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Carolinas

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October 5, 2009

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: Duke Energy Carolinas, LLC (Duke)
Catawba Nuclear Station, Unit 1
Docket Number 50-413
Request for Relief Number 09-CN-001
Limited Weld Examinations During the End-of-Cycle 17
Refueling Outage

Pursuant to 10 CFR 50.55a(g)(5)(iii), please find attached Request for Relief 09-CN-001. This request for relief is associated with limited weld examinations during inservice inspection activities for the subject refueling outage.

The attachment to this letter contains all technical information necessary in support of this request for relief. Duke is requesting NRC review and approval of this request at your earliest convenience.

There are no regulatory commitments contained in this letter or its attachment.

If you have any questions concerning this material, please call L.J. Rudy at (803) 701-3084.

Very truly yours,

James R. Morris

LJR/s

Attachment

A047
NRR

xc (with attachment):

L.A. Reyes, Regional Administrator
U.S. Nuclear Regulatory Commission, Region II
Atlanta Federal Center
61 Forsyth St., SW, Suite 23T85
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U.S. Nuclear Regulatory Commission
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Mail Stop 8-G9A
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bxc (with attachment):

R.D. Hart
L.J. Rudy
M.A. Pyne
E.B. Miller, Jr.
K. Douthit
RGC File
Document Control File 801.01
ELL-EC05O
NCMPA-1
NCEMC
PMPA

Attachment

Request for Relief 09-CN-001

Relief Request 09-CN-001

Proposed Relief in Accordance with 10 CFR 50.55a(g)(5)(iii)

Inservice Inspection Impracticality

Duke Energy Corporation

Catawba Nuclear Station - Unit 1 (EOC17)

Third 10-Year Interval - Inservice Inspection Plan

Interval Start Date = 6-29-2005 Interval End Date = 6-29-2015

This Relief Request has 5 welds for which relief is being sought.

The ID's, Summary Numbers, Attachments, Pages Per Attachment for the 5 welds are as follows:

List Number	Weld ID	Summary Number	Attachment/ Pages Per Attachment
1.	1PZR-W2	C1.B3.110.0002	A/10
2.	1PZR-W3	C1.B3.110.0003	B/8
3.	1ELDHX-HD-FLG	C1.C1.20.0003	C/7
4.	1VCT-LH-SH	C1.C1.20.0019	D/6
5.	1NI11-9	C1.C5.21.0002	E/6

Designated Attachments contain the examination data for each of these five welds.

Items in this relief request were examined during May of 2008.

I. ASME Code Component Affected

Pressurizer
Reactor Coolant System
Pressurizer Spray Nozzle to Upper Head Weld
Weld ID = 1PZR-W2
Summary Number = C1.B3.110.0002

II. Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI - 1998 Edition thru the 2000 Addenda

III. Applicable Code Requirement

IWB-2500, Table IWB-2500-1, Examination Category B-D, Item Number B3.110 Fig. IWB-2500-7 (a), 100% Volume Coverage of Examination Volume A-B-C-D-E-F-G-H-I

IV. Impracticality of Compliance

The material is carbon steel. This is a pressure vessel weld with a diameter of 12.75 inches and a wall thickness of 3.0 inches.

During the ultrasonic examination of this weld, 81.7% coverage of the required examination volume was obtained. This weld is limited to 81.7% of the required examination volume because of the proximity of the nozzle blend radius which prevents scanning the weld from the nozzle side. The ultrasonic examination was performed in accordance with the requirements of Section V, Article 4 and the additional requirements of Section XI, Appendix I, 1998 Edition through the 2000 Addenda. Refracted shear wave angles of 35°, 45°, and 60° were used to scan the weld and base material covering the examination volume to the maximum extent practical. In addition, a straight beam examination was performed. The percentage of coverage reported represents the aggregate coverage from all scans performed on the weld and adjacent base material. The coverage from each scan is shown in the following tables.

Angle Beam Weld Metal Coverage

Primary Angles	Beam Direction	Weld Length Scanned (inches)	Percent of Volume Covered	Percent of Coverage Claimed
35° and 45° shear	Perpendicular from Surface 1	100	100	100
35° and 45° shear	Perpendicular from Surface 2	100	(76.1 + 58.9)/2 = 68	68
35° and 45° shear	Parallel to the weld clock wise	100	100	100
35° and 45° shear	Parallel to the weld counter clock wise	100	100	100
		Total Weld Metal Coverage = 91.9%		

Angle Beam Base Metal Coverage

Primary Angles	Beam Direction	Weld Length Scanned (inches)	Percent of Volume Covered	Percent of Coverage Claimed
35°, 45° and 60° shear	Perpendicular from Surface 1	100	90.5	90.5
No scan from nozzle side				
35° and 45° shear	Parallel to the weld clock wise	100	64.5	64.5
35° and 45° shear	Parallel to the weld counter clock wise	100	64.5	64.5
		Total Base Metal Coverage = 77.5%		

The straight beam examination covered 75.6% of the weld and base material. The aggregate coverage is the average of the weld metal angle beam scans, the

base metal angle beam scans and the straight beam scan, $(91.9 + 77.5 + 75.6) \div 3 = 81.7\%$. To obtain more coverage the weld would need to be re-designed to allow scanning from the nozzle side which is impractical. There were no recordable indications on this weld.

The Catawba Inservice Inspection Plan allows the use of Code Case N-460, which requires greater than 90% volumetric coverage of examination volume A-B-C-D-E-F-G-H-I. Therefore, the available coverage will not meet the criteria of this Code Case.

V. Proposed Alternative and Basis for Use

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

No substitution alternative for this weld is available which would provide better coverage.

VI. Duration of Proposed Alternative

This request is for the duration of the third inservice inspection interval, currently scheduled to end on June 29, 2015.

VII. Justification for Granting Relief

Background:

The vessel / nozzle juncture containing weld 1PZR-W2 is an ASME III, Class 1 component with a design temperature of 680°F and a design pressure of 2500 psia. This weld is located inside the Unit 1 containment and serves as part of the reactor coolant system (RCS) pressure boundary. The design functions of the RCS as described in the UFSAR are a) to maintain primary fission product barrier of the fuel assemblies, b) to provide a barrier against the release of radioactivity generated within the reactor, c) to support the transfer of heat from the fuel assemblies to the S/Gs during power operation and when the reactor is subcritical, including the initial phase of plant cooldown, to the steam and power conversion system, d) to support transfer of the heat produced during the subsequent phase of plant cooldown and cold shutdown to the Residual Heat Removal System, e) to support heat transfer via natural circulation, assuring no fuel damage within the operating bounds permitted by the Reactor Control and Protection Systems, f) to serve as a boundary for containing the fluid used as the core neutron moderator and reflector and as a solvent for chemical shim control, and g) to maintain the homogeneity of soluble neutron poison concentration and rate of change of coolant temperature such that uncontrolled reactivity changes do not occur.

Weld 1PZR-W2 is a full penetration butt weld between the pressurizer spray nozzle and the pressurizer vessel head. The nozzle forging is fabricated from SA508 Class 2 material. The head is fabricated from SA533,Grade A, Class 2 material.

The justification for this proposed relief request is:

a) The deficient margin between the actual and required inspection volumes for this examination is small (see Section IV). Furthermore, no recordable indications were identified in the examined volume. The ultrasonic examination of the weld was conducted using personnel qualified in accordance with ASME Section XI, Appendix VII of the 1998 Edition with the 2000 Addenda and ultrasonic procedures complied with the requirements of ASME Section V, Article 4 of the 1998 Edition with the 2000 Addenda as amended by Section XI, Appendix I.

b) Visual examinations (VT-2) are performed each refueling outage in accordance with ASME XI, IWB-2500, Table IWB-2500-1, Examination Category B-P, System Leakage Tests. These examinations further confirm the structural integrity of the welded joint and the absence of pressure boundary leakage.

c) The base materials have good mechanical properties and are highly weldable. The primary failure mechanism of these materials in the RCS application is wastage due to corrosion. However, these low alloy steel components include a stainless steel cladding on inside surfaces to preclude the corrosion effects of primary coolant. As for other degradation mechanisms such as erosion/corrosion, fatigue, stress corrosion cracking, and hydrogen embrittlement, no service induced problems have been observed at similar locations in operating PWR plants.

d) During each refueling outage, multiple walkdowns of containment are performed to determine the presence of external leakage. These walkdowns include a boric acid walkdown (PT/1/A/4150/001H) while the primary system remains at temperature and pressure (Mode 3). Other walkdowns performed during the outage are system engineer walkdowns (PEP 3.09), operation walkdowns at 350 psi, 1000 psi, and normal operation pressure (OP/1/A/6100/001) and the ASME XI, IWA 5000, system leakage test. During these various walkdowns, any leakage from this weld would be recognized by active leakage or boron deposit buildups around the nozzle and mirror insulation.

e) In addition, leakage during operation at this weld location would be detected by various leakage detection systems available to the operator. These systems identified in plant technical specifications include:

- Containment Atmosphere Particulate Radioactivity (EMF 38) Monitoring System which would detect airborne radiological activity;

- Containment Ventilation Unit Condensate Drain Tank Level Monitoring Subsystem which collects and measures as unidentified leakage the moisture removed from the containment atmosphere;

- Containment Floor and Equipment Sump Level and Flow Monitoring Subsystem where unidentified accumulated water on the containment floor would be monitored and evaluated as sump level changes.

- A reactor coolant system water inventory balance is performed on a regular basis (i.e. at least once every three days). The normal operating practice is to perform this computer based program on a daily frequency and/or whenever the operators suspect any abnormal changes to other leakage detection systems. A Plant Technical Specification requires system leakage from "unidentified" sources be maintained below 1 gpm; however, plant operation procedure (PT/1/A/4150/001D, NC System Leakage Calculation) establishes an administrative limit of 0.15 gpm above which the source of leakage will be investigated. Leakage as a result of a failed weld discussed in this section would show up as unidentified leakage and subject to the 0.15 gpm administrative limit.

Other leakage detection parameters available to the operator include 1) Volume Control Tank (VCT) level changes, 2) VCT make-up frequencies, 3) Containment Humidity indication, and 4) Containment Air Temperature and Pressure variations.

Based on the reasons stated above, the limited volumetric examination coverage associated with this weld has no significant impact on the continued assurance of structural integrity of the pressurizer spray nozzle to head weld. Thus, the design functions of the reactor coolant pressure boundary are maintained without full examination coverage of the subject weld.

References:

1) Flow Diagram CN-1553-1.1
2) CNM-1201.01-0066, Pressurizer Drawing
3) CNM-1201.01-0175, Pressurizer Drawing
4) Technical Specification 3.4.13, RCS Operational Leakage
5) Technical Specification 3.4.15, RCS Leakage Detection Instrumentation

VIII. Previous Submittals

None.

The limitations from EOC 17 were compared with the past examination data. This comparison shows the following:

Pre outage estimates of percentages were inaccurate because the precise search unit size and wedge configuration was not known at the time.

I. ASME Code Component Affected

Pressurizer
Reactor Coolant System
Pressurizer Safety/Relief Nozzle to Head Weld
Weld ID = 1PZR-W3
Summary Number = C1.B3.110.0003

II. Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI - 1998 Edition thru the 2000 Addenda

III. Applicable Code Requirement

IWB-2500, Table IWB-2500-1, Examination Category B-D, Item Number B3.110 Fig. IWB-2500-7 (a), 100% Volume Coverage of Examination Volume A-B-C-D-E-F-G-H-I

IV. Impracticality of Compliance

The material is carbon steel. This is a pressure vessel weld with a diameter of 15.0 inches and a wall thickness of 3.0 inches.

This weld is limited to 81.2% of the required examination volume because of the proximity of the nozzle blend radius which prevents scanning the weld from the nozzle side. The ultrasonic examination was performed in accordance with the requirements of Section V, Article 4 and the additional requirements of Section XI, Appendix I, 1998 Edition through the 2000 Addenda. Refracted shear wave angles of 35°, 45°, and 60° were used to scan the weld and base material covering the examination volume to the maximum extent practical. In addition, a straight beam examination was performed. The percentage of coverage reported represents the aggregate coverage from all scans performed on the weld and adjacent base material. The coverage from each angle beam scan is shown on the following tables.

Angle Beam Weld Metal Coverage

Primary Angles	Beam Direction	Weld Length Scanned (inches)	Percent of Volume Covered	Percent of Coverage Claimed
35° and 45° shear	Perpendicular from Surface 1	100	100	100
35° and 45° shear	Perpendicular from Surface 2	100	(82.4 + 61.4)/2 = 71.9	71.9
35° and 45° shear	Parallel to the weld clock wise	100	100	100
35° and 45° shear	Parallel to the weld counter clock wise	100	100	100
			Total Weld Metal Coverage = 93%	

Angle Beam Base Metal Coverage

Primary Angles	Beam Direction	Weld Length Scanned (inches)	Percent of Volume Covered	Percent of Coverage Claimed
35°, 45° and 60° shear	Perpendicular from Surface 1	100	89.3	89.3
No scan from nozzle side				
35° and 45° shear	Parallel to the weld clock wise	100	63.1	63.1
35° and 45° shear	Parallel to the weld counter clock wise	100	63.1	63.1
			Total Base Metal Coverage = 76.2%	

The straight beam examination covered 74.3% of the weld and base material. The aggregate coverage is the average of the weld metal angle beam scans, the

base metal angle beam scans and the straight beam scan, $(93 + 76.2 + 74.3) \div 3 = 81.2\%$. To obtain more coverage the weld would need to be re-designed to allow scanning from the nozzle side which is impractical. There were no recordable indications found during the examination of this weld.

The Catawba Inservice Inspection Plan allows the use of Code Case N-460, which requires greater than 90% volumetric coverage of examination volume A-B-C-D-E-F-G-H-I. Therefore, the available coverage will not meet the criteria of this Code Case.

V. Proposed Alternative and Basis for Use

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

No substitution alternative for this weld is available which would provide better coverage.

VI. Duration of Proposed Alternative

This request is for the duration of the third inservice inspection interval, currently scheduled to end on June 29, 2015.

VII. Justification for Granting Relief

Background:

The vessel / nozzle juncture containing weld 1PZR-W3 is an ASME III, Class 1 component with a design temperature of 680°F and a design pressure of 2500 psia. This weld is located inside the Unit 1 containment and serves as part of the reactor coolant system (RCS) pressure boundary. The design functions of the RCS as described in the UFSAR are a) to maintain primary fission product barrier of the fuel assemblies, b) to provide a barrier against the release of radioactivity generated within the reactor, c) to support the transfer of heat from the fuel assemblies to the S/Gs during power operation and when the reactor is subcritical, including the initial phase of plant cooldown, to the steam and power conversion system, d) to support transfer of the heat produced during the subsequent phase of plant cooldown and cold shutdown to the Residual Heat Removal System, e) to support heat transfer via natural circulation, assuring no fuel damage within the operating bounds permitted by the Reactor Control and Protection Systems, f) to serve as a boundary for containing the fluid used as the core neutron moderator and reflector and as a solvent for chemical shim control, and g) to maintain the homogeneity of soluble neutron poison concentration and rate of change of coolant temperature such that uncontrolled reactivity changes do not occur.

Weld 1PZR-W3 is a full penetration butt weld between the pressurizer PORV nozzle and the pressurizer vessel head. The nozzle forging is fabricated from SA508 Class 2 material. The head is fabricated from SA533,Grade A, Class 2 material.

