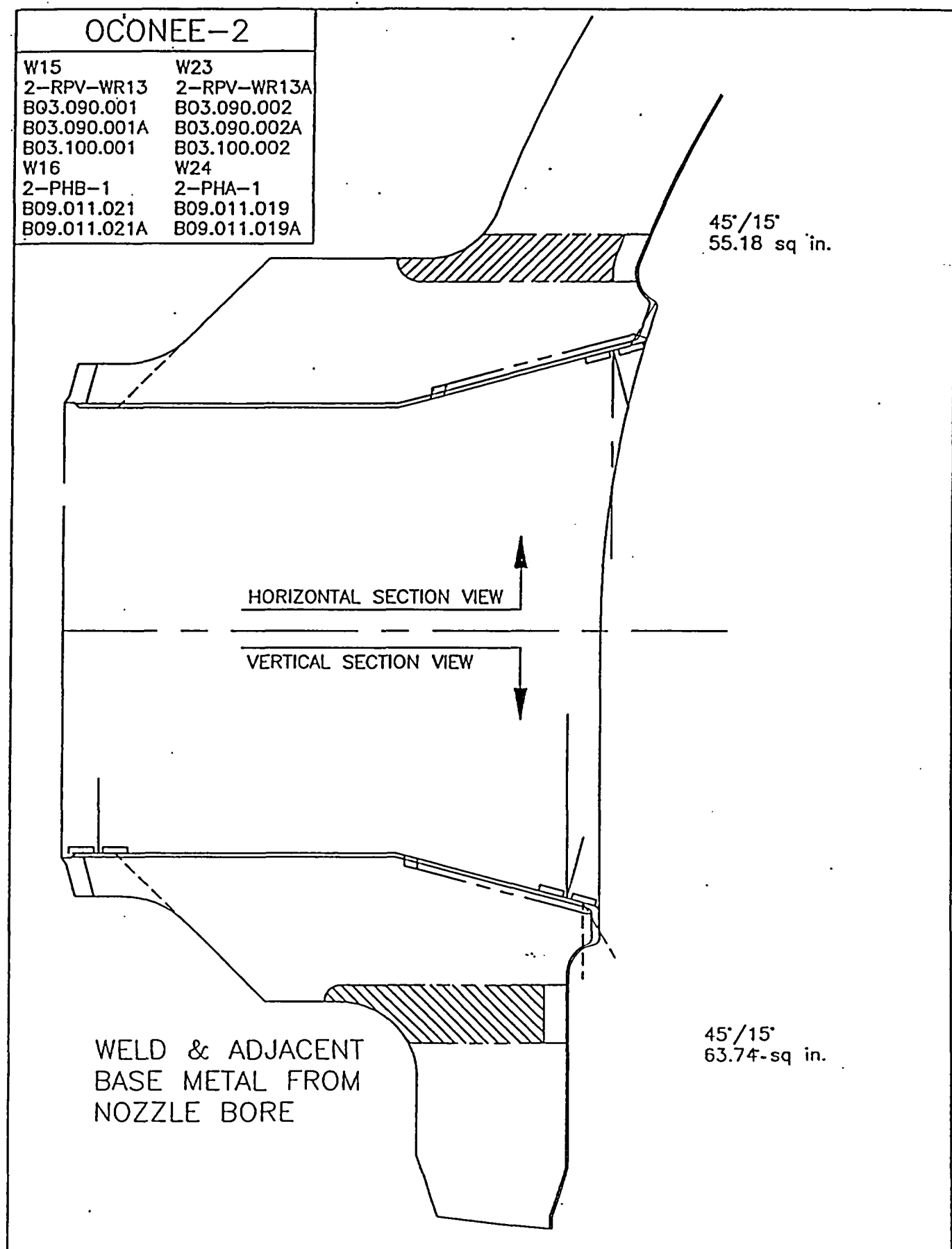
Weld (Balance of Volume Region G-H-I-J)

Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined	
1	45L	11	6.21	168.05	1043.6	1043.6	100%	FULL
2	45L	11	5.70	56.01	319.3	347.8	92%	PARTIAL
3	45L	11	0.00	224.06	0.0	1391.4	0%	NONE
4	45L	12	6.21	168.05	1043.6	1043.6	100%	FULL
5	45L	12	0.00	56.01	0.0	347.8	0%	PARTIAL
6	45L	12	0.00	224.06	0.0	1391.4	0%	NONE
7	45L	3	6.21	168.05	1043.6	1043.6	100%	FULL
8	45L	3	0.00	56.01	0.0	347.8	0%	PARTIAL
9	45L	3	0.00	224.06	0.0	1391.4	0%	NONE
10	45L	4	6.21	168.05	1043.6	1043.6	100%	FULL
11	45L	4	0.00	56.01	0.0	347.8	0%	PARTIAL
12	45L	4	0.00	224.06	0.0	1391.4	0%	NONE
13	45S	11	6.21	168.05	1043.6	1043.6	100%	FULL
14	45S	11	5.70	56.01	319.3	347.8	92%	PARTIAL
15	45S	11	0.00	224.06	0.0	1391.4	0%	NONE
16	45S	12	6.21	168.05	1043.6	1043.6	100%	FULL
17	45S	12	0.00	56.01	0.0	347.8	0%	PARTIAL
18	45S	12	0.00	224.06	0.0	1391.4	0%	NONE
19	45S	3	6.21	168.05	1043.6	1043.6	100%	FULL
20	45S	3	0.00	56.01	0.0	347.8	0%	PARTIAL
21	45S	3	0.00	224.06	0.0	1391.4	0%	NONE
22	45S	4	6.21	168.05	1043.6	1043.6	100%	FULL
23	45S	4	0.00	56.01	0.0	347.8	0%	PARTIAL
24	45S	4	0.00	224.06	0.0	1391.4	0%	NONE
Totals:					8987.0	22262.4	40%	

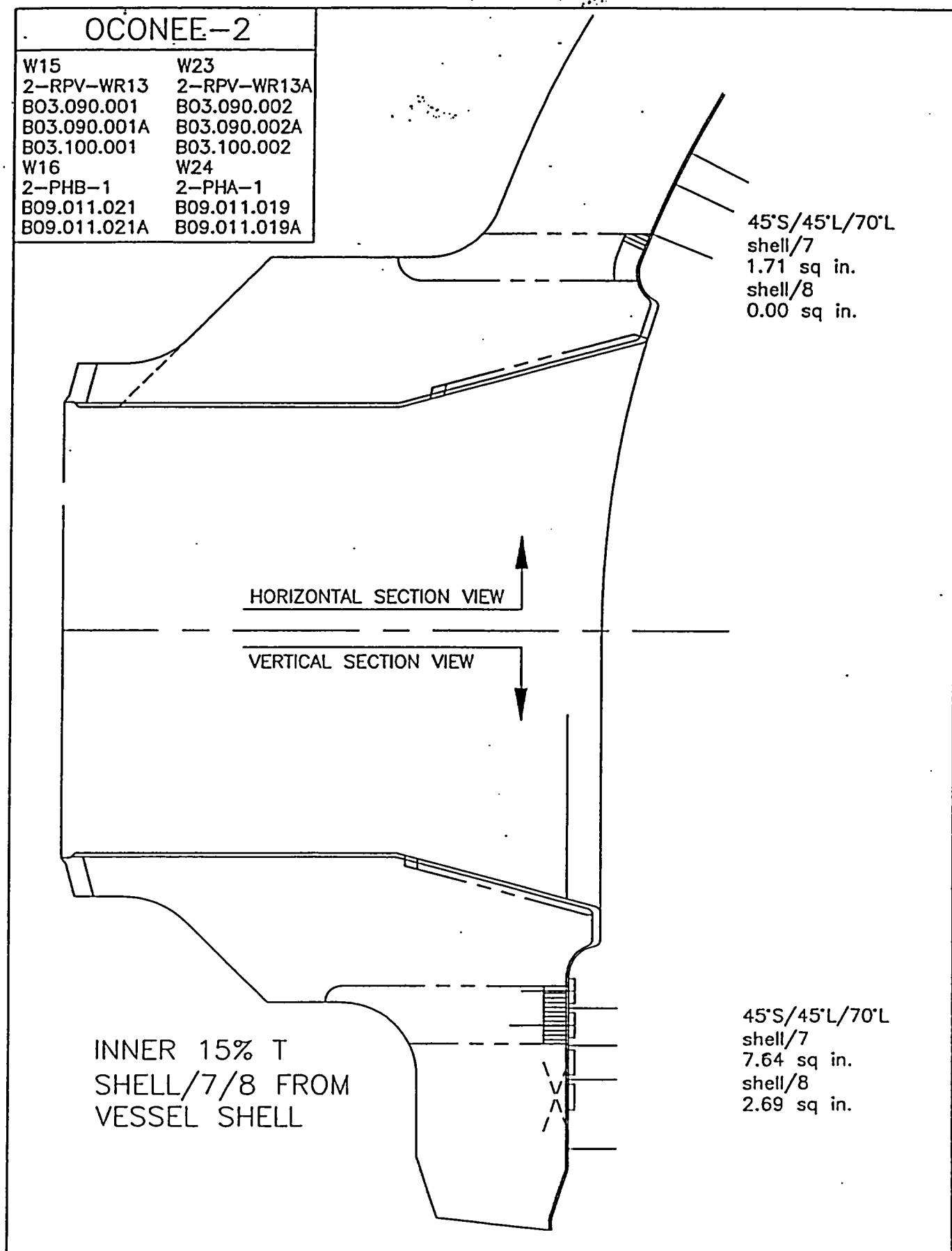
BASE METAL								
SHEET-2								
Adjacent Base Metal (Near Surface Region A-B-I-L and C-D-E-H)								
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined	
1	70L	11	6.02	168.05	1011.6	1011.6	100%	FULL
2	70L	11	2.50	56.01	140.0	337.2	42%	PARTIAL
3	70L	11	0.00	224.06	0.0	1348.8	0%	NONE
4	70L	3	6.02	168.05	1011.6	1011.6	100%	FULL
5	70L	3	1.82	56.01	101.9	337.2	30%	PARTIAL
6	70L	3	0.00	224.06	0.0	1348.8	0%	NONE
Totals:					2265.2	5395.3	42%	
Adjacent Base Metal (Balance of Volume Region E-F-G-H and I-J-K-L)								
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined	
1	45L	11	24.78	168.05	4164.2	4164.2	100%	FULL
2	45L	11	18.95	56.01	949.4	1387.9	68%	PARTIAL
3	45L	11	0.00	224.06	0.0	5552.2	0%	NONE
4	45S	3	24.78	168.05	4164.2	4164.2	100%	FULL
5	45S	3	8.19	56.01	458.7	1387.9	33%	PARTIAL
6	45S	3	0.00	224.06	0.0	5552.2	0%	NONE
Totals:					9736.4	22208.6	44%	