The justification for this proposed relief request is:

a) The deficient margin between the actual and required inspection volumes for this examination is small (see Section IV). Furthermore, no recordable indications were identified in the examined volume. The ultrasonic examination of the weld was conducted using personnel qualified in accordance with ASME Section XI, Appendix VII of the 1998 Edition with the 2000 Addenda and ultrasonic procedures complied with the requirements of ASME Section V, Article 4 of the 1998 Edition with the 2000 Addenda as amended by Section XI, Appendix I.

b) Visual examinations (VT-2) are performed each refueling outage in accordance with ASME XI, IWB-2500, Table IWB-2500-1, Examination Category B-P, System Leakage Tests. These examinations further confirm the structural integrity of the welded joint and the absence of pressure boundary leakage.

c) The base materials have good mechanical properties and are highly weldable. The primary failure mechanism of these materials in the RCS application is wastage due to corrosion. However, these low alloy steel components include a stainless steel cladding on inside surfaces to preclude the corrosion effects of primary coolant. As for other degradation mechanisms such as erosion/corrosion, fatigue, stress corrosion cracking, and hydrogen embrittlement, no service induced problems have been observed at similar locations in operating PWR plants.

d) During each refueling outage, multiple walkdowns of containment are performed to determine the presence of external leakage. These walkdowns include a boric acid walkdown (PT/1/A/4150/001H) while the primary system remains at temperature and pressure (Mode 3). Other walkdowns performed during the outage are system engineer walkdowns (PEP 3.09), operation walkdowns at 350 psi, 1000 psi, and normal operation pressure (OP/1/A/6100/001) and the ASME XI, IWA 5000, system leakage test. During these various walkdowns, any leakage from this weld would be recognized by active leakage or boron deposit buildups around the nozzle and mirror insulation.

e) In addition, leakage during operation at this weld location would be detected by various leakage detection systems available to the operator. These systems identified in plant technical specifications include:

- Containment Atmosphere Particulate Radioactivity (EMF 38) Monitoring System which would detect airborne radiological activity;

- Containment Ventilation Unit Condensate Drain Tank Level Monitoring Subsystem which collects and measures as unidentified leakage the moisture removed from the containment atmosphere;

- Containment Floor and Equipment Sump Level and Flow Monitoring Subsystem where unidentified accumulated water on the containment floor would be monitored and evaluated as sump level changes.

- A reactor coolant system water inventory balance is performed on a regular basis (i.e. at least once every three days). The normal operating practice is to perform this computer based program on a daily frequency and/or whenever the operators suspect any abnormal changes to other leakage detection systems. A Plant Technical Specification requires system leakage from "unidentified" sources be maintained below 1 gpm; however, plant operation procedure (PT/1/A/4150/001D, NC System Leakage Calculation) establishes an administrative limit of 0.15 gpm above which the source of leakage will be investigated. Leakage as a result of a failed weld discussed in this section would show up as unidentified leakage and subject to the 0.15 gpm administrative limit.

Other leakage detection parameters available to the operator include 1) Volume Control Tank (VCT) level changes, 2) VCT make-up frequencies, 3) Containment Humidity indication, and 4) Containment Air Temperature and Pressure variations.

Based on the reasons stated above, the limited volumetric examination coverage associated with this weld has no significant impact on the continued assurance of structural integrity of the pressurizer spray nozzle to head weld. Thus, the design functions of the reactor coolant pressure boundary are maintained without full examination coverage of the subject weld.

References:

1. Flow Diagram CN-1553-1.1
2. CNM-1201.01-0066, Pressurizer Drawing
3. CNM-1201.01-0175, Pressurizer Drawing
4. Technical Specification 3.4.13, RCS Operational Leakage
5. Technical Specification 3.4.15, RCS Leakage Detection Instrumentation

VIII. Previous Submittals

None.

The limitations from EOC 17 were compared with the past examination data. This comparison shows the following:

Pre outage estimates of percentages were inaccurate because the precise search unit size and wedge configuration was not known at the time.

I. ASME Code Component Affected

Excess Letdown Heat Exchanger
Chemical and Volume Control System
Head to Flange Weld
Weld ID = 1ELDHX-HD-FLG
Summary Number = C1.C1.20.0003

II. Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI - 1998 Edition thru the 2000 Addenda

III. Applicable Code Requirement

IWC-2500, Table IWC-2500-1, Examination Category C-A, Item Number C1.20
Fig. IWC-2500-1 (a), 100% Volume Coverage of Examination Volume A-B-C-D

IV. Impracticality of Compliance

The materials are carbon steel and stainless steel. This weld has a diameter of 9.5 inches and a wall thickness of .75 inches.

This weld is limited to 21.6% of the required examination volume because of the weld joint design, the proximity of a nozzle drain line and the flange configuration. These factors prevent scanning the weld from two axial and two circumferential beam path directions as required by ASME, Section XI, Appendix III, III-4420 and III-4430, 1998 Edition through the 2000 Addenda. The examination volume was scanned with 45° shear waves and 70° refracted longitudinal waves to achieve the maximum practical coverage. The coverage from each angle beam scan is shown in the following table.

Primary Angles	Beam Direction	Weld Length Scanned (inches)	Percent of Volume Covered	Percent of Coverage Claimed
45° shear & 70° RL	Axial Head Side	14.0	59.4	27.7
No axial scan from flange side				
45° shear	Clockwise and Counter Clockwise Head Side at Drain Nozzles	14.0	31.4	29.3
45° shear	Clockwise and Counter Clockwise Flange Side Balance of Weld Length	14.0	31.4	29.3
		Aggregate = 21.6%		

$$\frac{(27.7 + 0 + 29.3 + 29.3)}{4} = 21.6\%$$

In order to obtain more coverage the weld would have to be re-designed to allow scanning from both sides of the weld and the drain line would have to be moved. This is impractical. There were no recordable indications found during the examination of this weld.

The Catawba Inservice Inspection Plan allows the use of Code Case N-460, which requires greater than 90% volumetric coverage of examination volume A-B-C-D. Therefore, the available coverage will not meet the criteria of this Code Case.

V. Proposed Alternative and Basis for Use

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

No substitution alternative for this weld is available which would provide better coverage.

VI. Duration of Proposed Alternative

This request is for the duration of the third inservice inspection interval, currently scheduled to end on June 29, 2015.

VII. Justification for Granting Relief

Background:

The head to flange juncture containing weld 1ELDHX-HD-FLG is an ASME III, Class 2 component with a design temperature of 650°F and a design pressure of 2500 psia. This weld is located inside the Unit 1 containment and serves as part of the chemical and volume control system (NV) pressure boundary. The design functions of the NV system as described in the UFSAR are a) to maintain a predetermined water level in the pressurizer, i.e. maintain required water inventory in the Reactor Coolant System, b) to maintain seal water injection flow to the reactor coolant pumps, c) to control reactor coolant water chemistry conditions, activity level, soluble chemical neutron absorber concentration and makeup, d) to provide emergency core cooling (safety injection), and e) to provide conditions for filling, draining, and hydrostatic testing in the Reactor Coolant System.

Weld 1ELDHX-HD-FLG is a full penetration butt weld between the primary side head and flange of the excess letdown heat exchanger. The primary side flange is fabricated from SA105 material and welded with SS 309L cladding on the inside surface. The primary side head is fabricated from SA240 Type 304 material.

The justification for this proposed relief request is:

a) While the margin between the actual and required inspection volumes for this weld was large, no recordable indications were identified in the limited volume that was examined. The ultrasonic examination of the weld was conducted using personnel qualified in accordance with ASME Section XI, Appendix VII of the 1998 Edition with the 2000 Addenda and ultrasonic procedures complied with the requirements of ASME Section V, Article 4 of the 1998 Edition with the 2000 Addenda as amended by Section XI, Appendix I.

b) Visual examinations (VT-2) of the heat exchanger are performed each inspection period in accordance with ASME XI, IWC-2500, Table IWC-2500-1, Examination Category C-H, System Leakage Tests. These examinations further confirm the structural integrity of the welded joint and the absence of pressure boundary leakage.

c) This weld is a dissimilar metal weld between the austenitic stainless steel head and the cladded carbon steel flange. These materials (with credit for the

internal cladding of the flange) have a high corrosion resistance with low contribution of corrosion products to the coolant, have good mechanical properties and are highly weldable. Very few service induced problems with stainless steel in PWR primary system applications have been observed in operating plants. There has been limited susceptibility to stress corrosion cracking due to chloride contamination and cracking in stagnant borated systems. However, chemistry limits on chlorides, fluorides, sulfides, and dissolved oxygen are controlled by Selected Licensee Commitment (SLC) and other administrative procedures at Catawba to ensure that any favorable conditions for SCC are precluded. Additionally, controls on welding filler material consistent with Regulatory Guide 1.31 also have served to limit the susceptibility of these welds to SCC. No other known degradation mechanisms are applicable to this material at this particular location within the system.

d) During each refueling outage, multiple walkdowns of containment are performed to determine the presence of external leakage. These walkdowns include a boric acid walkdown (PT/1/A/4150/001H) while the primary system remains at temperature and pressure (Mode 3). Other walkdowns performed during the outage are system engineer walkdowns (PEP 3.09), operation walkdowns at 350 psi, 1000 psi, and normal operation pressure (OP/1/A/6100/001) and the ASME XI, IWA 5000, system leakage test. During these various walkdowns, any leakage from this weld would be recognized by active leakage or boron deposit buildups around the nozzle and mirror insulation.

e) The excess letdown heat exchanger is normally isolated. However, if the heat exchanger is placed in service, leakage during operation at this weld location would be detected by various leakage detection systems available to the operator. These systems identified in plant technical specifications include:

- Containment Atmosphere Particulate Radioactivity (EMF 38) Monitoring System which would detect airborne radiological activity;

- Containment Ventilation Unit Condensate Drain Tank Level Monitoring Subsystem which collects and measures as unidentified leakage the moisture removed from the containment atmosphere;

- Containment Floor and Equipment Sump Level and Flow Monitoring Subsystem where unidentified accumulated water on the containment floor would be monitored and evaluated as sump level changes.

- A reactor coolant system water inventory balance is performed on a regular basis (i.e. at least once every three days). The normal operating practice is to perform this computer based program on a daily frequency and/or whenever the operators suspect any abnormal changes to other leakage detection systems. A Plant Technical Specification requires

system leakage from "unidentified" sources be maintained below 1 gpm; however, plant operation procedure (PT/1/A/4150/001D, NC System Leakage Calculation) establishes an administrative limit of 0.15 gpm above which the source of leakage will be investigated. Leakage as a result of a failed weld discussed in this section would show up as unidentified leakage and subject to the 0.15 gpm administrative limit.

Other leakage detection parameters available to the operator include 1) Volume Control Tank (VCT) level changes, 2) VCT make-up frequencies, 3) Containment Humidity indication, and 4) Containment Air Temperature and Pressure variations.

Based on the reasons stated above, the limited volumetric examination coverage associated with this weld has no significant impact on the continued assurance of structural integrity of the excess letdown heat exchanger flange to head weld. Thus, the design functions of the NV system pressure boundary are maintained without full examination coverage of the subject weld.

References:

1) Flow Diagram CN-1554-1.0
2) CNM-1201.06-0083, Auxiliary Heat Exchangers, Instruction Manual
3) CNM-1201.06-0037, Excess Letdown Heat Exchanger Outline Drawing
4) Technical Specification 3.4.13, RCS Operational Leakage
5) Technical Specification 3.4.15, RCS Leakage Detection Instrumentation

VIII. Previous Submittals

This weld was last inspected 12/16/97 during 1EOC10 with 38.52% coverage. Relief Request 98-02 was submitted to and accepted/granted by the NRC without an RAI recognizing that best effort was made to complete the examination with maximum coverage and that re-design and/or replacement of the component in order to fully comply with Code requirements would be a significant burden.

I. ASME Code Component Affected

Volume Control Tank
Chemical and Volume Control System
Lower Head to Shell Weld
Weld ID = 1VCT-LH-SH
Summary Number = C1.C1.20.0019

II. Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI - 1998 Edition thru the 2000 Addenda

III. Applicable Code Requirement

IWC-2500, Table IWC-2500-1, Examination Category C-A, Item Number C1.20
Fig. IWC-2500-1 (a), 100% Volume Coverage of Examination Volume A-B-C-D

IV. Impracticality of Compliance

The material is stainless steel. This weld has a diameter of 90.0 inches and a wall thickness of .25 inches.

This weld is limited to 89.4% of the required examination volume because of the proximity of four support legs. This factor prevent scanning the weld from two axial and two circumferential beam path directions as required by ASME, Section XI, Appendix III, III-4420 and III-4430, 1998 Edition through the 2000 Addenda. The examination volume was scanned with 45° shear waves to achieve the maximum practical coverage. The coverage from each angle beam scan is shown in the following table.

Primary Angles	Beam Direction	Weld Length Scanned (inches)	Percent of Volume Covered	Percent of Coverage Claimed
45° shear	Axial Head Side	283.0	89.4	89.4
45° shear	Axial Shell Side	283.0	89.4	89.4
45° shear	Clockwise and Counter Clockwise Head Side	283.0	89.4	89.4
45° shear	Clockwise and Counter Clockwise Shell Side	283.0	89.4	89.4
		Aggregate = 89.4%		

$$\frac{(89.4 + 89.4 + 89.4 + 89.4)}{4} = 89.4\%$$

In order to obtain more coverage the supports would have to be moved to allow scanning from both sides of the weld. This is impractical. There were no recordable indications found during the examination of this weld.

The Catawba Inservice Inspection Plan allows the use of Code Case N-460, which requires greater than 90% volumetric coverage of examination volume A-B-C-D. Therefore, the available coverage will not meet the criteria of this Code Case.

V. Proposed Alternative and Basis for Use

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

No substitution alternative for this weld is available which would provide better coverage.

VI. Duration of Proposed Alternative

This request is for the duration of the third inservice inspection interval, currently scheduled to end on June 29, 2015.

VII. Justification for Granting Relief

Background:

The volume control tank (VCT) lower head to shell weld, 1VCT-LH-SH, is an ASME III, Class 2 component with a design temperature of 650°F and a design pressure of 2500 psia. This weld is located inside the Unit 1 auxiliary building and serves as part of the chemical and volume control system (NV) pressure boundary. The design functions of the NV system as described in the UFSAR are a) to maintain a predetermined water level in the pressurizer, i.e. maintain required water inventory in the Reactor Coolant System, b) to maintain seal water injection flow to the reactor coolant pumps, c) to control reactor coolant water chemistry conditions, activity level, soluble chemical neutron absorber concentration and makeup, d) to provide emergency core cooling (safety injection), and e) to provide conditions for filling, draining, and hydrostatic testing in the Reactor Coolant System.

Weld 1VCT-LH-SH is a full penetration butt weld between the shell and lower head of the volume control tank. The head and shell are fabricated from SA240 Type 304 material.

The justification for this proposed relief request is:

a) The deficient margin between the actual and required inspection volumes for this examination is small (see Section IV). Furthermore, no recordable indications were identified in the examined volume. The ultrasonic examination of the weld was conducted using personnel qualified in accordance with ASME Section XI, Appendix VII of the 1998 Edition with the 2000 Addenda and ultrasonic procedures complied with the requirements of ASME Section V, Article 4 of the 1998 Edition with the 2000 Addenda as amended by Section XI, Appendix I.

b) Visual examinations (VT-2) are performed each inspection period in accordance with ASME XI, IWC-2500, Table IWC-2500-1, Examination Category C-H, System Leakage Tests. These examinations further confirm the structural integrity of the welded joint and the absence of pressure boundary leakage.

c) This weld is a similar metal weld between austenitic stainless steel base materials. These materials have a high corrosion resistance with low contribution of corrosion products to the coolant, have good mechanical properties, and are highly weldable. Very few service induced problems with stainless steel in PWR primary system applications have been observed in operating plants. There has been limited susceptibility to stress corrosion cracking due to chloride contamination and cracking in stagnant borated systems. However, chemistry limits on chlorides, fluorides, sulfides, and dissolved oxygen are controlled by Selected Licensee Commitment (SLC) and other administrative procedures at Catawba to ensure that any favorable

conditions for SCC are precluded. Additionally, controls on welding filler material consistent with Regulatory Guide 1.31 also have served to limit the susceptibility of these welds to SCC. No other known degradation mechanisms are applicable to this material at this particular location within the system.

d) During plant operation, periodic walkdowns of the auxiliary building are performed to determine the presence of external leakage. Radioactive systems outside containment, which includes the VCT, are visually inspected weekly. Other activities performed where leakage would be identified are the NV system leak rate determination performed each 18 months and system engineer walkdowns performed 3 times yearly. Any leakage from this weld would be recognized by these activities through the presence of active leakage or boron deposits at the head to shell interface.

e) Leakage during operation at this weld location would also be detected by various leakage detection systems available to the operator. Since the VCT is within the boundary of the Reactor Coolant Inventory Balance Calculation, any leakage would be indicated by this calculation which is required by Technical Specification every 72 hours yet typically run every 24 hours. Other leakage detection parameters available to the operator include VCT level changes and VCT make-up frequencies.

Based on the reasons stated above, the limited volumetric examination coverage associated with this weld has no significant impact on the continued assurance of structural integrity of the excess letdown heat exchanger flange to head weld. Thus, the design functions of the NV system pressure boundary are maintained without full examination coverage of the subject weld.

References:

1. Flow Diagram CN-1554-1.1
2. CNM-1201.04-0102, Volume Control Tank, Unit 1 Outline Drawing
3. Technical Specification 3.4.13, RCS Operational Leakage
4. Technical Specification 3.4.15, RCS Leakage Detection Instrumentation

VIII. Previous Submittals

This weld was last inspected 5/4/99 during 1EOC11 with 88.34% coverage. Relief Request 99-02 was submitted to and accepted/granted by the NRC without an RAI recognizing that best effort was made to complete the examination with maximum coverage and that re-design and/or replacement of the component in order to fully comply with Code requirements would be a significant burden.

I. ASME Code Component Affected

Piping Weld
Safety Injection System
Elbow to Tee Weld
Weld ID = 1NI11-9
Summary Number = C1.C5.21.0002

II. Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI - 1998 Edition thru the 2000 Addenda

III. Applicable Code Requirement

IWC-2500, Table IWC-2500-1, Examination Category C-F-1, Item Number C5.21
Fig. IWC-2500-7(a), 100% Volume Coverage of Examination Volume C-D-E-F

IV. Impracticality of Compliance

The material is stainless steel. This weld has a nominal pipe size of 4.0 inches and a wall thickness of 0.531 inches.

This weld is limited to 77% of the required examination volume because of the proximity of the tee radius. The tee radius prevents scanning in two axial and two circumferential directions for the full length of the weld on the tee side as required by 10CFR50.55a (b)(2)(xv)(A)(1). Therefore no credit is taken for the examination volume past the centerline of the weld on the tee side where access is limited. The ultrasonic examination was performed using Appendix VIII qualified personnel, procedures, and equipment. A 60° refracted longitudinal wave was used to examine the tee side and elbow side in the areas of the obstructions but is not included in the percent of coverage. The coverage from each angle beam scan is shown in the following table.

Primary Angles	Beam Direction	Weld Length Scanned (inches)	Percent of Volume Covered	Percent of Coverage Claimed
60° shear	Axial Tee Side	14.2	50.8	50.8
60° shear	Axial Elbow Side	14.2	64.8	64.8
45° shear	Clockwise Elbow Side and Tee Side	14.2	92.2	92.2
45° shear	Counter Clockwise Elbow Side and Tee Side	14.2	100	100
			Aggregate = 77.0%	
Supplemental Angle	**Beam Direction**	**Weld Length Scanned (in.)**	**Percent of Volume Covered**	**Percent of Coverage Claimed**
60° RL	Axial Elbow Side	6.0	13.0	0
60° RL	Axial Tee Side	2.0	12.1	0

$$\frac{(50.8 + 64.8 + 92.2 + 100)}{4} = 77.0\%$$

In order to obtain more coverage the weld would have to be re-designed to allow complete scanning from the tee side and the adjacent pipe would have to be relocated. This is impractical. There were no recordable indications found during the examination of this weld.

The Catawba Inservice Inspection Plan allows the use of Code Case N-460, which requires greater than 90% volumetric coverage of examination volume C-D-E-F. Therefore, the available coverage will not meet the criteria of this Code Case.

V. Proposed Alternative and Basis for Use

Radiography (RT) is not a desired option because RT is limited in the ability to detect expected degradation mechanisms such as thermal fatigue cracking and

stress corrosion cracking initiating at the pipe inside surface. Additionally, Radiography has not been qualified through performance demonstration.

No substitution alternative for this weld is available which would provide better coverage.

VI. Duration of Proposed Alternative

This request is for the duration of the third inservice inspection interval, currently scheduled to end on June 29, 2015.

VII. Justification for Granting Relief

Background:

The piping containing weld 1NI11-9 is an ASME III, Class 2 component with a design temperature of 650°F and a design pressure of 2500 psia. This weld is located inside the Unit 1 containment and serves as part of the safety injection system (NI) pressure boundary. The safety related function of the NI System is to provide emergency core cooling in order to prevent unacceptable fuel damage and to assure that the core remains intact during all phases of a Design Basis Event (DBE). Weld 1NI11-9 is a full penetration butt weld between the branch side of a 4" schedule 160 tee and a 4" 90°, schedule 160 elbow. These seamless components are fabricated from SA403 WP304 material.

The justification for this proposed relief request is:

a) The deficient margin between the actual and required inspection volumes for this examination is small (see Section IV). Furthermore, no recordable indications were identified in the examined volume. The ultrasonic examination of the weld was conducted using personnel, equipment, and procedures qualified in accordance with ASME Section XI, Appendix VIII Supplement 2 of the 1998 Edition with the 2000 Addenda as administered by the Performance Demonstration Initiative (PDI).

b) Visual examinations (VT-2) are performed each inspection period in accordance with ASME XI, IWC-2500, Table IWC-2500-1, Examination Category C-H, System Leakage Tests. These examinations further confirm the structural integrity of the welded joint and the absence of pressure boundary leakage.

c) This weld is a similar metal weld between austenitic stainless steel base materials. These materials have a high corrosion resistance with low contribution of corrosion products to the coolant, have good mechanical properties, and are highly weldable. Very few service induced problems with stainless steel in PWR primary system applications have been observed in

operating plants. There has been limited susceptibility to stress corrosion cracking due to chloride contamination and cracking in stagnant borated systems. However, chemistry limits on chlorides, fluorides, sulfides, and dissolved oxygen are controlled by Selected Licensee Commitment (SLC) and other administrative procedures at Catawba to ensure that any favorable conditions for SCC are precluded. Additionally, controls on welding filler material consistent with Regulatory Guide 1.31 also have served to limit the susceptibility of these welds to SCC. No other known degradation mechanisms are applicable to this material at this particular location within the system.

d) During each refueling outage, multiple walkdowns of containment are performed to determine the presence of external leakage. These walkdowns include a boric acid walkdown (PT/1/A/4150/001H) while the primary system remains at temperature and pressure (Mode 3). Other walkdowns performed during the outage are system engineer walkdowns (PEP 3.09), operation walkdowns at 350 psi, 1000 psi, and normal operation pressure (OP/1/A/6100/001) and the ASME XI, IWA 5000, system leakage test. During these various walkdowns, any leakage from this weld would be recognized by active leakage or boron deposit buildups at the weld.

e) The NI piping containing this weld is under FWST static pressure during normal plant operation. Leakage during normal operation is unlikely due to the low piping stresses in this piping.

Based on the reasons stated above, the limited volumetric examination coverage associated with this weld has no significant impact on the continued assurance of structural integrity of the safety injection piping inside containment. Thus, the design functions of the NI system pressure boundary are maintained without full examination coverage of the subject weld.

References:

1. Flow Diagram CN-1562-1.3
2. CN-1NI-0011, Piping Weld Isometric
3. Technical Specification 3.4.13, RCS Operational Leakage
4. Technical Specification 3.4.15, RCS Leakage Detection Instrumentation

VIII. Previous Submittals

None.

The limitations from EOC 17 were compared with the past examination data. This comparison shows the following:

1. Limitations increased for similar metal piping welds as expected due to the limitations imposed by 10CFR50.55a(b)(2)(xv)(A)(1) since the last 10 Year Interval.

2. Pre outage estimates of percentages were inaccurate because the precise search unit size and wedge configuration was not known at the time.

UT Vessel Examination

Duke Energy.

Site/Unit:	Catawba / 1	Procedure:	NDE-640	Outage No.:	C1-17
Summary No.:	C1.B3.110.0002	Procedure Rev.:	4	Report No.:	UT-08-007
Workscope:	ISI	Work Order No.:	01756752	Page:	1 of 1

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

Drawing No.: CNM 1201.01-175/1 Description: Nozzle to Head

System ID: NC

Component ID: 1PZR-W2 Size/Length: NA Thickness/Diameter: 3.000 / 12.750

Limitations: Yes - See Limitation Information on Report UT-08-009 Start Time: 1441 Finish Time: 1610

Examination Surface: Inside ☐ Outside ☑ Surface Condition: GROUND

Lo Location: 9.2.3 Wo Location: Centerline of Weld Couplant: ULTRAGEL II Batch No.: 07125

Temp. Tool Mfg.: FISHER Serial No.: MCNDE 27220 Surface Temp.: 69 °F

Cal. Report No.: CAL-08-013

Angle Used	0	45	45T	60	60T	
Scanning dB	41.8					

Indication(s): Yes ☐ No ☑ Scan Coverage: Upstream ☑ Downstream ☑ CW ☑ CCW ☑

Comments:

Results: Accept ☐ Reject ☑ Info ☐

Percent Of Coverage Obtained > 90%: No - 81.7% Reviewed Previous Data: Yes

Examiner Level II-N Griebel, David M.	Signature	Date 5/7/2008	Reviewer	Signature III	Date 5/19/08
Examiner Level II-N Ellis, Ken	Signature	Date 5/7/2008	Site Review N/A	Signature	Date
Other Level II-N Keene, Douglas L.	Signature	Date 5/7/2008	ANII Review	Signature	Date 5-21-08

Relief Request 09-CN-001, Attachment A

RHH 8/11/08

UT Vessel Examination

Site/Unit: Catawba / 1 | Procedure: NDE-820 | Outage No.: C1-17

Summary No.: C1.B3.110.0002 | Procedure Rev.: 2 | Report No.: UT-08-009

Workscope: ISI | Work Order No.: 01756752 | Page: 1 of 9

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

Drawing No.: CNM 1201.01-175/1 | Description: Nozzle to Head

System ID: NC

Component ID: 1PZR-W2 | Size/Length: N/A | Thickness/Diameter: 3.000 / 12.750

Limitations: Yes - Single Sided Due to Nozzle | Start Time: 1441 | Finish Time: 1540

Examination Surface: Inside ☐ Outside ☑ | Surface Condition: GROUND

Lo Location: 9.2.3 | Wo Location: Centerline of Weld | Couplant: ULTRAGEL II | Batch No.: 07125

Temp. Tool Mfg.: FISHER | Serial No.: MCNDE 27220 | Surface Temp.: 69 °F

Cal. Report No.: CAL-08-014, CAL-08-015, CAL-08-016

Angle Used	0	45	45T	60	60T	35T
Scanning dB		66.0	66.0	75.4	70.0	70.0

Indication(s): Yes ☑ No ☐ | Scan Coverage: Upstream ☑ Downstream ☑ CW ☑ CCW ☑

Comments:

See attached coverage and indication data sheets.

Results: Accept ☐ Reject ☑ Info ☐ | Additional Inspectors: Josie Muirhead / Ken Ellis

Percent Of Coverage Obtained > 90%: No-81.7% | Reviewed Previous Data: Yes

Examiner Level II-N Griebel, David M.	Signature	Date 5/7/2008	Reviewer	Signature III	Date 5/17/08
Examiner Level III-N Stauffer, Lester, E.	Signature	Date 5/7/2008	Site Review N/A	Signature	Date
Other Level II-N Keene, Douglas L.	Signature	Date 5/7/2008	ANII Review	Signature	Date 5-21-08

Relief Request 09-CN-001, Attachment A

Ultrasonic Indication Report

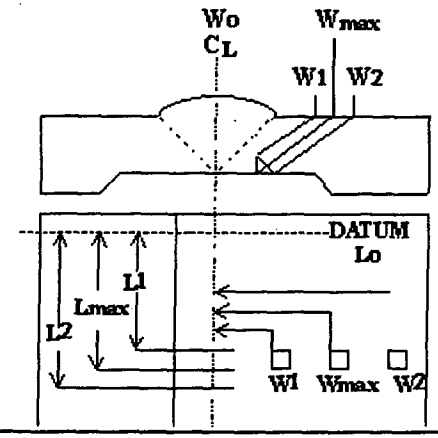
Site/Unit:	Catawba / 1	Procedure:	NDE-820	Outage No.:	C1-17
Summary No.:	C1.B3.110.0002	Procedure Rev.:	2	Report No.:	UT-08-009
Workscope:	ISI	Work Order No.:	01756752	Page:	2 of 9

Search Unit Angle: 35 °

Wo Location: Centerline of Weld

Lo Location: 9.2.3

- ○ Piping Welds
- ◉ Ferritic Vessels ≥ 2"T
- ○ Other _____



MP	Metal Path	Wmax	Distance From Wo To S.U. At Maximum Response
RBR	Remaining Back Reflection	W1	Distance From Wo At Of Max (Forward)
L	Distance From Datum	W2	Distance From Wo At Of Max (Forward)

Comments:

Scan #	Indication No.	% Of DAC	W Max W	W Max MP	Forward Of Max W1	Forward Of Max MP	Backward Of Max W2	Backward Of Max MP	L1 Of Max	L Max	L2 Of Max	RBR Amp.	Remarks
S2	1	105%	1.1	3.4	N/A	N/A	N/A	N/A	N/A	3.25 CCW	N/A	N/A	ID Geometry

Examiner Level II-N Griebel, David M.	Signature	Date 5/7/2008	Reviewer	Signature III	Date 5/17/08
Examiner Level III-N Stauffer, Lester, E.	Signature	Date 5/7/2008	Site Review N/A	Signature	Date
Other Level II-N Keene, Douglas L.	Signature	Date 5/7/2008	ANII Review	Signature	Date 5-21-08