W10  
DCONEE-2  
2-RPV-WR35  
B01.021.003







# OCONEE-2

W15	W23
2-RPV-WR13	2-RPV-WR13A
B03.090.001	B03.090.002
B03.090.001A	B03.090.002A
B03.100.001	B03.100.002
W16	W24
2-PHB-1	2-PHA-1
B09.011.021	B09.011.019
B09.011.021A	B09.011.019A

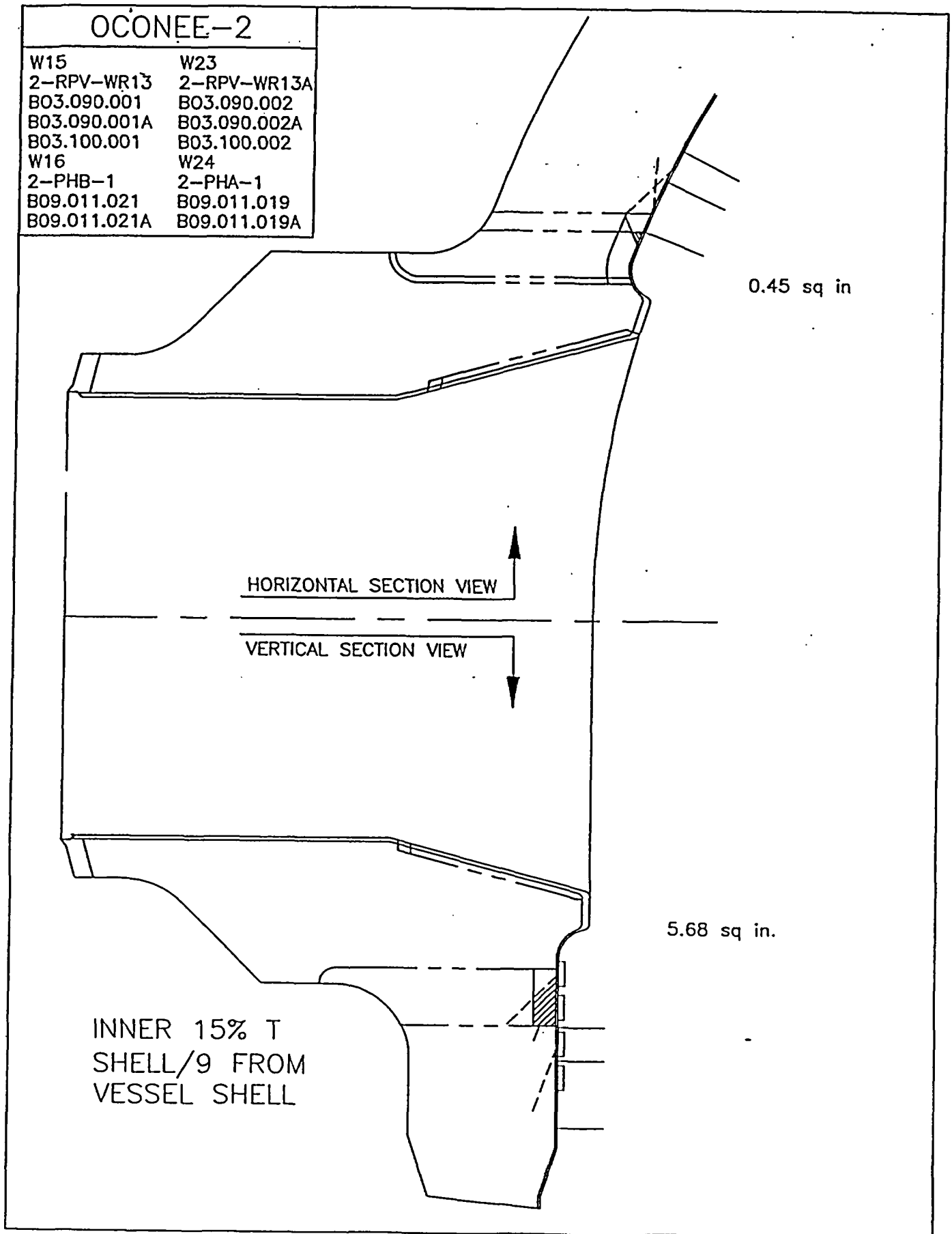
0.45 sq in

HORIZONTAL SECTION VIEW

VERTICAL SECTION VIEW

5.68 sq in.

INNER 15% T  
SHELL/9 FROM  
VESSEL SHELL



# OCONEE-2

W15	W23
2-RPV-WR13	2-RPV-WR13A
B03.090.001	B03.090.002
B03.090.001A	B03.090.002A
B03.100.001	B03.100.002
W16	W24
2-PHB-1	2-PHA-1
B09.011.021	B09.011.019
B09.011.021A	B09.011.019A

45S/45L/70L  
1.97 SQ IN.

HORIZONTAL SECTION VIEW

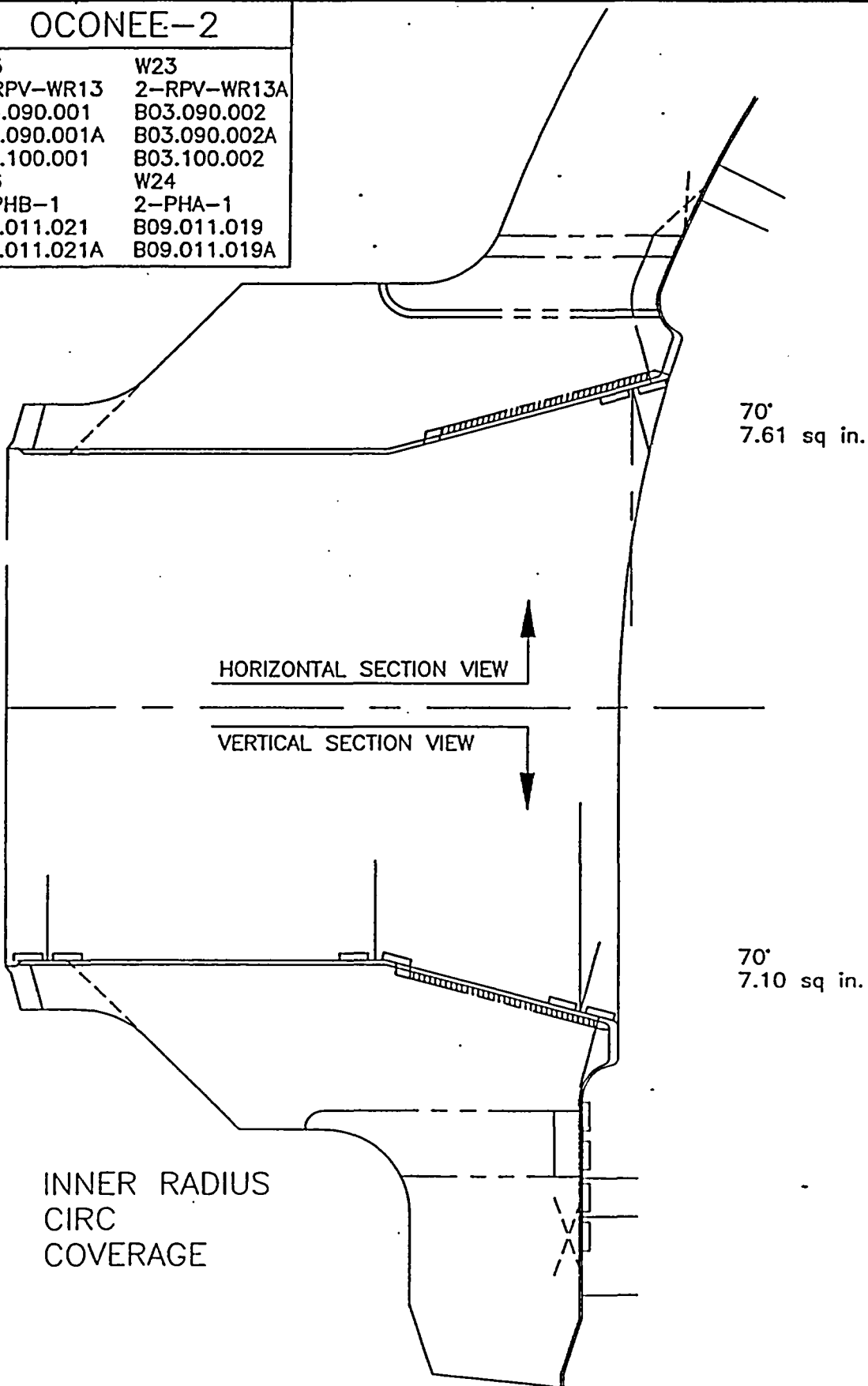
VERTICAL SECTION VIEW

INNER 15% T  
SHELL/10 FROM  
VESSEL SHELL

45S/45L/70L  
7.09 SQ IN.

# OCONEE-2

W15	W23
2-RPV-WR13	2-RPV-WR13A
B03.090.001	B03.090.002
B03.090.001A	B03.090.002A
B03.100.001	B03.100.002
W16	W24
2-PHB-1	2-PHA-1
B09.011.021	B09.011.019
B09.011.021A	B09.011.019A



# OCONEE-2 EXAMINATION COVERAGE FOR CORE FLOOD NOZZLES:

DRAWING NO.: 6014936E-02

W11 2-RPV-WR54  
B03.090.007  
B03.100.007  
W19 2-RPV-WR54A  
B03.090.008  
B03.100.008

AGGREGATE COVERAGE OBTAINED FOR WELD:

81%  
COVERAGE FROM BORE AND SHELL

AGGREGATE COVERAGE OBTAINED FOR INSIDE RADIUS:

52%

Zone Coverage Obtained			
Weld & Adjacent Base Metal:	79%	Inner 15% BMT: 97%	Inside Radius: 52%

HORIZONTAL SECTION EVALUATION									
Examination Volume Definition									
Weld Diameter:			25 in.		Nozzle Bore Diameter:			12.25 in.	
Area Measurement					Volume Calculation				
Weld & Adjacent			42.55 sq. in.		Weld & Adjacent			1670.9 cu. in.	
Base Metal (Shell)					Base Metal (Bore)				
Inner 15% BMT			6.14 sq. in.		Near Surface			241.1 cu. in.	
Inside Radius			6.22 sq. in.		Inside Radius			119.7 cu. in.	
Examination Coverage Calculations									
Weld & Adjacent Base Metal (Shell)									
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Degrees Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined		
1	45S/45L/70L	shell/40	42.55	180.0	1670.9	1670.9	100%	nwn	zone2
2	45S/45L/70L	shell/9	6.92	180.0	271.7	1670.9	16%	nwp	zone4
3	45S/45L/70L	shell/8	39.10	180.0	1535.5	1670.9	92%	nbl	zone5
4	45S/45L/70L	shell/7	42.55	180.0	1670.9	1670.9	100%	nbr	zone5
Totals:					5149.1	6683.7	77%		
Inner 15% BMT									
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Degrees Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined		
1	45S/45L/70L	shell/7	6.14	180.0	241.1	241.1	100%		
2	45S/45L/70L	shell/8	6.14	180.0	241.1	241.1	100%		
3	45S/45L/70L	shell/9	5.19	180.0	203.8	241.1	85%		
4	45S/45L/70L	shell/10	6.14	180.0	241.1	241.1	100%		
Totals:					927.2	964.5	96%		
Inside Radius									
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Degrees Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined		
1	70	circ	0.21	180.0	4.0	119.7	3%		
2	70	axial	6.22	180.0	119.7	119.7	100%		
Totals:					123.7	239.4	52%		

Note: The horizontal section coverage requirement is considered to be 180° total; 45° each side of 90° and 270°.

VERTICAL SECTION EVALUATION									
Examination Volume Definition									
Weld Diameter:		25 in.		Nozzle Bore Diameter:		12.25 in.			
Area Measurement				Volume Calculation					
Weld & Adjacent		39.68 sq. in.		Weld & Adjacent		1558.2 cu. in.			
Base Metal (Shell)				Base Metal (Bore)					
Near Surface		5.72 sq. in.		Near Surface		224.6 cu. in.			
Inside Radius		6.21 sq. in.		Inside Radius		119.5 cu. in.			
Examination Coverage Calculations									
Weld & Adjacent Base Metal (Shell)									
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Degrees Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined		
1	45S/45L/70L	shell/10	39.68	180.0	1558.2	1558.2	100%	nwn	zone1
2	45S/45L/70L	shell/10	39.68	60.0	519.4	519.4	100%	nwn	zone3
3	45S/45L/70L	shell/10	34.66	30.0	226.8	259.7	87%	nwn	zone3
4	45S/45L/70L	shell/9	7.03	180.0	276.1	1558.2	18%	nwp	zone4
5	45S/45L/70L	shell/8	39.68	180.0	1558.2	1558.2	100%	nbp	zone5
6	45S/45L/70L	shell/7	39.68	180.0	1558.2	1558.2	100%	nbn	zone5
Totals:					5697.0	7012.0	81%		
Inner 15% BMT									
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Degrees Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined		
1	45S/45L/70L	shell/7	5.72	180.0	224.6	224.6	100%		
2	45S/45L/70L	shell/8	5.72	180.0	224.6	224.6	100%		
3	45S/45L/70L	shell/9	5.04	180.0	197.9	224.6	88%		
4	45S/45L/70L	shell/10	5.72	180.0	224.6	224.6	100%		
Totals:					871.8	898.5	97%		
Inside Radius									
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Degrees Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined		
1	70	circ	0.26	180.0	5.0	119.5	4%		
2	70	axial	6.21	180.0	119.5	119.5	100%		
Totals:					124.5	239.0	52%		

Note: The vertical section coverage requirement is considered to be 180° total; 45° each side of 0° and 180°.

**Oconee-2**  
**Explanation of Limited Coverage**  
**for**  
**Core Flood Nozzle to Shell Weld**

The Core Flood Nozzle of a B&W 177 plant has several obstructions which limits UT inspection of the nozzle-to-shell weld. In order of magnitude of impact these include:

The Flow Restrictor located in the bore of the Core Flood Nozzle.  
The Inlet Nozzles located 30 degrees on either side of the Core Flood Nozzles  
The taper above the Core Flood Nozzle associated with the Core Support Ledge.  
The radius blend between the shell and the bore of the nozzle itself.

Despite these obstructions, Framatome ANP has gone to great lengths to get the maximum practical coverage of this weld. The coverage, which is described by the following spread sheet output and graphic figures, totals up as follows:

Weld & Adjacent Base Metal = 81%  
Near Surface (Vessel ID) = 97%  
Inside Radius = 52%

"Ursula", the robotic system which will perform this inspection, uses several abbreviations to describe a coordinate system for scan and index purposes. There are four major classes of scans in the "Ursula" system:

("S") Shell used for the cylindrical vessel ID  
("N") Nozzle used for the nozzle to shell from the vessel ID  
("P") Pipe used for scans in the nozzle ID  
("M") Meridional used for the lower head

In addition, several axes of motion are labeled:

("Z") which is the major centerline axis of the vessel, with the positive sense down into the vessel ("R") which is a radial distance measured perpendicular to the "Z" axis, with the positive sense away from the "Z" axis  
("T") Theta which is an angular displacement, in the plane "R" is measured in, between 0 degrees and 720 degrees from vessel 0 (The B&W "W" axis of the vessel)  
("A") Alpha which is an angular displacement of the spherical radius (sr) of the lower head as measured from the reference 0 point when this sr is perpendicular to the "Z" axis, such that positive angles increase from 0 to 90 from the shell to the centerline of the vessel at the bottom of the lower head.

In addition to these major axes, each nozzle has an axis system associated with its centerline. Axes of nozzle motion are:

("R") units are measurements off the vessel centerline along the nozzle centerline  
("W") is a radial measurement, perpendicular to the nozzle centerline, with the positive sense away from the nozzle centerline  
("B") Beta is an angular displacement, in the plane "W" is measured in, from a reference 0 at "top dead center" of the nozzle.

Scans are denoted by the class, axis, and the positive or negative sense with which a reference axis on the

"Ursula" contact head aligns. For example, the scans we are interested in are within the Nozzle, or "N" scan class. The contact head reference axis (and in this case the beam direction of the transducers) will align with either the "W" radial direction from the nozzle centerline, or the Beta ("B") angular sense about the nozzle centerline with positive being clockwise rotation when viewing the nozzle from the vessel centerline.

Since the bore of the Core Flood Nozzle is obstructed by the Flow Restrictor all scans for the nozzle to shell weld are scanned from the vessel ID and will be either:

NWP

NWN

NBP

NBN

with the final "P" or "N" denoting positive or negative sense.

Because no scans are performed from the nozzle bore, scans must be performed on the shell perpendicular to the nozzle to shell weld centerline, in addition to the scans parallel to the weld centerline on the vessel ID. Figure 1,2 & 3 indicates zones of coverage in which different limitations and scan directions apply. The subsequent figures and spread sheet output are based on this coverage. Zones 1 thru 3 are all NWN scans with the beam direction perpendicular to the weld centerline towards the center of the nozzle. Zone 4 is a NWP scan with the beam direction perpendicular to the centerline of the weld away from the center of the nozzle. Zone 5 is scanned in both NBP & NBN with the beam direction parallel to the weld centerline.

The spread sheet entries are as follows:

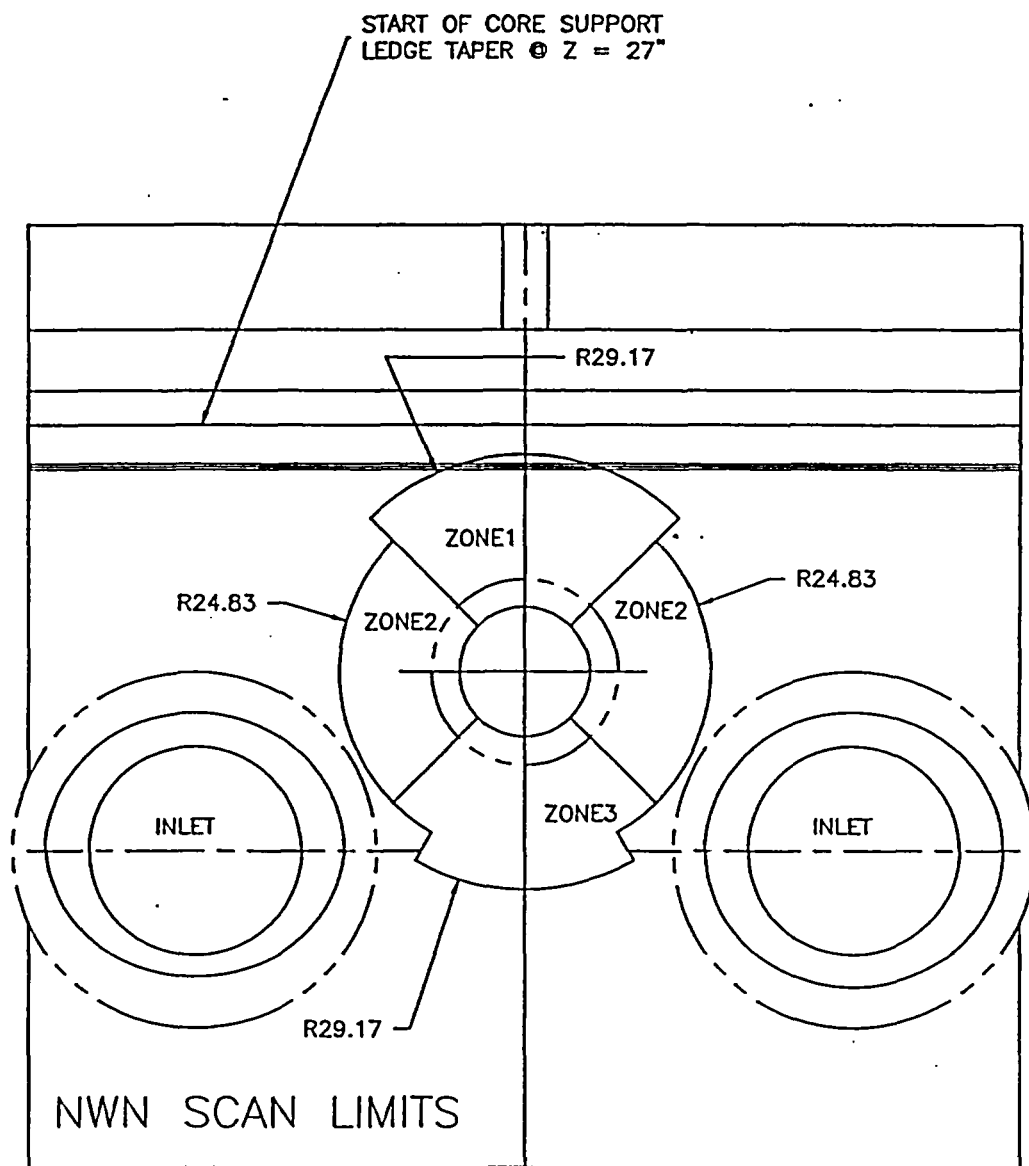
Beam Direction 1 comes from NWN scans

Beam Direction 2 comes from NWP scans

Beam Direction 3 comes from NBP scans

Beam Direction 4 comes from NBN scans

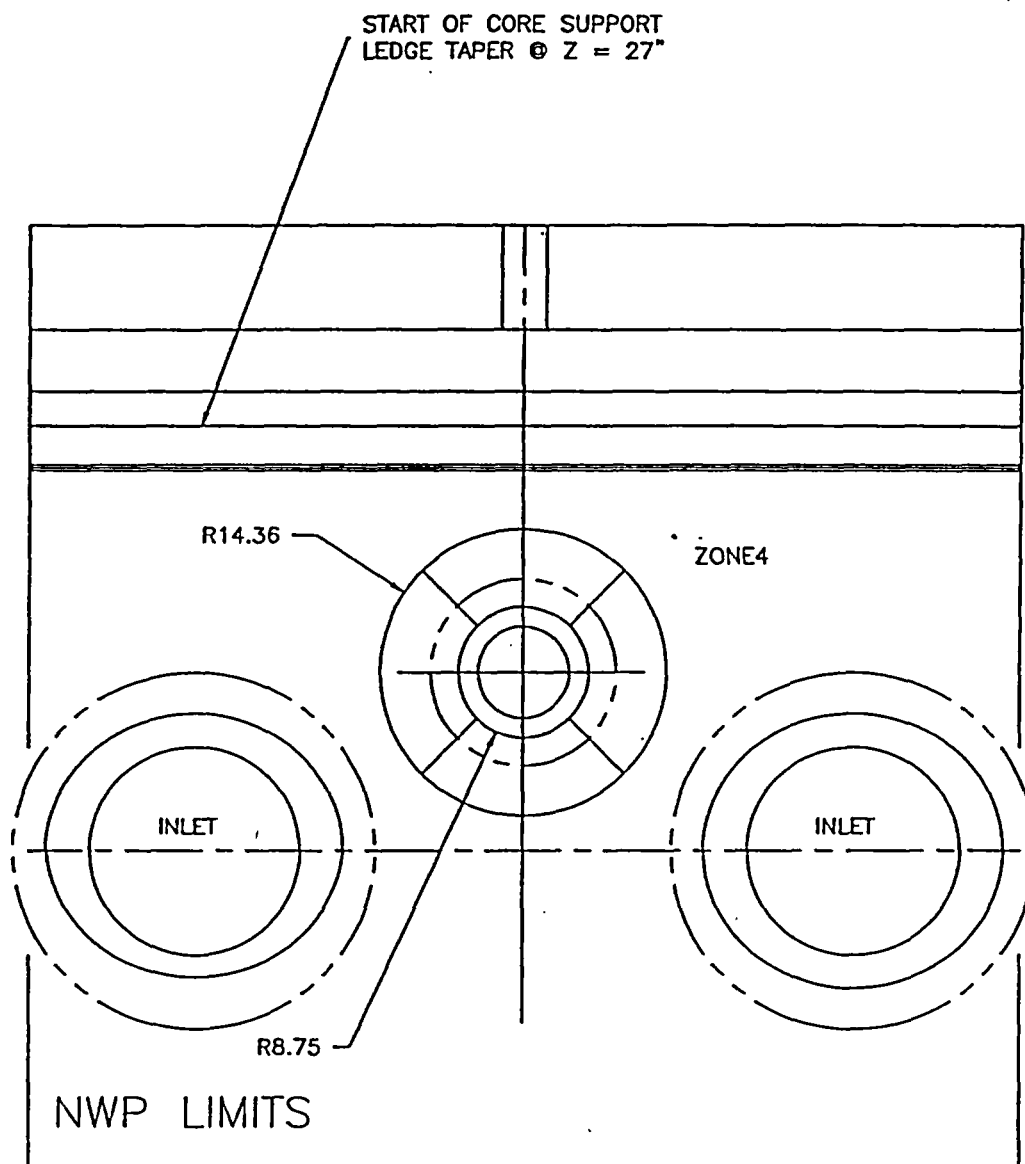
To calculate % coverage the spread sheet uses the volume acquired by a given angle divided by the true unobstructed inspection volume required to be examined. For a given angle and beam direction the sum of the degrees for which the various coverages were obtained must equal 180 degrees. This is because the total nozzle inspection volume is broken into a horizontal inspection volume (and subsequent coverage) and a vertical inspection volume (and subsequent coverage). Each area and coverage is considered to represent 180 degrees of the nozzle. After the horizontal and vertical sections are calculated separately they are combined to provide aggregate coverage numbers.