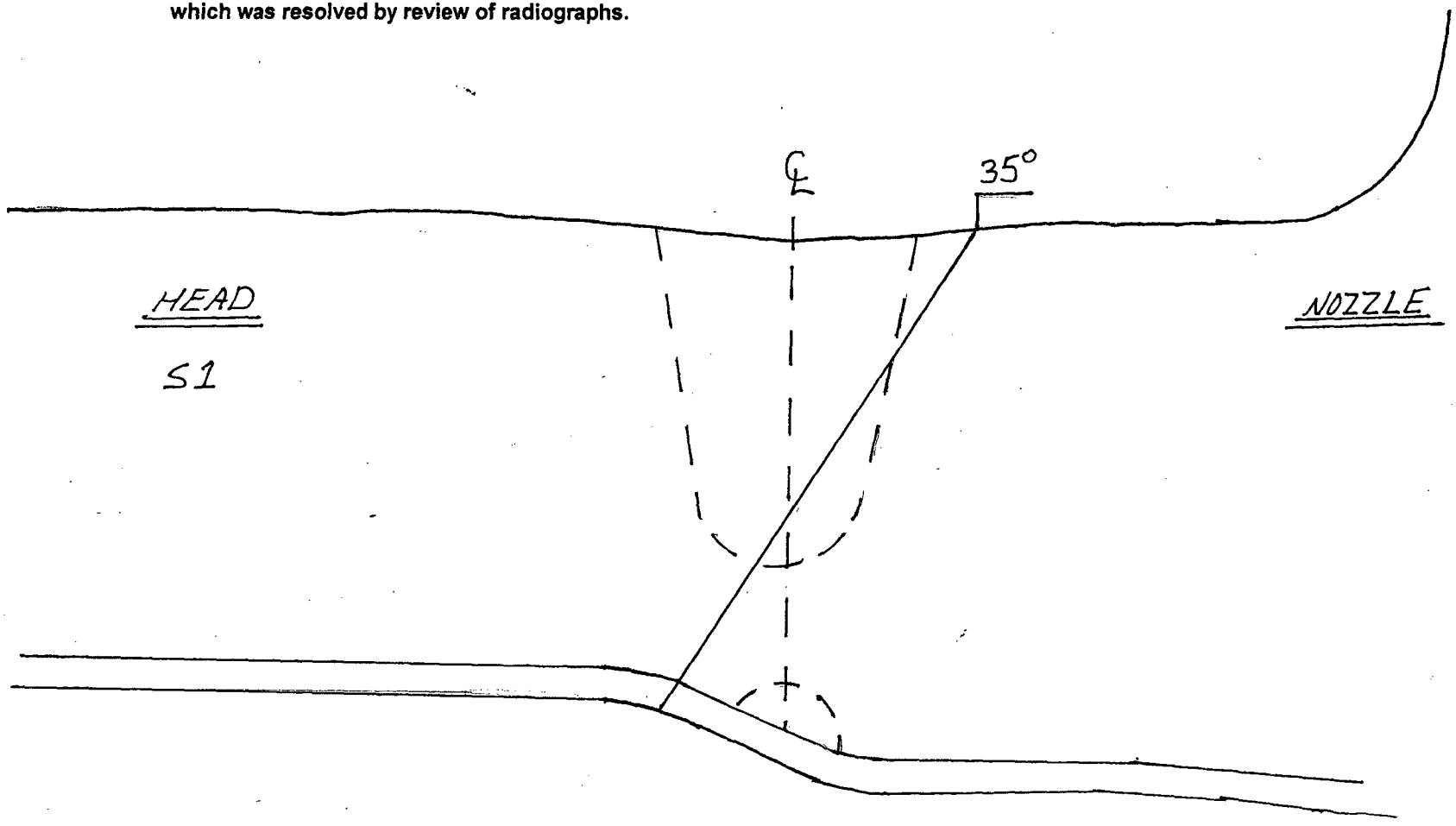
Supplemental Report

Report No.: UT-08-009

Summary No.: C1.B3.110.0002

Examiner:	Griebel, David M.	Level:	II-N	Reviewer:	III	Date:	5/17/08
Examiner:	Stauffer, Lester, E.	Level:	III-N	Site Review:	N/A	Date:	
Other:	Keene, Douglas L.	Level:	II-N	ANII Review:		Date:	5-21-08

Comments: Ind. #1 - 35° was determined to be a geometric reflector due to weld root geometry. This area was previously recorded on PSI and ISI exam data which was resolved by review of radiographs.



Pressurizer Spray Nozzle to Head % of Coverage

Item No. : C1.B3.110.0002 **Weld No. : 1PZR-W2**

Weld Coverage

Scan	Angle	% Coverage Obtained
S1	35°	100
S2	35°	76.1
S1	45°	100
S2	45°	58.9
CW	35°	100
CW	45°	100
CCW	35°	100
CCW	45°	100
	Total	735

735 ÷ 8 = **91.9** % Coverage

Base Material Coverage

S1	35°,45°&60°	90.5
CW & CCW	45°&35°	64.5
	Total	155

155 ÷ 2 = **77.5** % Coverage

0° Scan Coverage = **75.6** % Coverage

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

= **81.7** **% Coverage**

Inspector / Date : JTL 5/8/03

Pressurizer Spray Nozzle to Head

Total Area Weld & Base Material

Item No. :C1.B3.110.0002

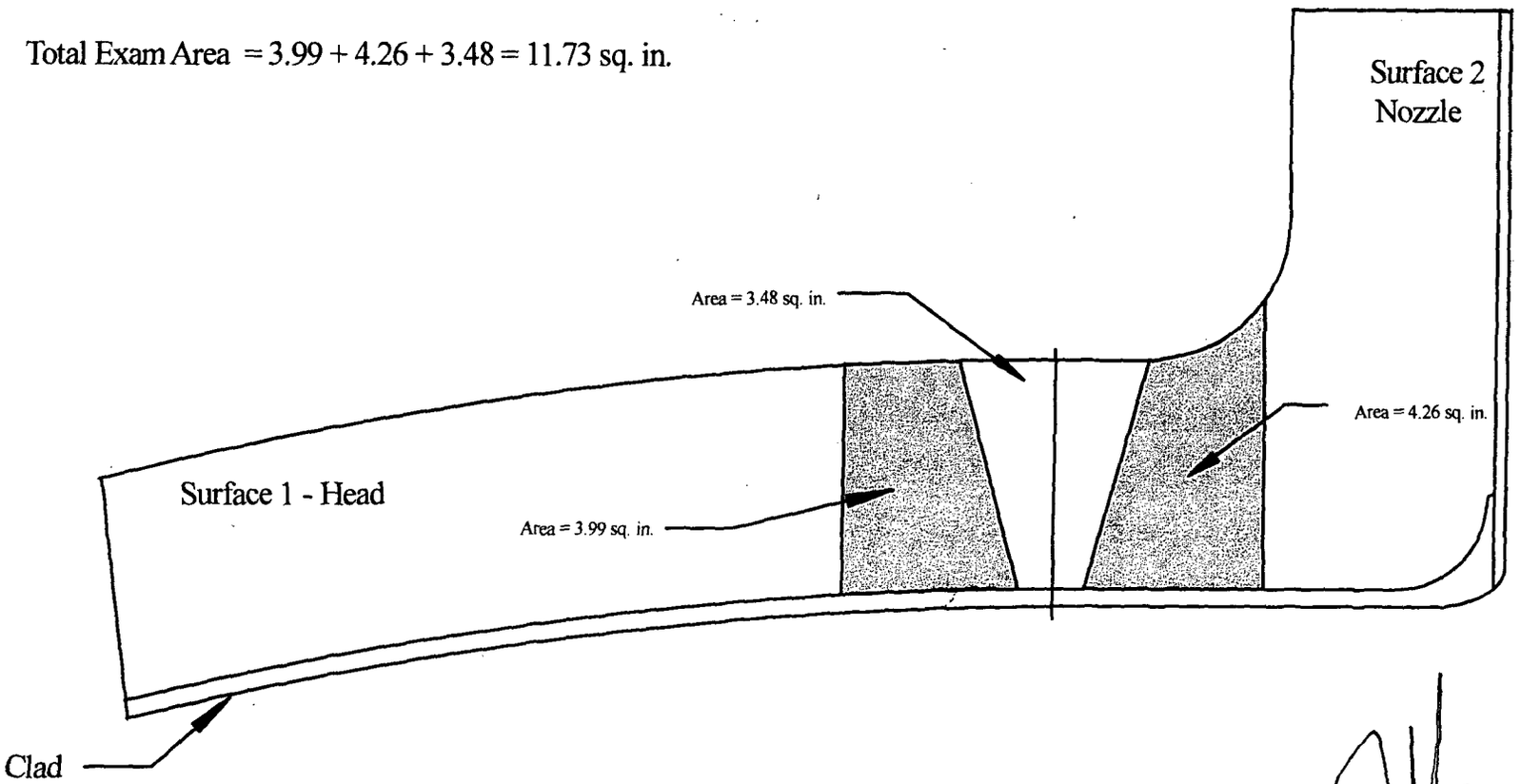
Weld No. : 1PZR-W2

Scale 1" = 2"

Total Weld Area = 3.48 sq. in.

Total Area of Base Material = 3.99 + 4.26 = 8.25 sq. in.

Total Exam Area = 3.99 + 4.26 + 3.48 = 11.73 sq. in.



Inspector / Date : JW III 5/3/08

Pressurizer Spray Nozzle to Head

0° Scan Coverage

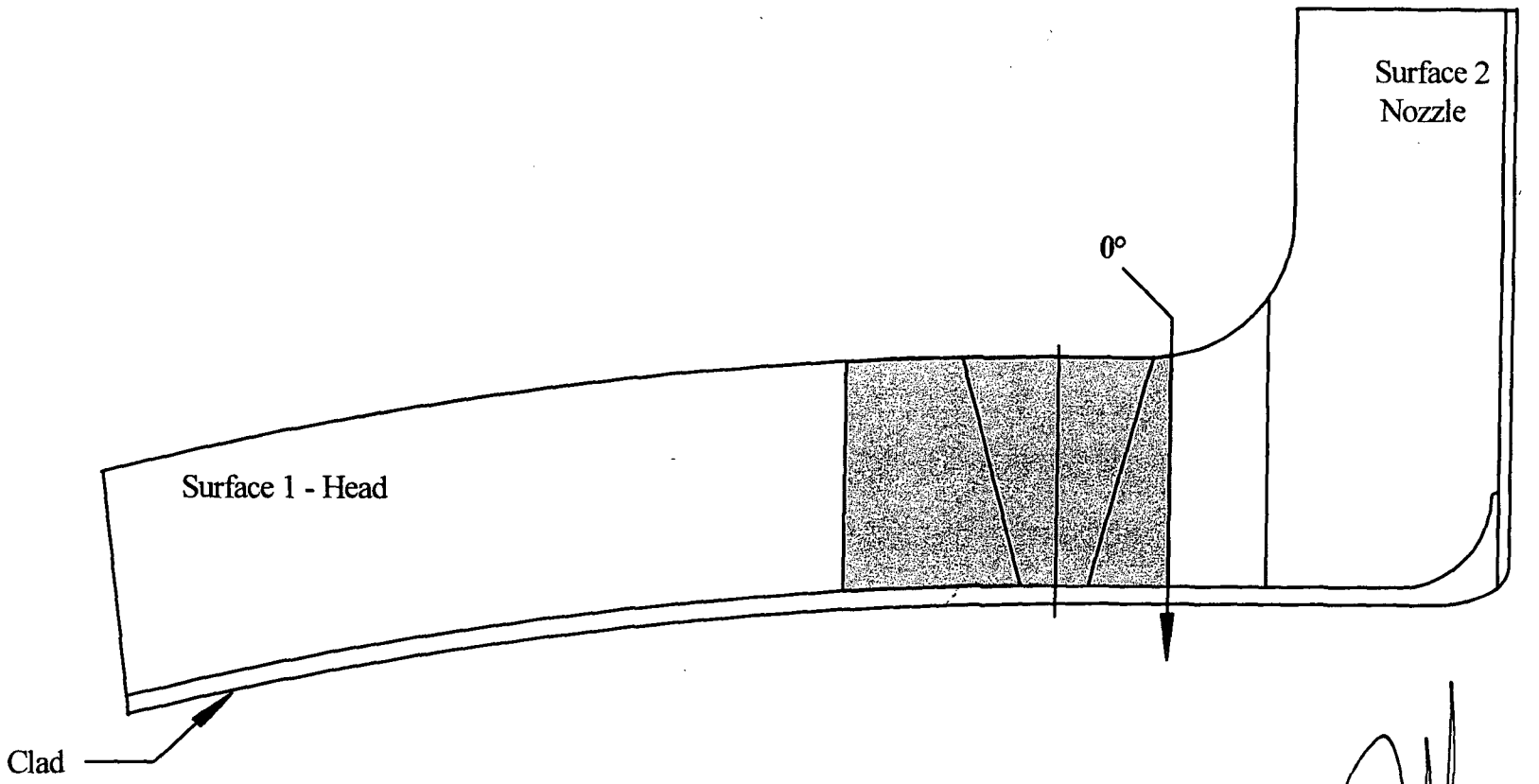
Item No. : C1.B3.110.0002

Weld No. :1PZR-W2

Scale 1" = 2"

0° Scan Total Area = 8.87 sq. in.

Total 0° Scan Coverage = 8.87 / 11.73 x 100 = 75.6 %



Inspector / Date : _____ III 5/8/08

Pressurizer Spray Nozzle to Head

Base Material Coverage - Axial Scans

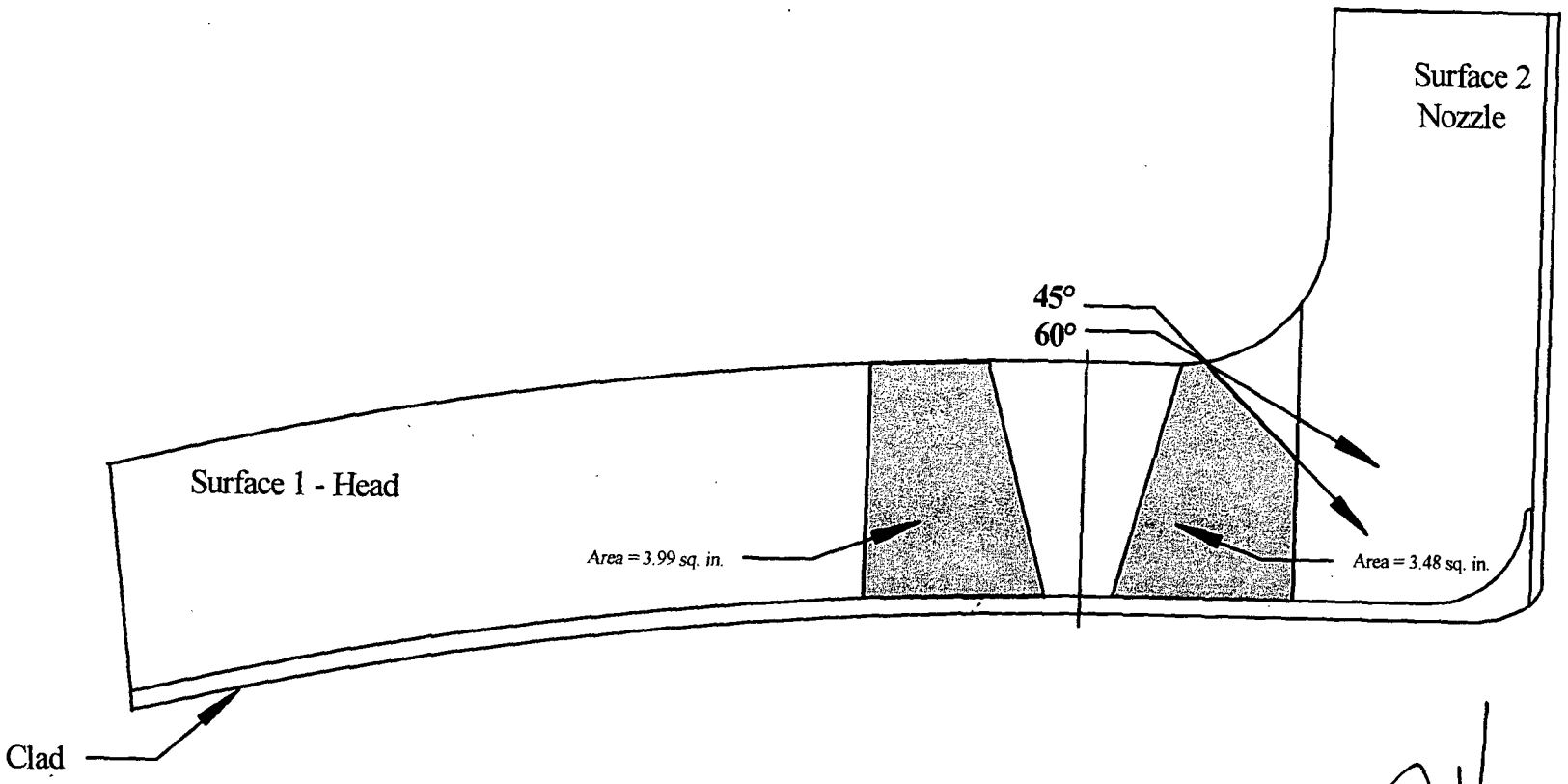
Item No. : C1.B3.110.0002

Weld No. : 1PZR-W2

Scale 1" = 2"

Total Area of Base Material = 3.99 + 3.48 = 7.47 sq. in.