$$\text{SHELL}/10 = \text{NWN SCANS}$$

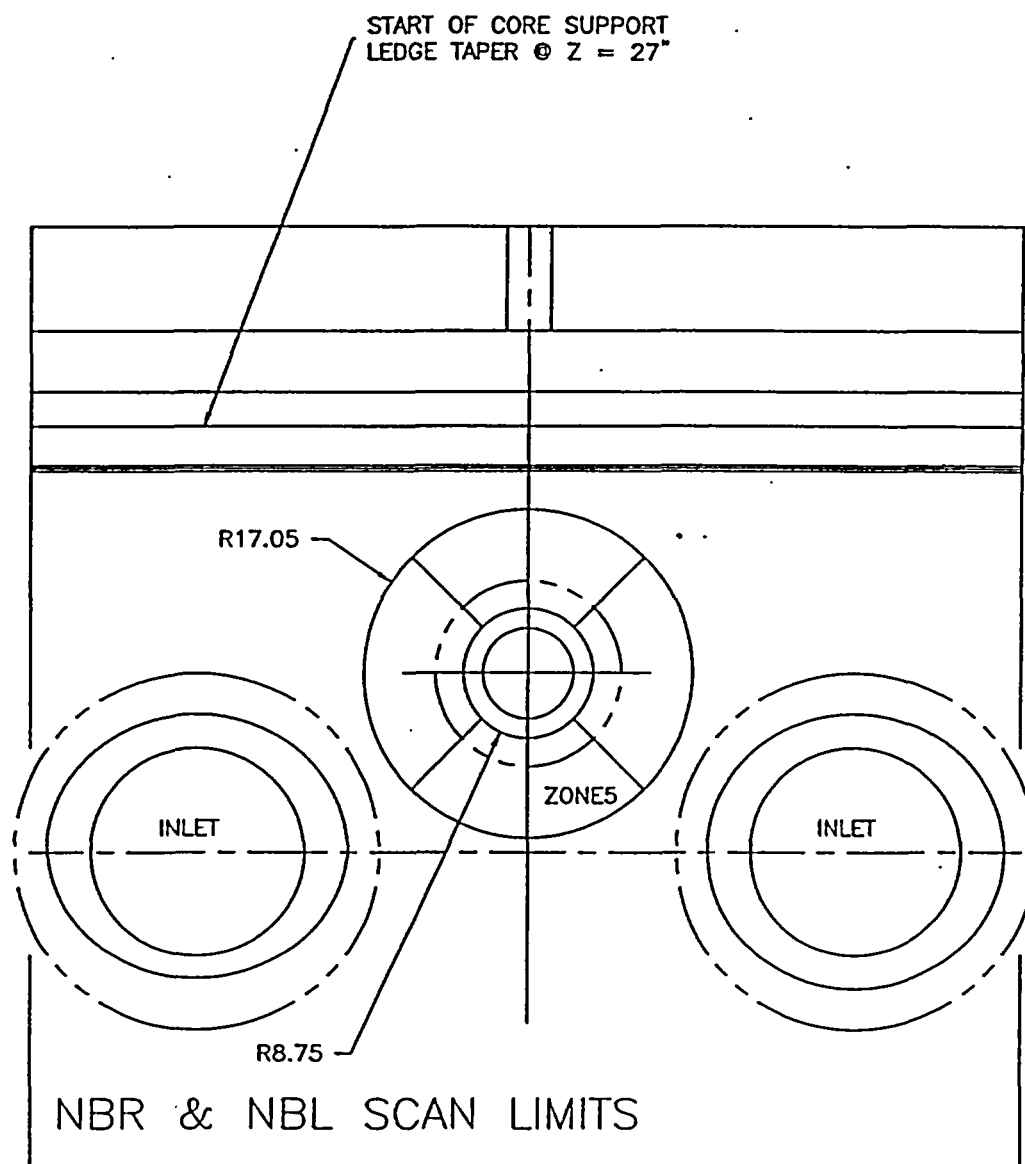
Figure-1





SHELL/9 = NWP SCANS

Figure-2



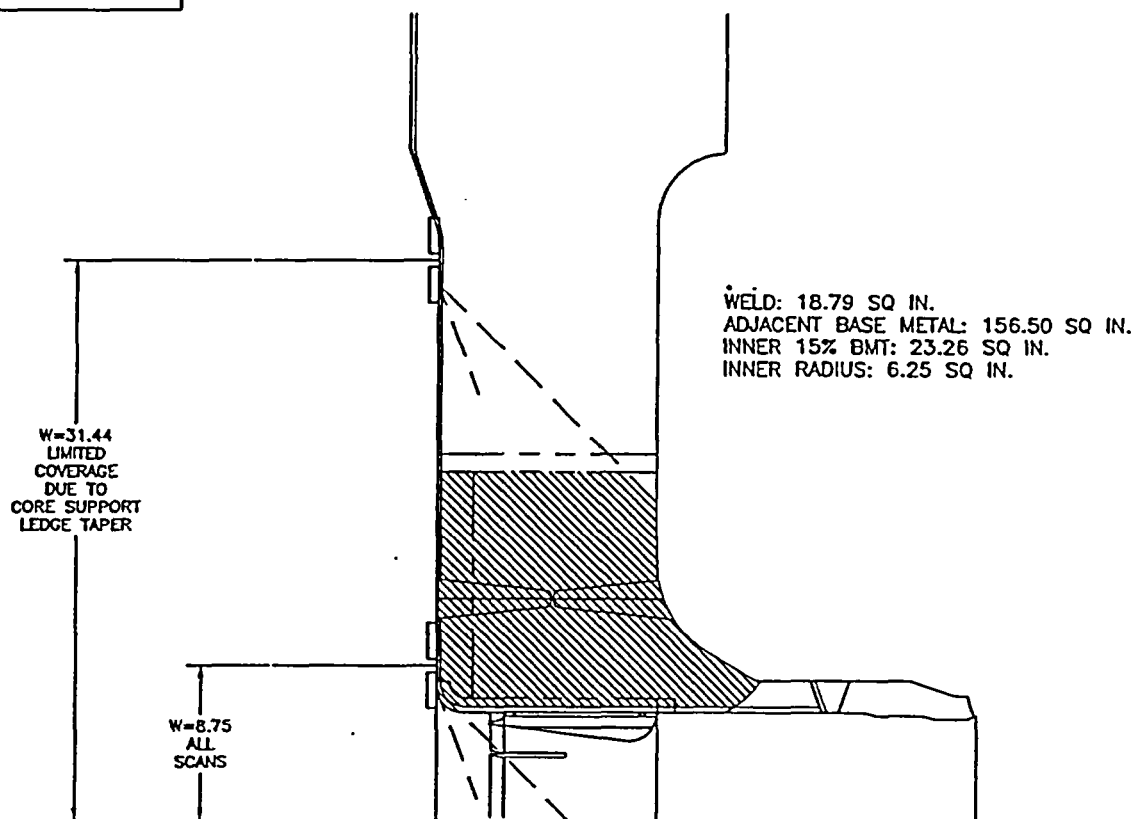
SHELL/7= NBR SCANS

SHELL/8 = NBL SCANS

Figure-3

OCONEE-2

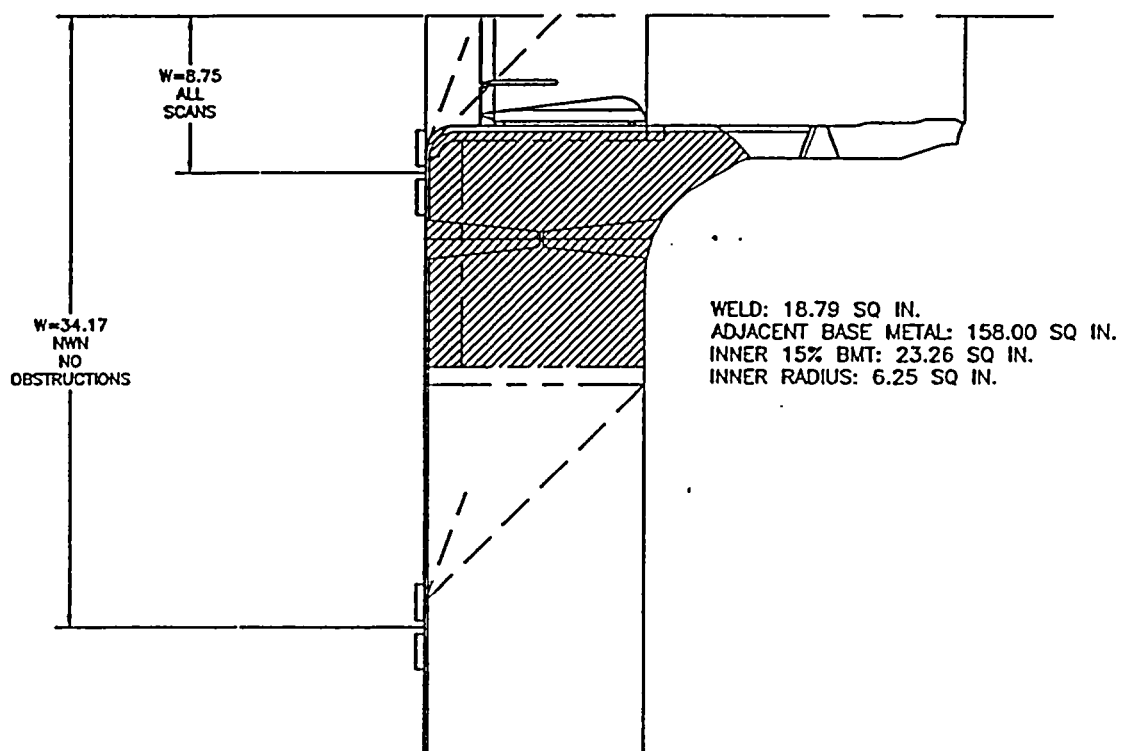
W11  
2-RPV-WR54  
B03.090.007  
B03.100.007  
W19  
2-RPV-WR54A  
B03.090.008  
B03.100.008



BEAM DIRECTION 1-ZONE 1

OCONEE-2

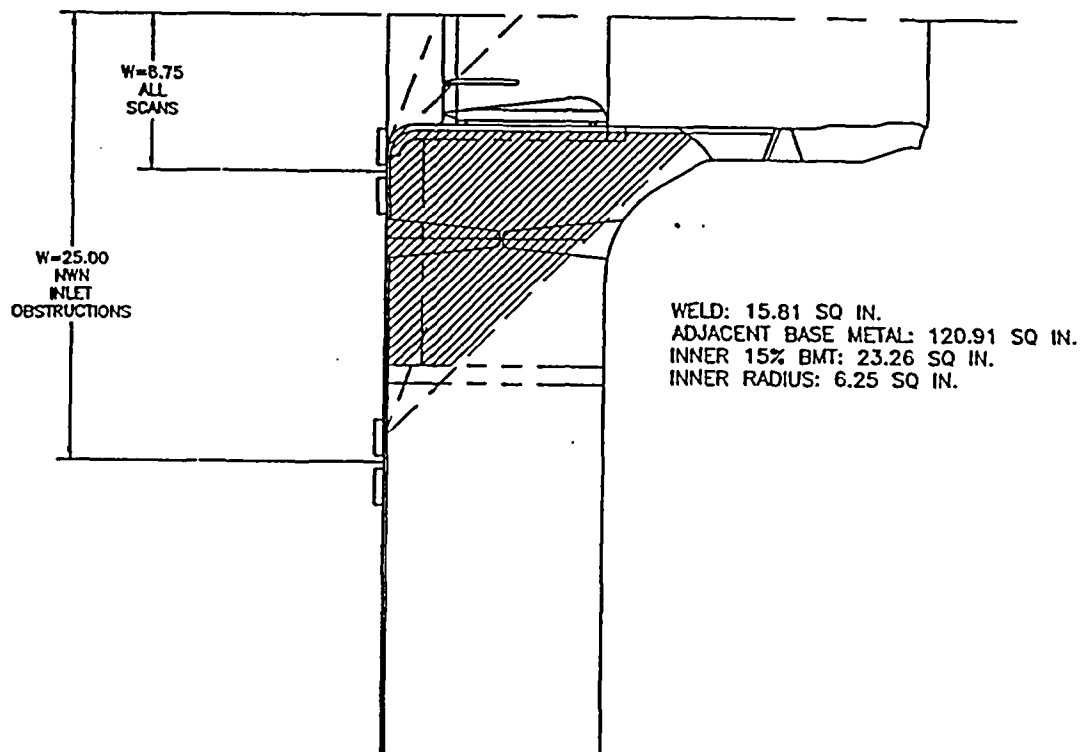
W11  
2-RPV-WR54  
B03.090.007  
B03.100.007  
W19  
2-RPV-WR54A  
B03.090.008  
B03.100.008