Total Base Material Coverage = 7.47 / 8.25 x 100 = 90.5 %



Inspector / Date : _____ III 5/8/08

Pressurizer Spray Nozzle to Head

Weld Coverage - Axial & Circumferential Scans

Item No. : C1.B3.110.0002

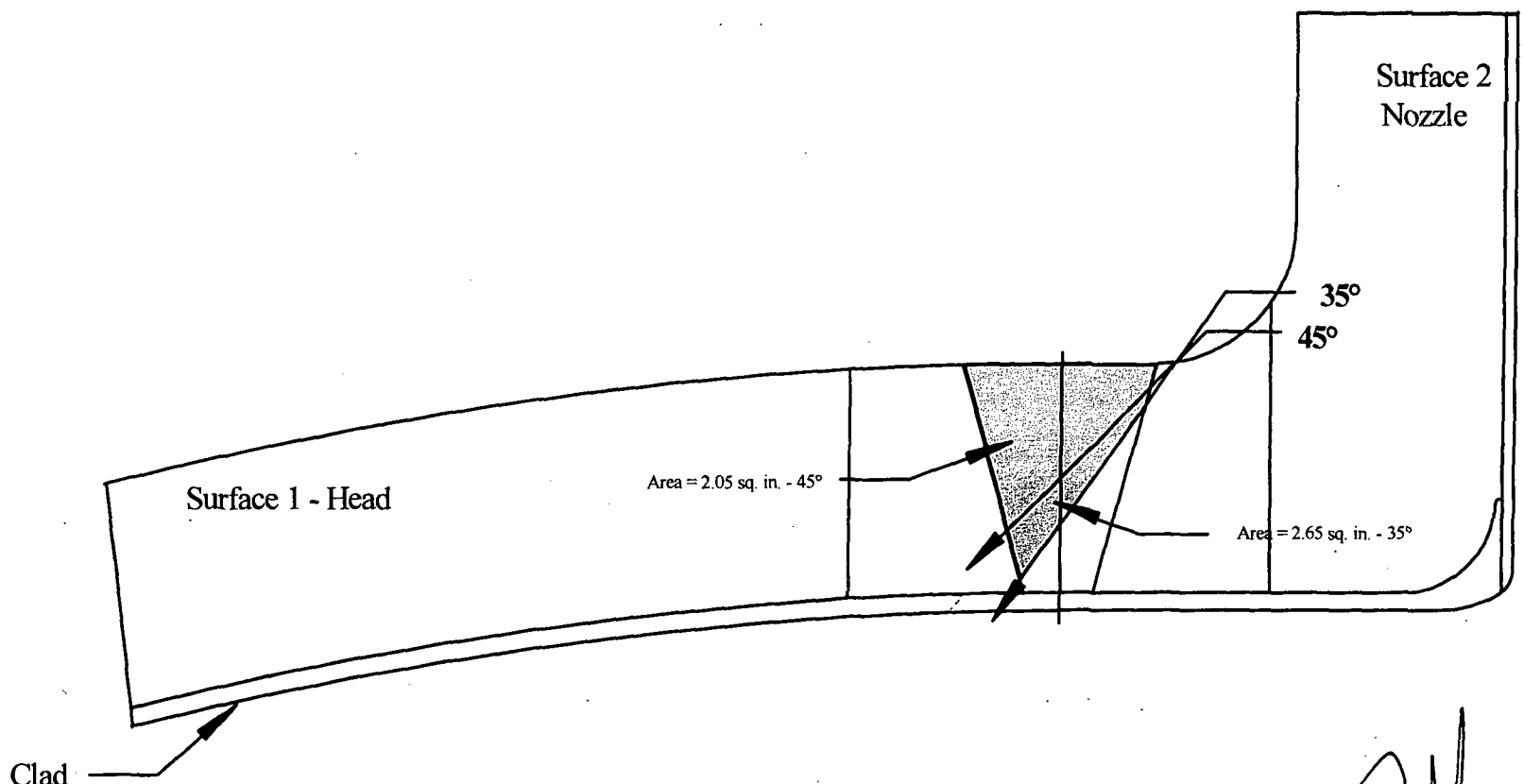
Weld No. : 1PZR-W2

Scale 1" = 2"

100% Coverage 35° & 45° Scans CW, CCW and Axial from Surface 1

Total Weld Coverage 35° from Surface 2 = 2.65 / 3.48 x 100 = 76.1 %

Total Weld Coverage 45° from Surface 2 = 2.05 / 3.48 x 100 = 58.9 %



Inspector / Date : _____ III 5/8/08

Pressurizer Spray Nozzle to Head

Base Material Coverage - Circumferential Scans

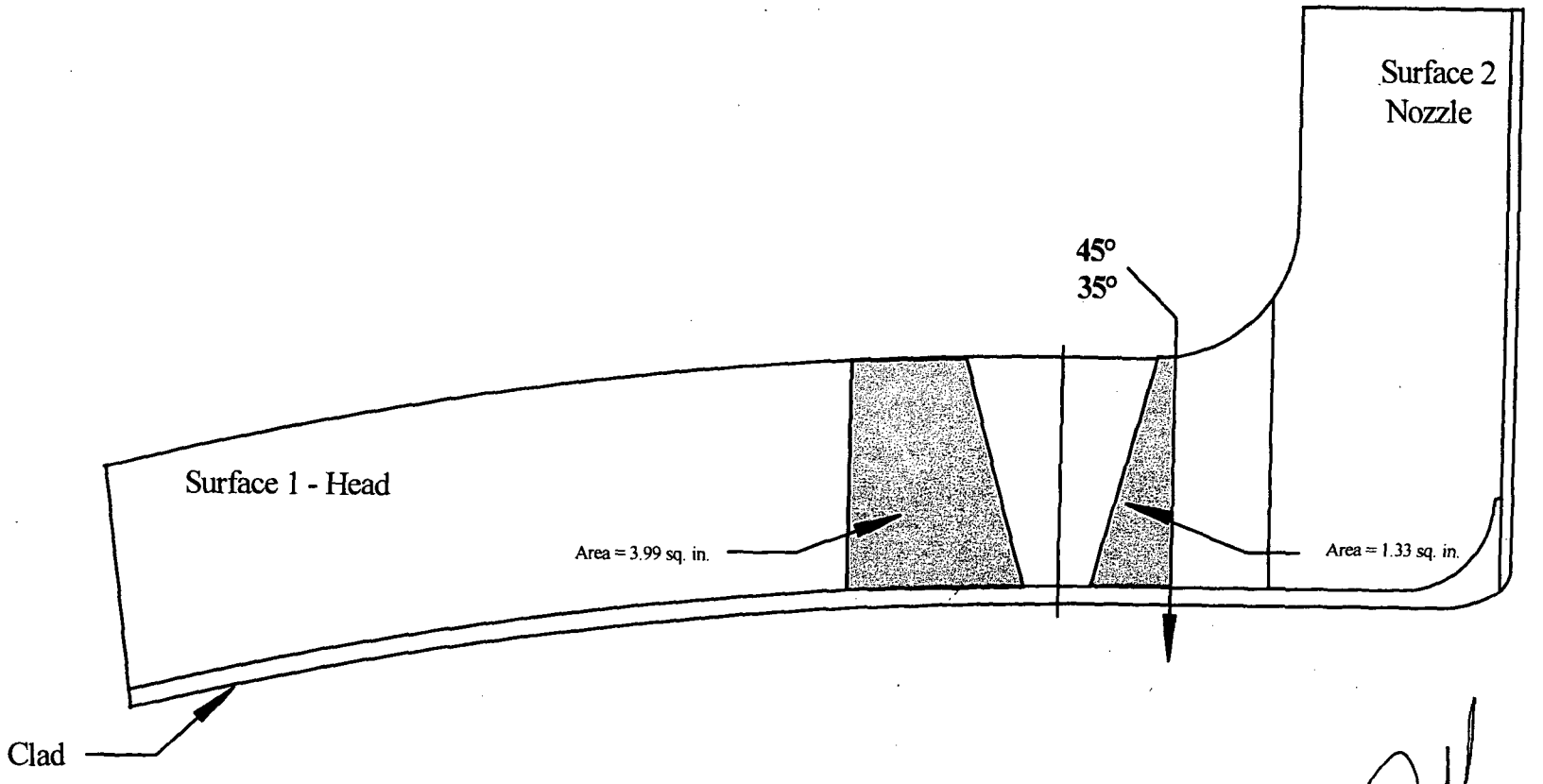
Item No. : C1.B3.110.0002

Weld No. : 1PZR-W2

Scale 1" = 2"

Total Area of Base Material = 3.99 + 1.33 = 5.32 sq. in.

Total Base Material Coverage = 5.32 / 8.25 x 100 = 64.5 %



Inspector / Date : _____ III 5/3/03

Duke Energy.

UT Vessel Examination

Relief Request 09-CN-001, Attachment B

Site/Unit:	Catawba / 1	Procedure:	NDE-640	Outage No.:	C1-17
Summary No.:	C1.B3.110.0003	Procedure Rev.:	4	Report No.:	UT-08-008
Workscope:	ISI	Work Order No.:	01756752	Page:	1 of 1

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

Drawing No.: CNM 1201.01-175/1 Description: Nozzle to Head

System ID: NC

Component ID: 1PZR-W3 Size/Length: N/A Thickness/Diameter: 3.000 / 15.000

Limitations: Yes - See Limitation Information on Report UT-08-010 Start Time: 1429 Finish Time: 1540

Examination Surface: Inside ☐ Outside ☑ Surface Condition: GROUND

Lo Location: 9.2.3 Wo Location: Centerline of Weld Couplant: ULTRAGEL II Batch No.: 07125

Temp. Tool Mfg.: FISHER Serial No.: MCNDE 27220 Surface Temp.: 69 °F

Cal. Report No.: CAL-08-013

Angle Used	0	45	45T	60	60T	
Scanning dB	41.8					

Indication(s): Yes ☐ No ☑ Scan Coverage: Upstream ☑ Downstream ☑ CW ☑ CCW ☑

Comments:

Results: Accept ☐ Reject ☑ Info ☐

Percent Of Coverage Obtained > 90%: No - 81.2% Reviewed Previous Data: Yes

Examiner Level II-N Griebel, David M.	Signature	Date 5/7/2008	Reviewer III	Signature	Date 5/19/08
Examiner Level II-N Ellis, Ken	Signature	Date 5/7/2008	Site Review N/A	Signature	Date
Other Level II-N Keene, Douglas L.	Signature	Date 5/7/2008	ANII Review	Signature	Date 5-21-08

AJH 8/11/08

Duke Energy.

UT Vessel Examination

Relief Request 09-CN-001, Attachment B

Site/Unit:	Catawba / 1	Procedure:	NDE-820	Outage No.:	C1-17
Summary No.:	C1.B3.110.0003	Procedure Rev.:	2	Report No.:	UT-08-010
Workscope:	ISI	Work Order No.:	01756752	Page:	1 of 7

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

Drawing No.: CNM 1201.01-175/1 Description: Nozzle to Head

System ID: NC

Component ID: 1PZR-W3 Size/Length: N/A Thickness/Diameter: 3.000 / 15.000

Limitations: Yes - Single Sided Due to Nozzle Start Time: 1429 Finish Time: 1610

Examination Surface: Inside ☐ Outside ☑ Surface Condition: AS GROUND

Lo Location: 9.2.3 Wo Location: Centerline of Weld Couplant: ULTRAGEL II Batch No.: 07125

Temp. Tool Mfg.: FISHER Serial No.: MCNDE 27220 Surface Temp.: 69 °F

Cal. Report No.: CAL-08-014, CAL-08-015, CAL-08-016

Angle Used	0	45	45T	60	60T	35T
Scanning dB		66.0	66.0	75.4	70.0	70.0

Indication(s): Yes ☐ No ☑ Scan Coverage: Upstream ☑ Downstream ☑ CW ☑ CCW ☑

Comments:

See attached coverage data sheets.
Previously recorded ID Geometry was seen, but at less than recordable indications

Results: Accept ☐ Reject ☑ Info ☐ Additional Inspectors: Josie Muirhed / Ken Ellis

Percent Of Coverage Obtained > 90%: No-81.2% Reviewed Previous Data: Yes

Examiner Level II-N Griebel, David M.	Signature	Date 5/7/2008	Reviewer	Signature III	Date 5/19/08
Examiner Level III-N Stauffer, Lester, E.	Signature	Date 5/7/2008	Site Review N/A	Signature	Date
Other Level II-N Keene, Douglas L.	Signature	Date 5/7/2008	ANII Review	Signature	Date 5-21-08

Pressurizer Safety/Relief Nozzle to Head % of Coverage

Item No. : C1.B3.110.0003 **Weld No. : 1PZR-W3**

Weld Coverage

Scan	Angle	% Coverage Obtained
S1	35°	100
S2	35°	82.4
S1	45°	100
S2	45°	61.4
CW	35°	100
CW	45°	100
CCW	35°	100
CCW	45°	100
	Total	743.8

743.8 ÷ 8 = **93.0** % Coverage

Base Material Coverage

S1	35°,45°&60°	89.3
CW & CCW	45°&35°	63.1
	Total	152.4

152.4 ÷ 2 = **76.2** % Coverage

0° Scan Coverage = **74.3** % Coverage

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

= **81.2** **% Coverage**

Inspector / Date : III 5/8/08

Pressurizer Safety / Relief Nozzle to Head
Total Area Weld & Base Material

Item No. : C1.B3.110.0003

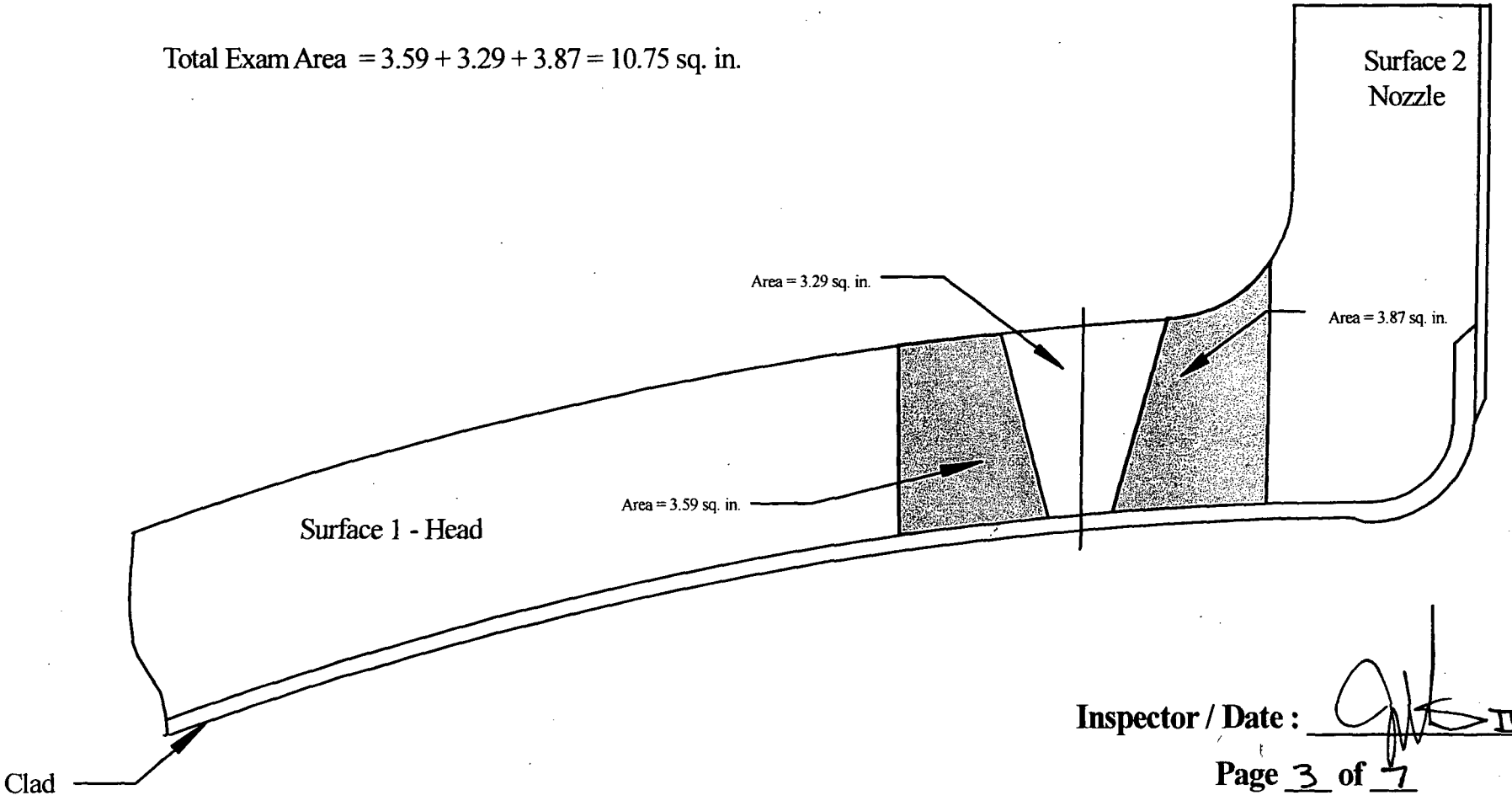
Weld No. : 1PZR-W3

Total Weld Area = 3.29 sq. in.