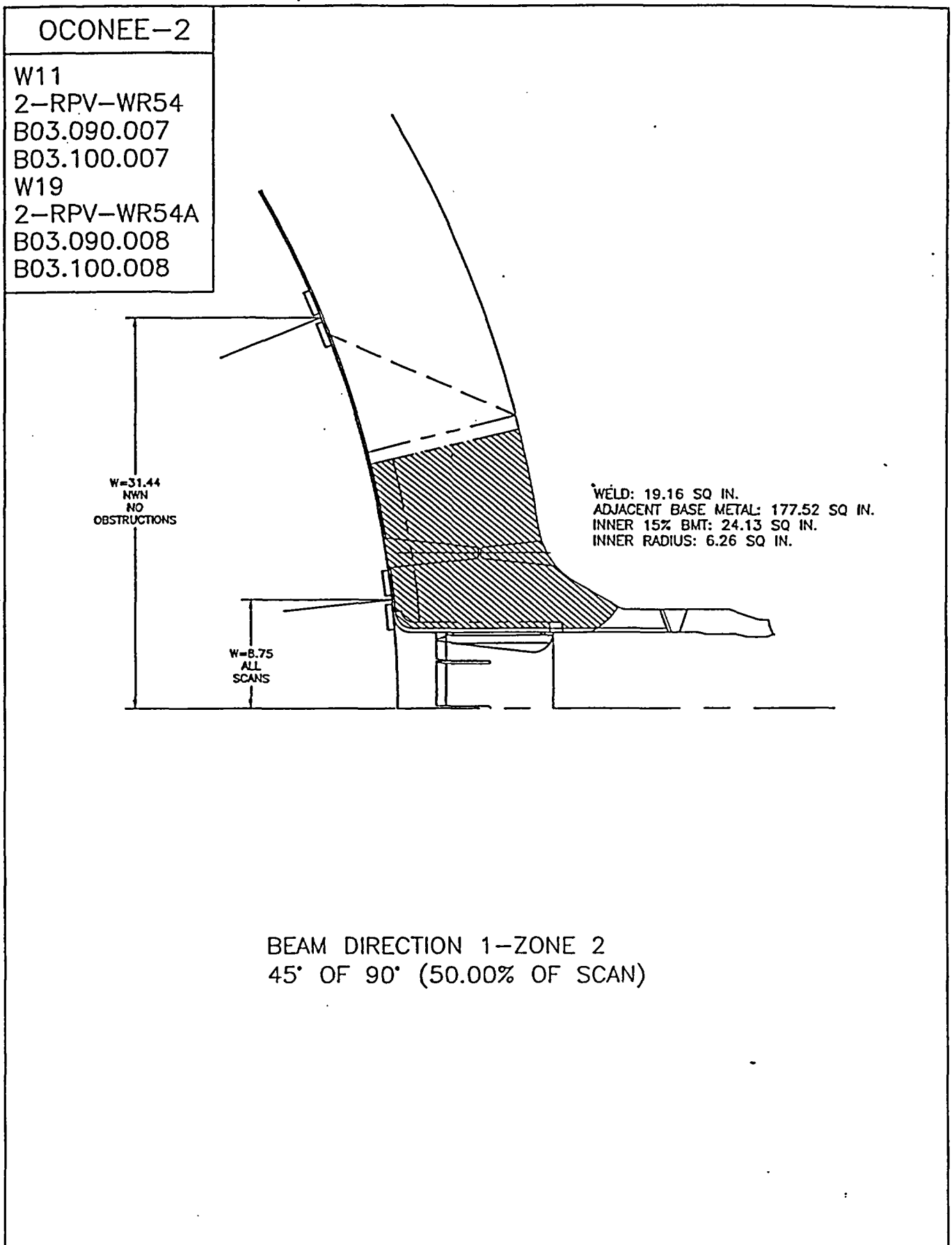
BEAM DIRECTION 1-ZONE 3  
60° OF 90° (66.6% OF SCAN)

OCONEE-2

W11  
2-RPV-WR54  
B03.090.007  
B03.100.007  
W19  
2-RPV-WR54A  
B03.090.008  
B03.100.008

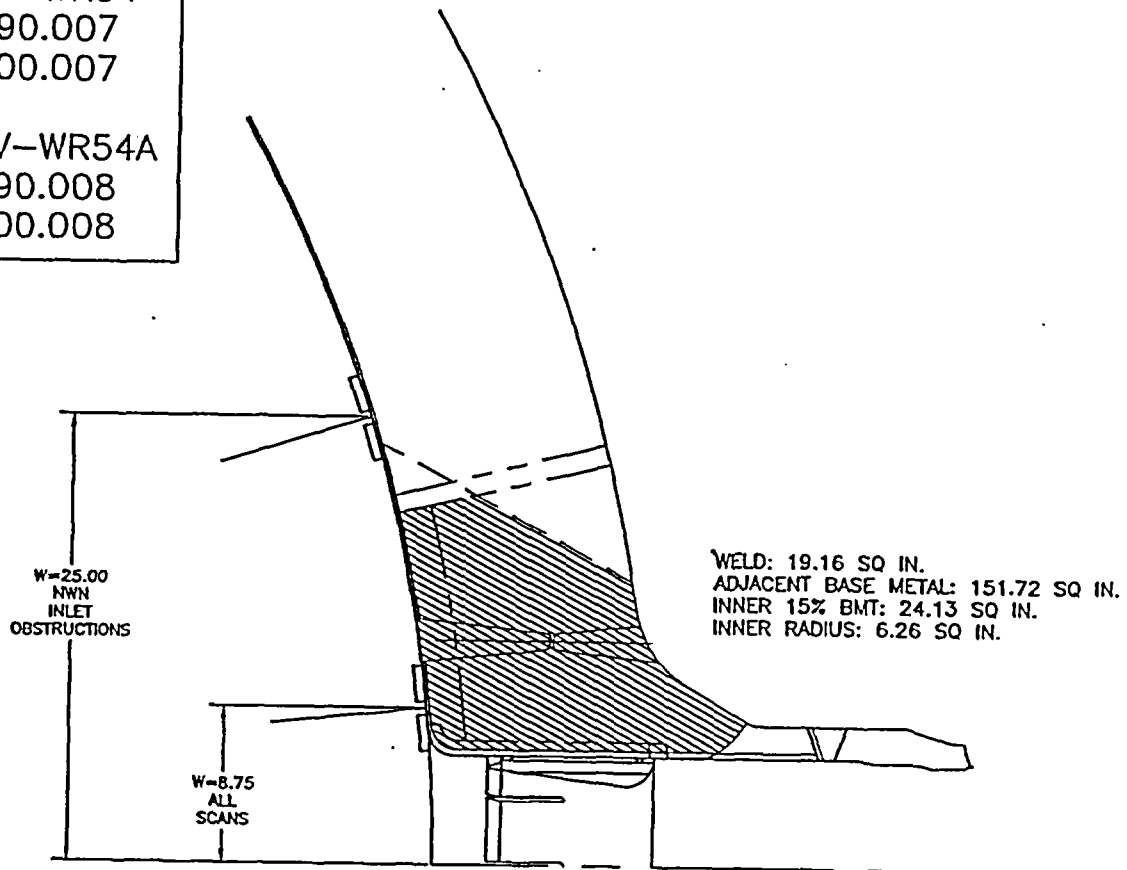


BEAM DIRECTION 1-ZONE 3  
30° OF 90° (33.3% OF SCAN)



OCONEE-2

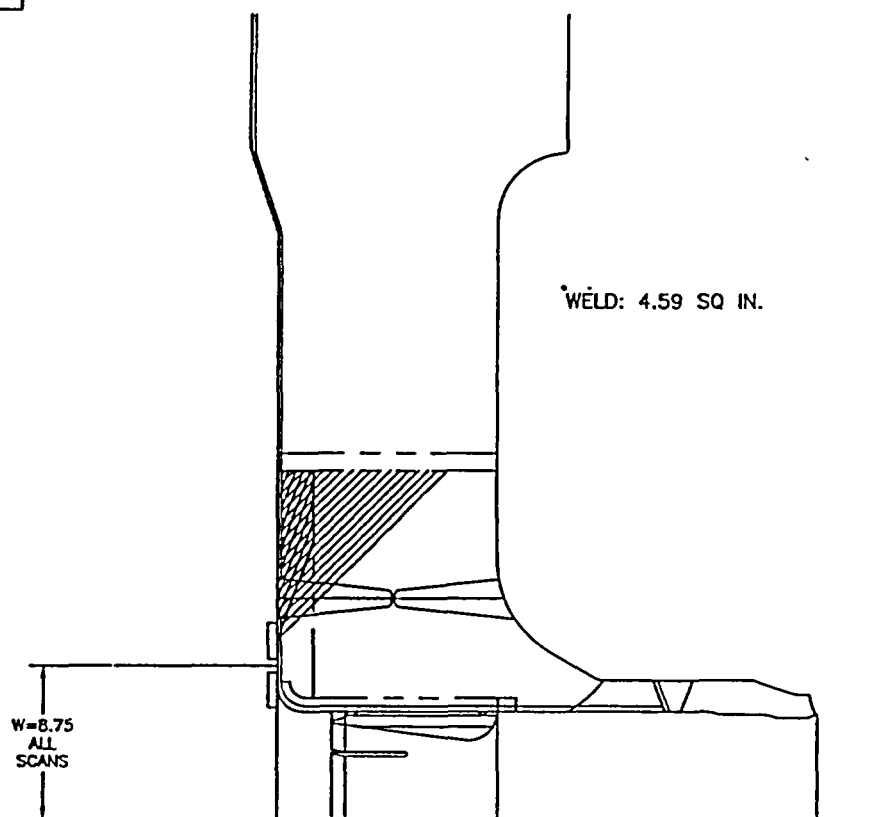
W11  
2-RPV-WR54  
B03.090.007  
B03.100.007  
W19  
2-RPV-WR54A  
B03.090.008  
B03.100.008



BEAM DIRECTION 1-ZONE 2  
45° OF 90° (50.00% OF SCAN)

OCONEE-2

W11  
2-RPV-WR54  
B03.090.007  
B03.100.007  
W19  
2-RPV-WR54A  
B03.090.008  
B03.100.008

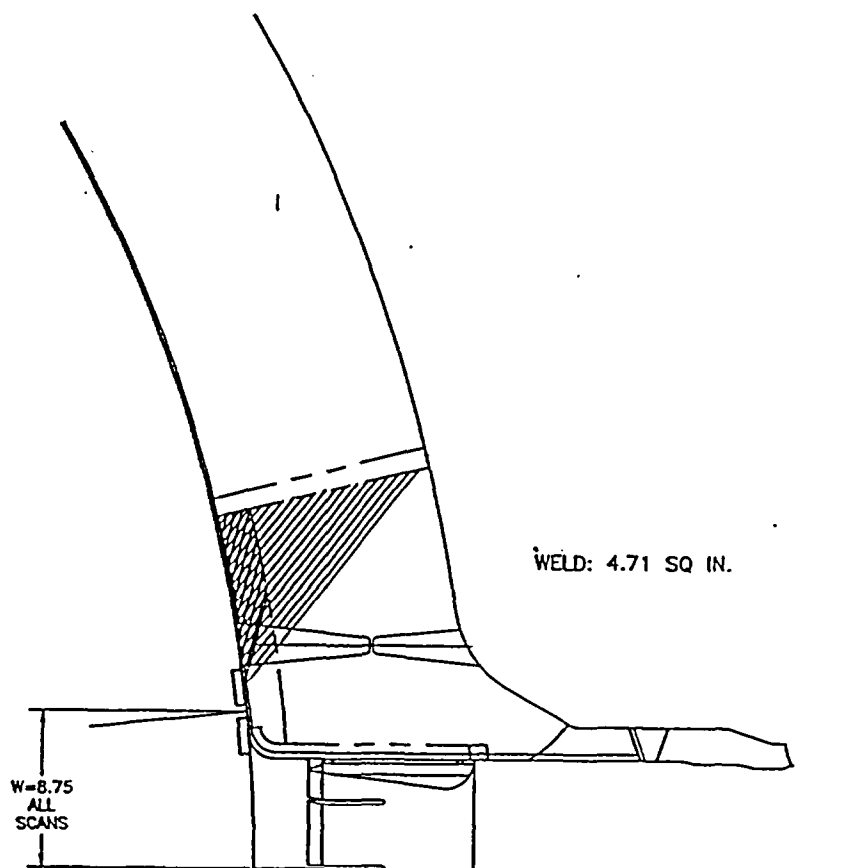


BEAM DIRECTION 2-ZONE 4



OCONEE-2

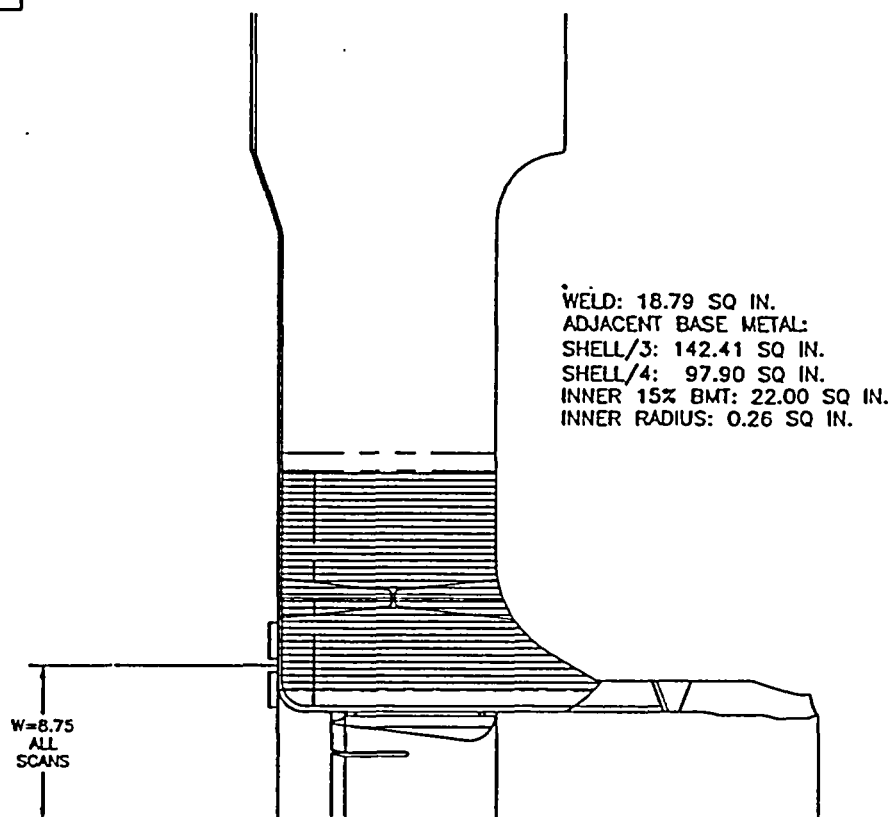
W11  
2-RPV-WR54  
B03.090.007  
B03.100.007  
W19  
2-RPV-WR54A  
B03.090.008  
B03.100.008



BEAM DIRECTION 2-ZONE 4

OCONEE-2

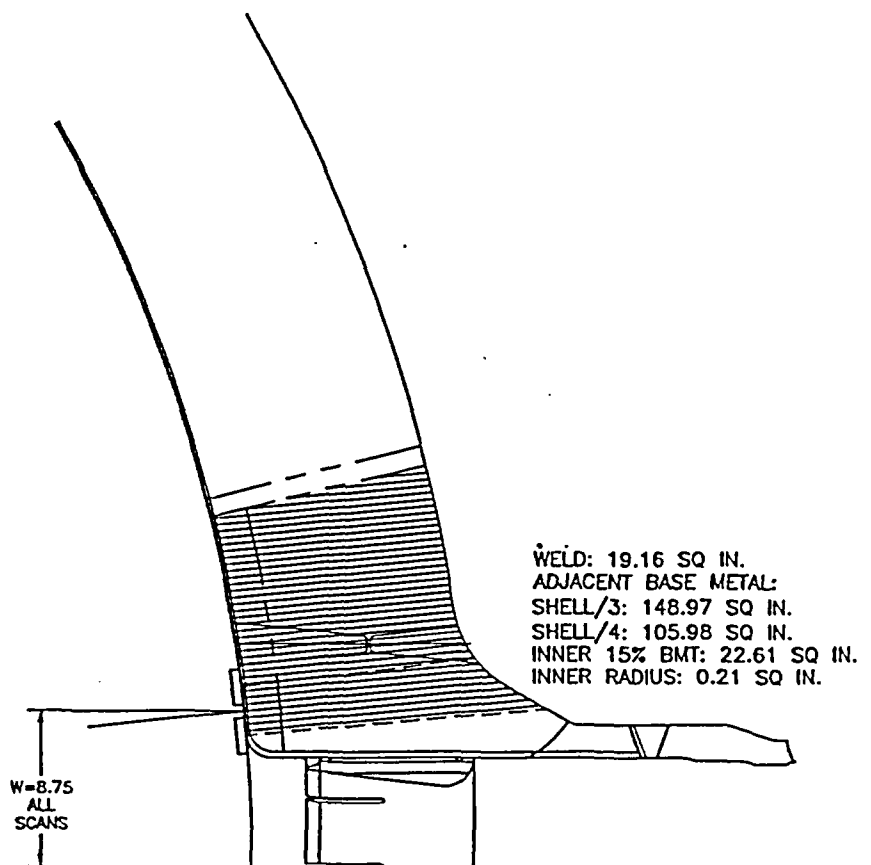
W11  
2-RPV-WR54  
B03.090.007  
B03.100.007  
W19  
2-RPV-WR54A  
B03.090.008  
B03.100.008



BEAM DIRECTION 3 & 4-ZONE 5

OCONEE-2

W11  
2-RPV-WR54  
B03.090.007  
B03.100.007  
W19  
2-RPV-WR54A  
B03.090.008  
B03.100.008



BEAM DIRECTION 3 & 4-ZONE 5

**OCONEE-2**  
**EXAMINATION COVERAGE FOR WELD:**

OCONEE-2	
W12	2-RPV-WR53
	B05.010.001
	B05.010.001A
	B05.010.001B
	2-53A-8-63
	B09.011.011
	B09.011.011A

**CORE FLOOD NOZZLE SAFE END WELDS @ 0 DEGREES**  
USING CORE FLOOD NOZZLE SCANNER FROM I.D.  
SCAN PLAN DWG NO.: 6014937E-02  
AGGREGATE COVERAGE OBTAINED: 97%

**CORE FLOOD NOZZLE-TO-SAFE END WELD**

Zone Coverage Obtained							
Weld & Adjacent Base Metal:			97%		Near (ID) Surface:		97%
Examination Volume Definition							
Weld Length:			38.48 in. = 12.25*PI				
Area Measurement				Volume Calculation			
Weld & Adjacent Base Metal		5.69 sq. in.		Weld & Adjacent Base		218.9512 cu. in.	
Near Surface		1.69 sq. in.		Near Surface		65.0312 cu. in.	
Examination Coverage Calculations							
Weld & Adjacent Base Metal							
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined
1	45L	Axial+R	5.69	37.50	213.4	219.0	97%
2	45L	Axial-R	5.69	37.50	213.4	219.0	97%
3	55L	Circ+B	5.69	37.50	213.4	219.0	97%
4	55L	Circ-B	5.69	37.50	213.4	219.0	97%
Totals:					853.5	875.8	97%
Near Surface							
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined
1	45L	Axial+R	1.69	37.50	63.4	65.0	97%
2	45L	Axial-R	1.69	37.50	63.4	65.0	97%
3	55L	Circ+B	1.69	37.50	63.4	65.0	97%
4	55L	Circ-B	1.69	37.50	63.4	65.0	97%
Totals:					253.5	260.1	97%

**CORE FLOOD NOZZLE PIPE WELDS @ 0 DEGREES**  
USING CORE FLOOD NOZZLE SCANNER FROM I.D.  
SCAN PLAN DWG NO.: 6014937E-02  
AGGREGATE COVERAGE OBTAINED: 76%

**SAFE END-TO-PIPE WELD**

Zone Coverage Obtained									
Weld & Adjacent Base Metal:			76%		Near (ID) Surface:			76%	
Examination Volume Definition									
Weld Length:			36.13 in. = 11.50*PI						
Area Measurement				Volume Calculation					
Weld & Adjacent Base Metal		3.31 sq. in.		Weld & Adjacent Base		119.5903 cu. in.			
Near Surface		1.07 sq. in.		Near Surface		38.6591 cu. in.			
Examination Coverage Calculations									
Weld & Adjacent Base Metal									
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined		
1	45L	Axial+R	3.31	27.50	91.0	119.6	76%		
2	45L	Axial-R	3.31	27.50	91.0	119.6	76%		
3	55L	Circ+B	3.31	27.50	91.0	119.6	76%		
4	55L	Circ-B	3.31	27.50	91.0	119.6	76%		
Totals:					364.1	478.4	76%		
Near Surface									
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined		
1	45L	Axial+R	1.07	27.50	29.4	38.7	76%		
2	45L	Axial-R	1.07	27.50	29.4	38.7	76%		
3	55L	Circ+B	1.07	27.50	29.4	38.7	76%		
4	55L	Circ-B	1.07	27.50	29.4	38.7	76%		
Totals:					117.7	154.6	76%		