Scale 1" = 2"

Total Area of Base Material = 3.59 + 3.87 = 7.46 sq. in.

Total Exam Area = 3.59 + 3.29 + 3.87 = 10.75 sq. in.



Inspector / Date : _____ III 5/8/08

Page 3 **of** 7

Pressurizer Safety / Relief Nozzle to Head

0° Scan Coverage

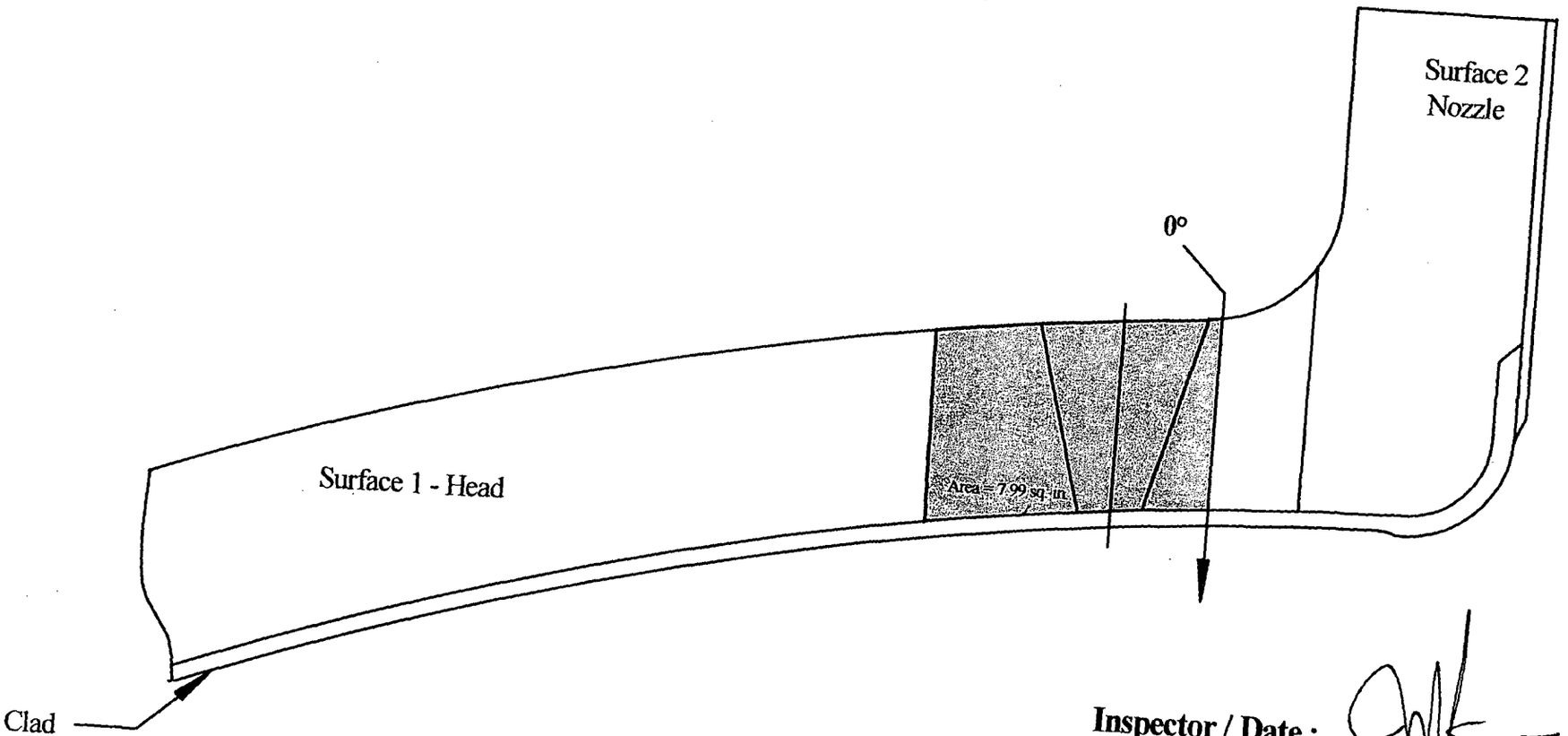
Item No. : C1.B3.110.0003

Weld No. : 1PZR-W3

0° Scan Total Area = 7.99 sq. in.

Total 0° Scan Coverage = 7.99 / 10.75 x 100 = 74.3 %

Scale 1" = 2"



Inspector / Date : JL III 5/9/08

Pressurizer Safety / Relief Nozzle to Head

Base Material Coverage - Axial Scans

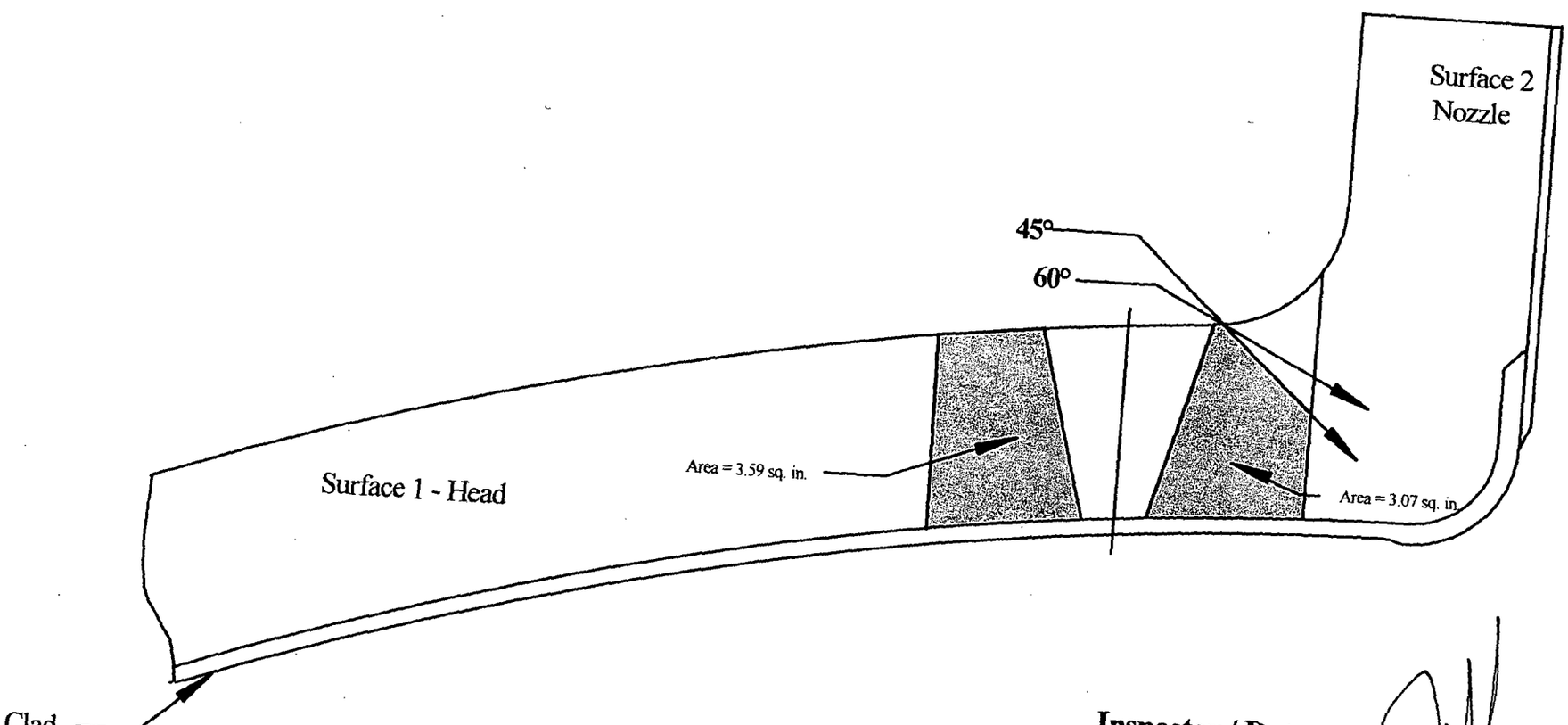
Item No. : C1.B3.110.0003

Weld No. : 1PZR-W3

Total Area of Base Material = 3.59 + 3.07 = 6.66 sq. in.

Total Base Material Scan Coverage = 6.66 / 7.46 x 100 = 89.3 %

Scale 1" = 2"



Inspector / Date : III 5/8/08

Pressurizer Safety / Relief Nozzle to Head

Weld Coverage - Axial & Circumferential Scans

Item No. : C1.B3.110.0003

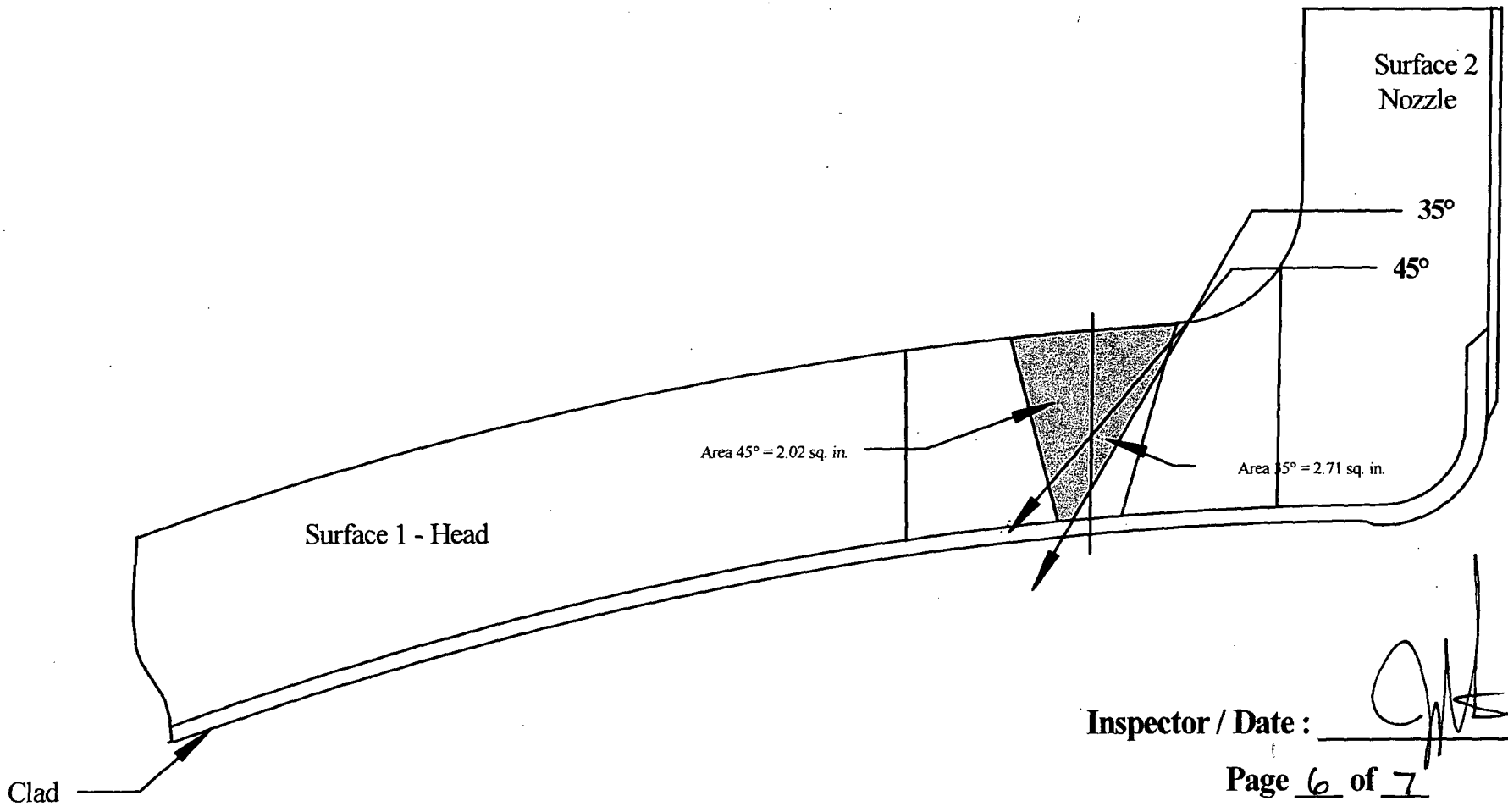
Weld No. : 1PZR-W3

Scale 1" = 2"

100% Coverage 35° & 45° Scans CW, CCW ans Axial from Surface 1

Total Weld Coverage 35° from Surface 2 = 2.71 / 3.29 x 100 = 82.4%

Total Weld Coverage 45° from Surface 2 = 2.02 / 3.29 x 100 = 61.4%



Inspector / Date : _____ III 5/3/08

Pressurizer Safety / Relief Nozzle to Head

Base Material Coverage - Circumferential Scans

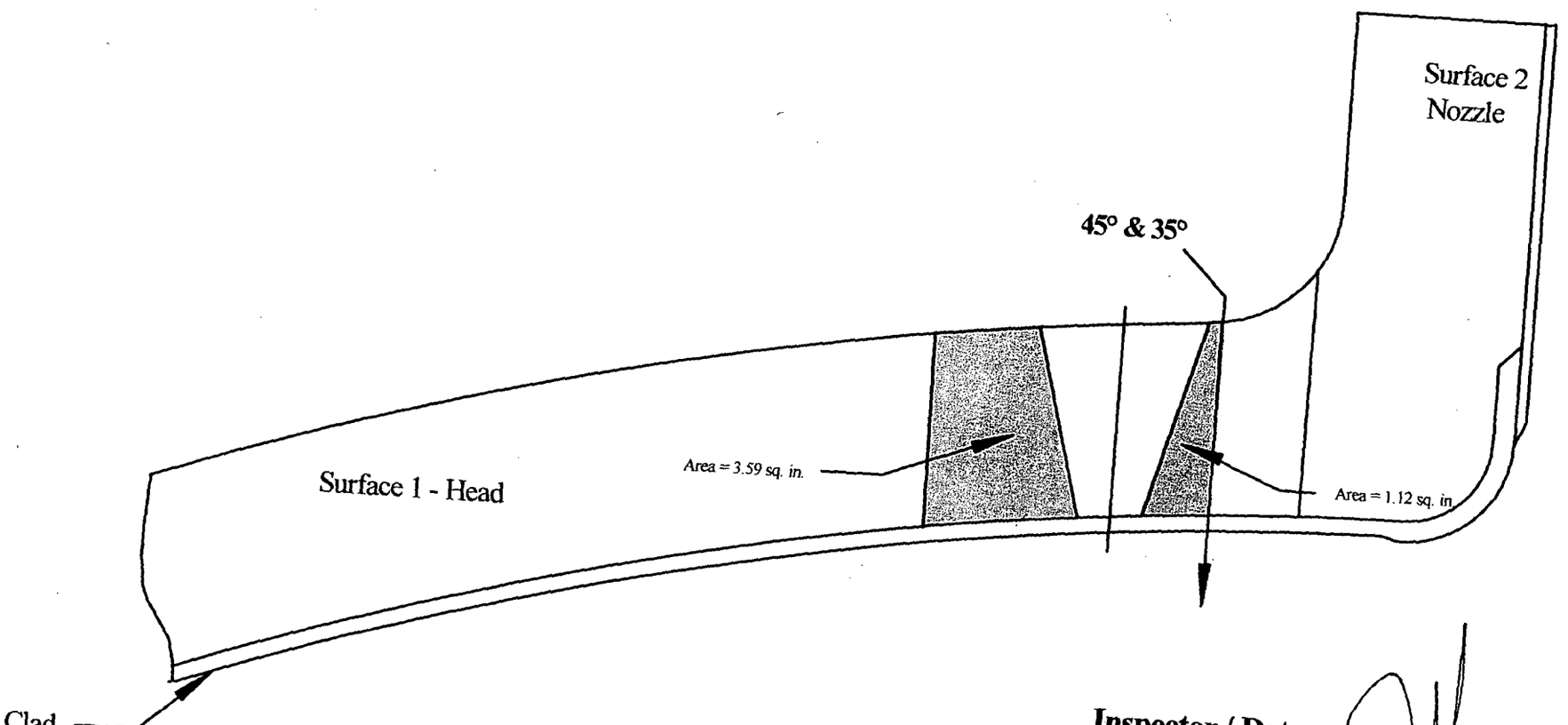
Item No. : C1.B3.110.0003

Weld No. : 1PZR-W3

Scale 1" = 2"

Total Area of Base Material = 3.59 + 1.12 = 4.71 sq. in.

Total Base Material Scan Coverage = 4.71 / 7.46 x 100 = 63.1 %



Inspector / Date : _____ III 5/8/03

Duke Energy

UT Vessel Examination

Relief Request 09-CN-001, Attachment C

Site/Unit:	Catawba / 1	Procedure:	NDE-3630	Outage No.:	C1-17
Summary No.:	C1.C1.20.0003	Procedure Rev.:	1	Report No.:	UT-08-054
Workscope:	ISI	Work Order No.:	01756741	Page:	1 of 7

Code: 1998/2000A Cat./Item: C-A/C1.20 Location:

Drawing No.: CN-ISIN3-1554-1.0 Description: Head to Flange

System ID: NV

Component ID: 1ELDHX-HD-FLG Size/Length: N/A Thickness/Diameter: 0.750 / 9.500

Limitations: Yes - See Attached Limitation Calculations Start Time: 0946 Finish Time: 1020

Examination Surface: Inside ☐ Outside ☑ Surface Condition: AS GROUND

Lo Location: RT #1 Wo Location: Centerline of Weld Couplant: ULTRAGEL II Batch No.: 07125

Temp. Tool Mfg.: FISHER Serial No.: MCNDE32768 Surface Temp.: 72 °F

Cal. Report No.: CAL-08-071, CAL-08-072, CAL-08-073, CAL-08-074

45S 70L 60S 72L 08

Angle Used	0	45	45T	~~60~~	~~60T~~	45L
Scanning dB		45:1	50.1	58.2 *	60	60 *

Indication(s): Yes ☑ No ☐ Scan Coverage: Upstream ☑ Downstream ☑ CW ☑ CCW ☑

Comments:

* Reduced scanning dB to obtain 2:1 signal to noise ratio.

21.6 % DKZ 09/16/09

Results: Accept ☐ Reject ☑ Info ☐

Percent Of Coverage Obtained > 90%: No ~~30.6%~~ Reviewed Previous Data: Yes

Examiner Level III-N Eaton; Jay A.	Signature	Date 5/22/2008	Reviewer	Signature	Date 5/27/08
Examiner Level III-N Stauffer, Lester, E.	Signature	Date 5/22/2008	Site Review N/A	Signature	Date
Other Level N/A N/A	Signature	Date 5/22/2008	ANII Review	Signature	Date 5-28-08

Ultrasonic Indication Report

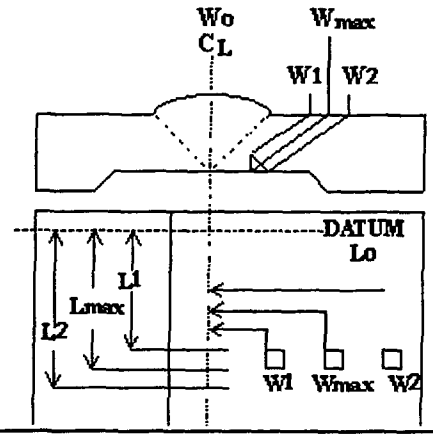
Site/Unit:	Catawba / 1	Procedure:	NDE-3630	Outage No.:	C1-17
Summary No.:	C1.C1.20.0003	Procedure Rev.:	1	Report No.:	UT-08-054
Workscope:	ISI	Work Order No.:	01756741	Page:	2 of 7

Search Unit Angle: 45 °

Wo Location: CL of Weld

Lo Location: RT. #1

- ○ Piping Welds
- ○ Ferritic Vessels ≥ 2"T
- ◉ Other Vessel < 2"T



MP	Metal Path	Wmax	Distance From Wo To S.U. At Maximum Response
RBR	Remaining Back Reflection	W1	Distance From Wo At Of Max (Forward)
L	Distance From Datum	W2	Distance From Wo At Of Max (Forward)

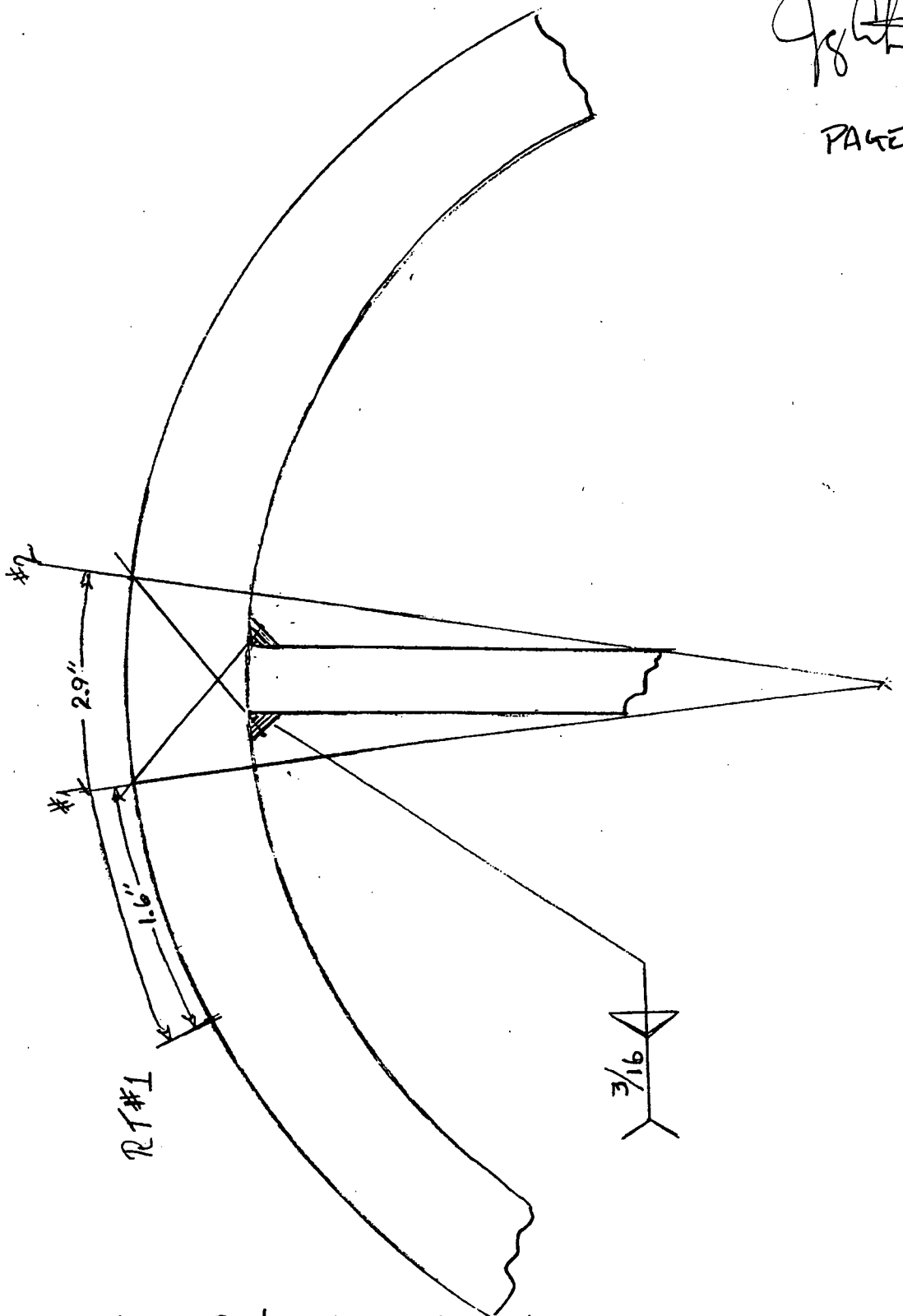
Comments:

Scan #	Indication No.	% Of DAC	W Max W	W Max MP	Forward Of Max W1	Forward Of Max MP	Backward Of Max W2	Backward Of Max MP	L1 Of Max	L Max	L2 Of Max	RBR Amp.	Remarks
4	1	200%	1-1.6	1.2	N/A	N/A	N/A	N/A	N/A	CL+1"	N/A	N/A	Geometry
3	2	200%	1-2.9	1.3	N/A	N/A	N/A	N/A	N/A	CL+1"	N/A	N/A	Geometry

Examiner Level III-N Eaton, Jay A.	Signature	Date 5/22/2008	Reviewer D E Jones	Signature	Date 5/27/08
Examiner Level III-N Stauffer, Lester, E.	Signature	Date 5/22/2008	Site Review N/A	Signature	Date
Other Level N/A N/A	Signature	Date 5/22/2008	ANII Review	Signature	Date 5-28-08

ITEM # C1.C1.20.0003
WELD# 1ELDHX-HD-FLG
CATAWBA UNIT # 1

III 5/22/03



IND. #1-45° & #2-45° ARE GEOMETRIC REFLECTORS FROM A BAFFLE INSIDE THE HEAT EXCHANGER. THIS WAS VERIFIED ON DESIGN DRAWINGS.

DUKE ENERGY COMPANY

ISI LIMITATION REPORT

Summary #: C1.C1.20.0003 **Component ID** 1ELDHX-HD-FLG

remarks:

☒ NO SCAN — SURFACE — BEAM DIRECTION — Nozzle Connection

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

FROM L 26.0" to L 30.0" INCHES FROM W0 + 0.5 to Beyond

ANGLE: ☐ 0 ☒ 45 ☐ 60 other 70° FROM ____ DEG to ____ DEG

☒ NO SCAN — SURFACE — BEAM DIRECTION — Nozzle Connection

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

FROM L 30.0" to L 3.5" INCHES FROM W0 + 0.5 to Beyone

ANGLE: ☐ 0 ☒ 45 ☐ 60 other 70° FROM ____ DEG to ____ DEG

☒ NO SCAN — SURFACE — BEAM DIRECTION — Nozzle Connection

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

FROM L 11.0" to L 16.0" INCHES FROM W0 + 0.5 to Beyond

ANGLE: ☐ 0 ☒ 45 ☐ 60 other 70° FROM ____ DEG to ____ DEG

☒ NO SCAN — SURFACE — BEAM DIRECTION — Nozzle Connection

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

FROM L 16.0" to L 19.5" INCHES FROM W0 + 0.5 to Beyond

ANGLE: ☐ 0 ☒ 45 ☐ 60 other 70° FROM ____ DEG to ____ DEG

Sketch(s) attached ☒ yes ☐ No

Prepared By: Jay Eaton Level: III Date: 05/22/2008 Sheet 4 of 7

Reviewed By: DE Hansen Date: 5/27/08 Authorized Inspector: [illegible] Date: 5-28-08

% Coverage Calculation

Summary No: C1.C1.20.0003 **Weld ID:** 1ELDHX-HD-FLG

Diameter: 9.5" **Thickness:** 0.750" **Weld Length:** 30"

Limited coverage for a total of 14" because of nozzle interference for 50% of the weld length.

Aggregate Coverage Calculation

Axial Scans

At 4 Nozzles	0%	(46.7% of the weld length x 0% of the volume)
Remaining length	27.7%	(46.7% of the weld length x 59.4% of the volume)
Total	27.7%	

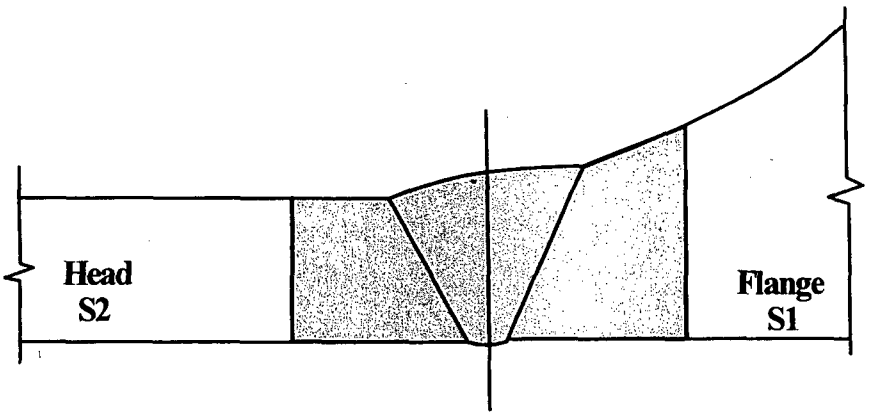
Circ. Scans

CW at 4 Nozzles	12.3%	(46.7% of the length x 26.4% of the volume)
CW for Remaining length	17.0%	(46.7% of the length x 36.3% of the volume)
Total CW	29.3%	
CCW at 4 Nozzles	12.3%	(46.7% of the length x 26.4% of the volume)
CCW for Remaining length	17.0%	(46.7% of the length x 36.3% of the volume)
Total CCW	29.3%	

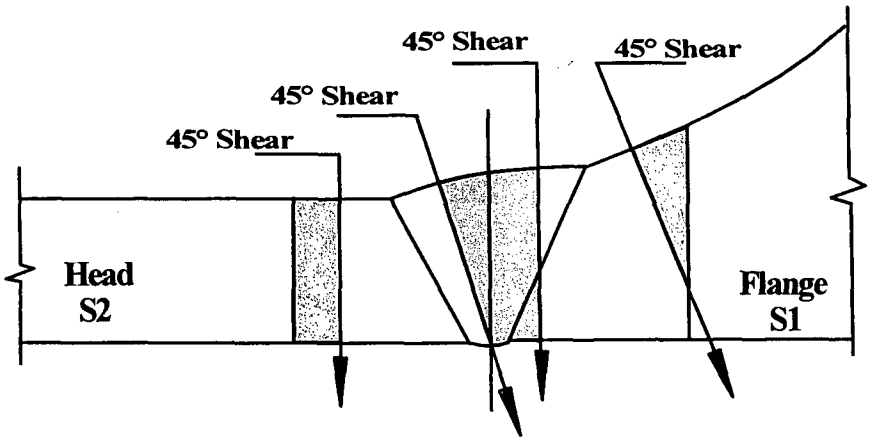
Total = (27.7+29.3+29.3) = 86.3/4 = 21.6%

Examiner/Date David K B / 09/16/09

Scale : 1" = 1"

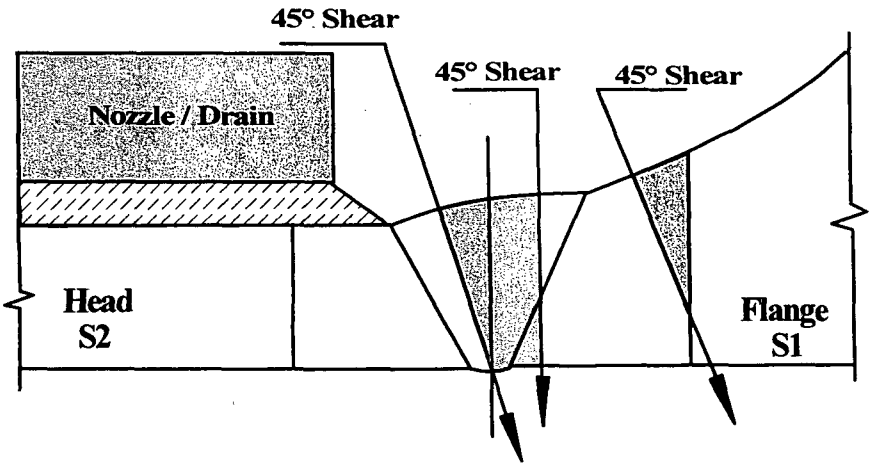


Total Exam Area = 1.75 sq. in.