**OCONEE-2**  
**EXAMINATION COVERAGE FOR WELD:**

OCONEE-2	
W20	2-RPV-WR53A
	B05.010.002
	B05.010.002A
	B05.010.002B
	2-53A-8-64
	B09.011.013
	B09.011.013A

**CORE FLOOD NOZZLE SAFE END WELDS @ 180 DEGREES**  
 USING CORE FLOOD NOZZLE SCANNER FROM I.D.  
 SCAN PLAN DWG NO.: 6014937E-02  
 AGGREGATE COVERAGE OBTAINED: 98%

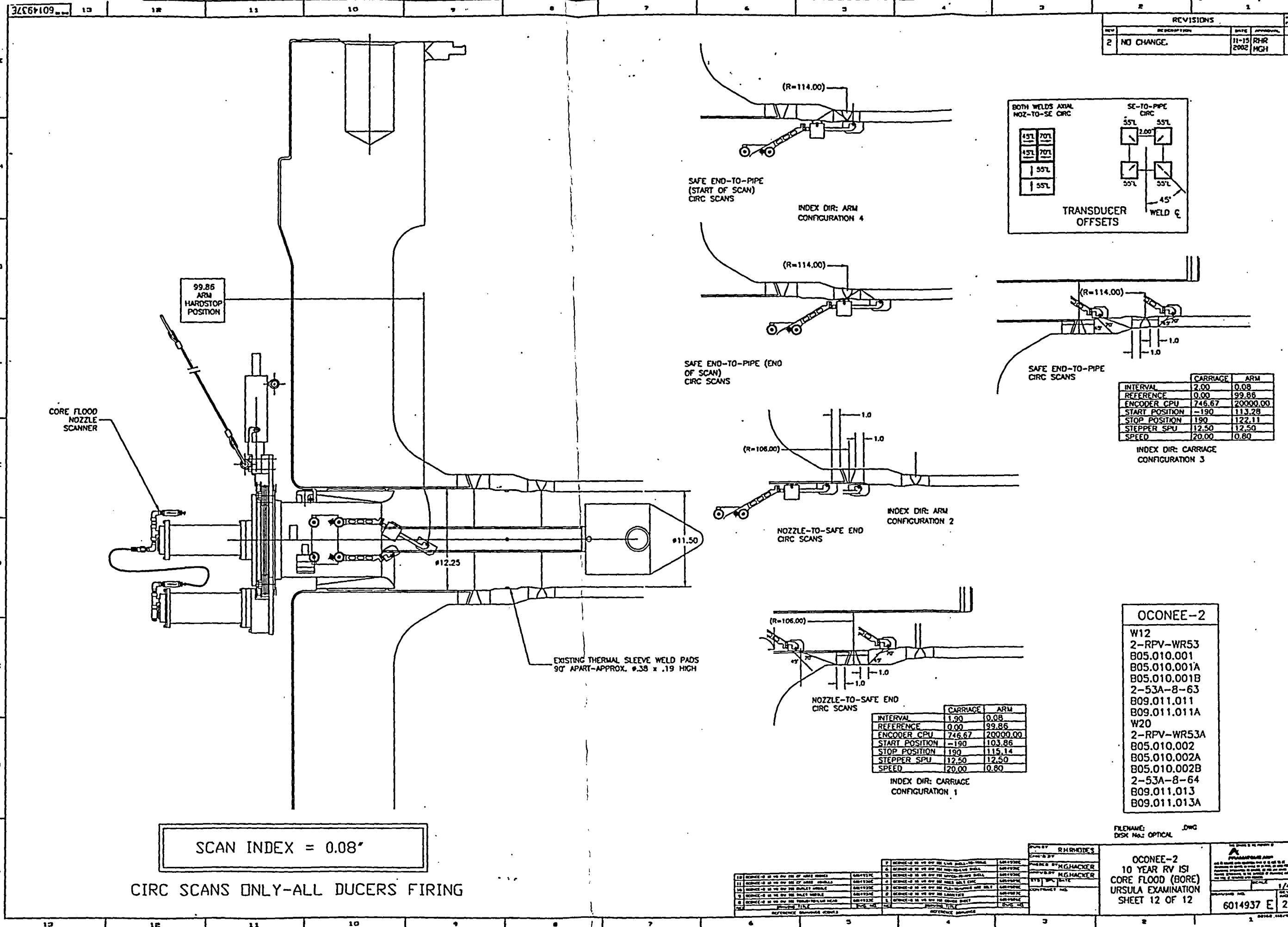
**CORE FLOOD NOZZLE-TO-SAFE END WELD**

Zone Coverage Obtained								
Weld & Adjacent Base Metal:			98%		Near (ID) Surface:		98%	
Examination Volume Definition								
Weld Length:			38.48 in. = 12.25*PI					
Area Measurement			Volume Calculation					
Weld & Adjacent Base Metal		5.69 sq. in.	Weld & Adjacent Base		218.9512 cu. in.			
Near Surface		1.69 sq. in.	Near Surface		65.0312 cu. in.			
Examination Coverage Calculations								
Weld & Adjacent Base Metal								
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined	
1	45L	Axial+R	5.69	37.75	214.8	219.0	98%	
2	45L	Axial-R	5.69	37.75	214.8	219.0	98%	
3	55L	Circ+B	5.69	37.75	214.8	219.0	98%	
4	55L	Circ-B	5.69	37.75	214.8	219.0	98%	
Totals:					859.2	875.8	98%	
Near Surface								
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined	
1	45L	Axial+R	1.69	37.75	63.8	65.0	98%	
2	45L	Axial-R	1.69	37.75	63.8	65.0	98%	
3	55L	Circ+B	1.69	37.75	63.8	65.0	98%	
4	55L	Circ-B	1.69	37.75	63.8	65.0	98%	
Totals:					255.2	260.1	98%	

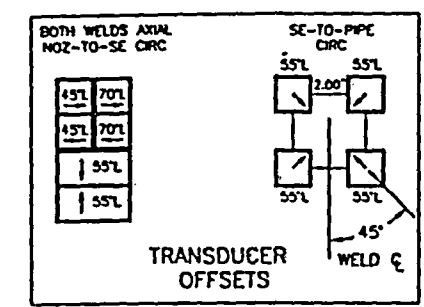
**CORE FLOOD NOZZLE PIPE WELDS @ 180 DEGREES**  
 USING CORE FLOOD NOZZLE SCANNER FROM I.D.  
 SCAN PLAN DWG NO.: 6014937E-02  
 AGGREGATE COVERAGE OBTAINED: 71%

**SAFE END-TO-PIPE WELD**

Zone Coverage Obtained							
Weld & Adjacent Base Metal:			71%		Near (ID) Surface:		71%
Examination Volume Definition							
Weld Length:			36.13 in. = 11.50*PI				
Area Measurement				Volume Calculation			
Weld & Adjacent Base Metal		3.31 sq. in.		Weld & Adjacent Base		119.5903 cu. in.	
Near Surface		1.07 sq. in.		Near Surface		38.6591 cu. in.	
Examination Coverage Calculations							
Weld & Adjacent Base Metal							
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined
1	45L	Axial+R	3.31	25.63	84.8	119.6	71%
2	45L	Axial-R	3.31	25.63	84.8	119.6	71%
3	55L	Circ+B	3.31	25.63	84.8	119.6	71%
4	55L	Circ-B	3.31	25.63	84.8	119.6	71%
Totals:					339.3	478.4	71%
Near Surface							
Entry #	Exam. Angle (deg.)	Beam Direction	Area Examined (sq. in.)	Length Examined (in.)	Volume Examined (cu. in.)	Volume Required (cu. in.)	Percent Examined
1	45L	Axial+R	1.07	25.63	27.4	38.7	71%
2	45L	Axial-R	1.07	25.63	27.4	38.7	71%
3	55L	Circ+B	1.07	25.63	27.4	38.7	71%
4	55L	Circ-B	1.07	25.63	27.4	38.7	71%
Totals:					109.7	154.6	71%



REVISIONS			
REV	DESCRIPTION	DATE	APPROVAL
2	NO CHANGE.	11-15 2002	RHR MGH



	CARRIAGE	ARM
INTERVAL	2.00	0.08
REFERENCE	0.00	99.86
ENCODER CPU	746.67	20000.00
START POSITION	-190	113.28
STOP POSITION	190	122.11
STEPPER SPU	12.50	12.50
SPEED	20.00	0.80

INDEX DIR: CARRIAGE CONFIGURATION 3

	CARRIAGE	ARM
INTERVAL	1.90	0.08
REFERENCE	0.00	99.86
ENCODER CPU	746.67	20000.00
START POSITION	-190	103.86
STOP POSITION	190	115.14
STEPPER SPU	12.50	12.50
SPEED	20.00	0.80

INDEX DIR: CARRIAGE CONFIGURATION 1

- Ocone-2**
- W12
  - 2-RPV-WR53
  - B05.010.001
  - B05.010.001A
  - B05.010.001B
  - 2-53A-8-63
  - B09.011.011
  - B09.011.011A
  - W20
  - 2-RPV-WR53A
  - B05.010.002
  - B05.010.002A
  - B05.010.002B
  - 2-53A-8-64
  - B09.011.013
  - B09.011.013A

FILENAME: Ocone-2.dwg  
DISK No: OPTICAL

Ocone-2  
10 YEAR RV ISI  
CORE FLOOD (BORE)  
URSULA EXAMINATION  
SHEET 12 OF 12

6014937 E	2
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