Circ. Coverage for 50% of the weld length

% Coverage in the Circ. direction = (0.173 + 0.344 + 0.118) / 1.75 x 100 = 36.3%

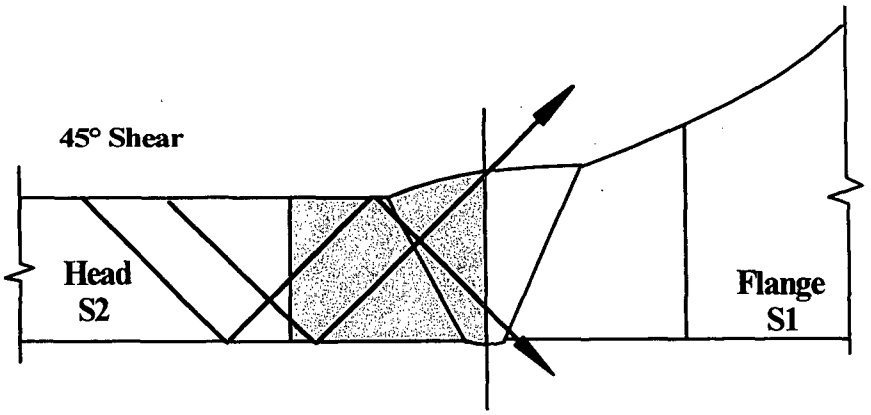


Circ. Coverage for 50% of the weld length due to Nozzles @ 4 locations

% Coverage in the Circ. direction = (0.344 + 0.118) / 1.75 x 100 = 26.4%

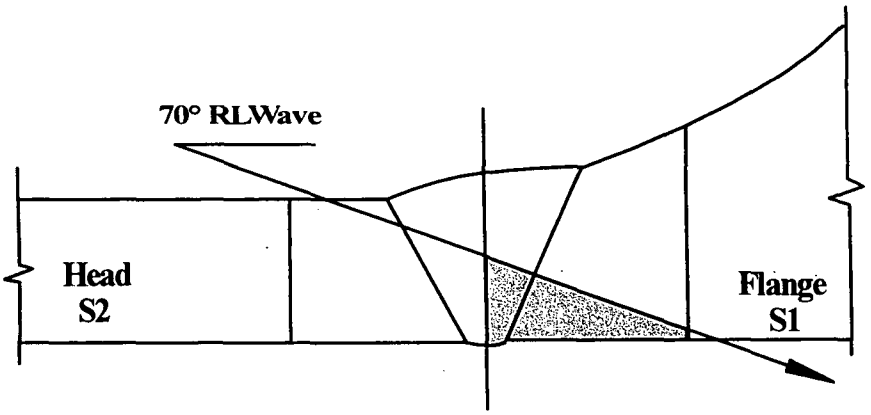
Inspector / Date : _____ III 5/22/03 Page 6 of 7

Scale : 1" = 1"



Axial Scan 45° Shear (ID / OD / ID Calibration)

% Coverage from S2 with Shear waves = 0.786 / 1.75 x 100 = 44.9%



Axial Scan 70° RL

% Coverage From S2 with 70° RL = 0.253 / 1.75 x 100 = 14.5%

Total % Coverage From S2 with 70° RL and 45° shear = 14.5% + 44.9% = 59.4%

Inspector / Date : III 5/22/08 Page 7 of 7

Duke Energy.

UT Vessel Examination

Relief Request 09-CN-001, Attachment D

Site/Unit:	Catawba / 1	Procedure:	NDE-3630	Outage No.:	C1-17
Summary No.:	C1.C1.20.0019	Procedure Rev.:	1	Report No.:	UT-08-031
Workscope:	ISI	Work Order No.:	01756742	Page:	1 of 5/6

Code: 1998/2000A Cat./Item: C-A/C1.20 Location: 5/15/08

Drawing No.: CN-ISIN3-1554-1.1 Description: Lower Head to Shell

System ID: NV

Component ID: 1VCT-LH-SH Size/Length: N/A Thickness/Diameter: 0.250/ 0.000

Limitations: Yes - See Attached Limitation Report Start Time: 1025 Finish Time: 1115

Examination Surface: Inside ☐ Outside ☑ Surface Condition: GROUND

Lo Location: 9.2.1 Wo Location: ~~Centerline of Flywheel~~ ℄ OF WELD 5/15/08 Couplant: ULTRAGEL II Batch No.: 07125

Temp. Tool Mfg.: FISHER Serial No.: MCNDE 27219 Surface Temp.: 87 °F

Cal. Report No.: CAL-08-052

Angle Used	0	45	45T	60	60T	
Scanning dB		61.8	61.8			

Indication(s): Yes ☑ No ☐ Scan Coverage: Upstream ☑ Downstream ☑ CW ☑ CCW ☑

Comments:

Results: Accept ☐ Reject ☑ Info ☐

Percent Of Coverage Obtained > 90%: No - 89.4% Reviewed Previous Data: Yes

Examiner Level II-N Leeper, Winfred C.	Signature Winfred C. Leeper	Date 5/14/2008	Reviewer	Signature III	Date 5/15/08
Examiner Level II-N Muirhead, Josie	Signature Josie Muirhead	Date 5/14/2008	Site Review N/A	Signature	Date
Other Level N/A N/A	Signature	Date 5/14/2008	ANII Review	Signature RMcGill	Date 5-20-08

KH 8/11/08

Ultrasonic Indication Report

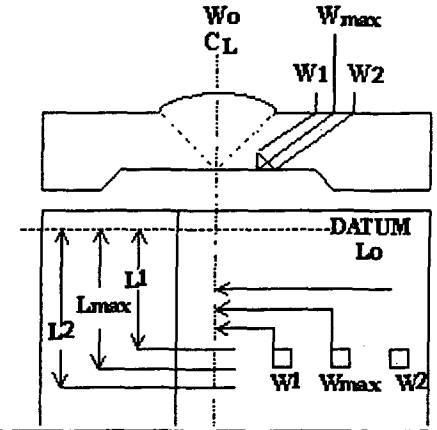
Site/Unit:	Catawba / 1	Procedure:	NDE-3630	Outage No.:	C1-17
Summary No.:	C1.C1.20.0019	Procedure Rev.:	1	Report No.:	UT-08-031
Workscope:	ISI	Work Order No.:	01756742	Page:	2 of 6 5/15/08

Search Unit Angle: 45 °

Wo Location: C

Lo Location: 9.2.1

- ○ Piping Welds
- ○ Ferritic Vessels ≥ 2"T
- ◉ Other Vessel < 2"T



MP	Metal Path	Wmax	Distance From Wo To S.U. At Maximum Response
RBR	Remaining Back Reflection	W1	Distance From Wo At Of Max (Forward)
L	Distance From Datum	W2	Distance From Wo At Of Max (Forward)

Comments:

Scan #	Indication No.	% Of DAC	W Max W	W Max MP	Forward Of Max W1	Forward Of Max MP	Backward Of Max W2	Backward Of Max MP	L1 Of Max	L Max	L2 Of Max	RBR Amp.	Remarks
S2	1	40%	.20	.38	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Geometry - 360° INT.

Examiner Leeper, Winfred C.	Level II-N	Signature	Date 5/14/2008	Reviewer		Signature III	Date 5/15/08
Examiner Muirhead, Josie	Level II-N	Signature	Date 5/14/2008	Site Review N/A		Signature	Date
Other N/A	Level N/A	Signature	Date 5/14/2008	ANII Review		Signature	Date 5-20-08

Supplemental Report

Duke Energy.

Report No.: UT-08-031

Page: 3 of 5/6

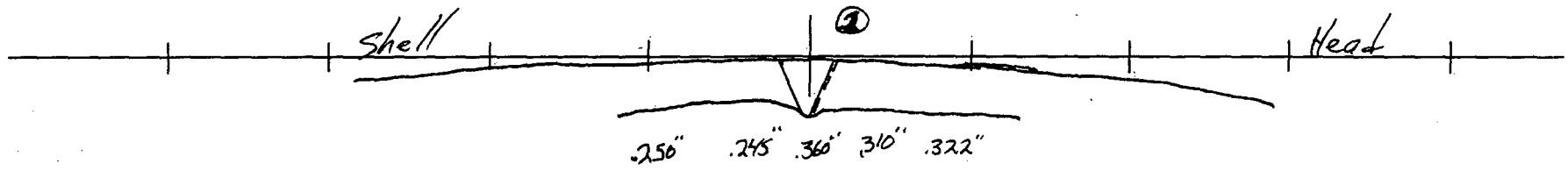
5/15/08

Summary No.: C1.C1.20.0019

Examiner:	Leeper, Winfred C.	Level:	II-N	Reviewer:	III	Date:	5/15/08
Examiner:	Muirhead, Josie	Level:	II-N	Site Review:	N/A	Date:	
Other:	N/A	Level:	N/A	ANII Review:		Date:	5-20-08

Comments: **Indication #1 - 45°- 360° INT. is geometrical weld root indication caused by beam redirection.**

Sketch or Photo: Z:\UT\IDDEAL\ProfileLine2.jpg



Determination of Percent Coverage for UT Examinations - Vessels

Site/Unit:	Catawba / 1	Procedure:	NDE-3630	Outage No.:	C1-17
Summary No.:	C1.C1.20.0019	Procedure Rev.:	1	Report No.:	UT-08-031
Workscope:	ISI	Work Order No.:	01756742	Page:	4 of ~~5~~ 6

QC 5/15/08

0 deg Planar

Scan _____ % Length X _____ % volume of length / 100 = _____ % total for 0 deg

45 deg

Scan 1 89.400 % Length X 100.000 % volume of length / 100 = 89.400 % total for Scan 1

Scan 2 89.400 % Length X 100.000 % volume of length / 100 = 89.400 % total for Scan 2

Scan 3 89.400 % Length X 100.000 % volume of length / 100 = 89.400 % total for Scan 3

Scan 4 89.400 % Length X 100.000 % volume of length / 100 = 89.400 % total for Scan 4

Add totals and divide by # scans = 89.400 **% total for 45 deg**

Other deg _____

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

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

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

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

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

Percent complete coverage

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

89.400 **% Total for complete exam**

Note:

Supplemental coverage may be achieved by use of other angles / methods. When used, the coverage for volume not obtained with angles as noted above shall be calculated and added to the total to provide the percent total for the complete examination.

Site Field Supervisor: _____ JTL Date: 5/14/08

DUKE ENERGY COMPANY

ISI LIMITATION REPORT

Summary #: C1.C1.20.0019 **Component ID** 1VCT-LH-SH

remarks:

☒ NO SCAN — SURFACE — BEAM DIRECTION

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

FROM L * to L * — INCHES FROM **W0** CL to Beyonod

ANGLE: ☐ 0 ☒ 45 ☐ 60 other ____ FROM ____ DEG to ____ DEG

7 1/2" at 4 support leg

@ 45°, 135°, 225° and 315°

% of weld not examined

☐ NO SCAN — SURFACE — BEAM DIRECTION

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

FROM L ____ to L ____ — INCHES FROM **W0** ____ to ____

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

= 7.5" X 4 = 30"

Total weld length = 283"

% examined =(283-30) / 283x100

= 89.4%

☐ NO SCAN — SURFACE — BEAM DIRECTION

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

FROM L ____ to L ____ — INCHES FROM **W0** ____ to ____

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

☐ NO SCAN — SURFACE — BEAM DIRECTION

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

FROM L ____ to L ____ — INCHES FROM **W0** ____ to ____

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

Sketch(s) attached

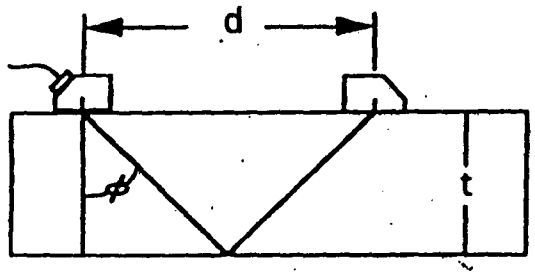
☐ yes ☒ No

Prepared By: Winfred Leeper — Level: II — Date: 05/14/2008 — Sheet 5 of 6

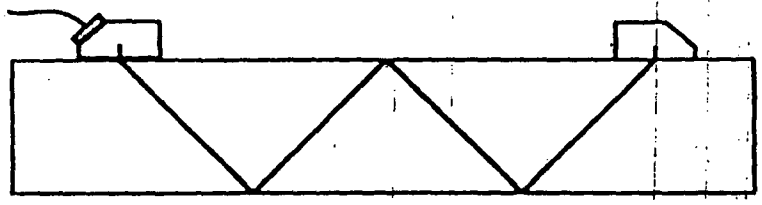
Reviewed By: — Date: 5/15/08 — Authorized Inspector: — Date: 5-20-08

DUKE POWER COMPANY

ULTRASONIC BEAM ANGLE MEASUREMENT RECORD



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



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 run 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.

JL 5/14/08

Pipe size: 90.0' N/A

Pipe Schedule: N/A (.305")

Nominal 45 deg: d= 0.8 ; t= 0.385 ; measured angle= 46.09 deg

Nominal 60 deg: d=_____; t=_____; measured angle=_____ deg

Nominal 70 deg: d=_____; t=_____; measured angle=_____ deg

PAGE 6 OF 6

JL 5/15/08

Examiner	Level	Date	Examiner	Level	Date
Wilfred O. Rogers	II	5-14-08	Joe Medal	II	5/14/08
Reviewed By	**Level**	**Date**	**Authorized Inspector**		**Date**
	III	5/15/08	Robert McGill		5-20-08

Duke Energy.

UT Pipe Weld Examination

Relief Request 09-ZN-001, Attachment E

Site/Unit:	Catawba / 1	Procedure:	NDE-600	Outage No.:	C1-17
Summary No.:	C1.C5.21.0002	Procedure Rev.:	17	Report No.:	UT-08-023
Workscope:	ISI	Work Order No.:	01756732	Page:	1 of 6

Code: 1998/2000A Cat./Item: C-F-1/C5.21 Location:

Drawing No.: CN-1NI-11 Description: Elbow to Tee

System ID: NI

Component ID: 1NI11-9 Size/Length: N/A Thickness/Diameter: 0.531 / 4.000

Limitations: Yes - See Attached Limitation Report Start Time: 0935 Finish Time: 1020

Examination Surface: Inside ☐ Outside ☑ Surface Condition: AS GROUND

Lo Location: 9.1.1.1 Wo Location: Centerline of Weld Couplant: ULTRAGEL II Batch No.: 07125

Temp. Tool Mfg.: FISHER Serial No.: MCNDE 27220 Surface Temp.: 68 °F

Cal. Report No.: CAL-08-041, CAL-08-042, CAL-08-043

Angle Used	0	45	45T	60	60L	
Scanning dB			45.0	45.0	50	

Indication(s): Yes ☐ No ☑ Scan Coverage: Upstream ☑ Downstream ☑ CW ☑ CCW ☑

Comments:

FC 08-03

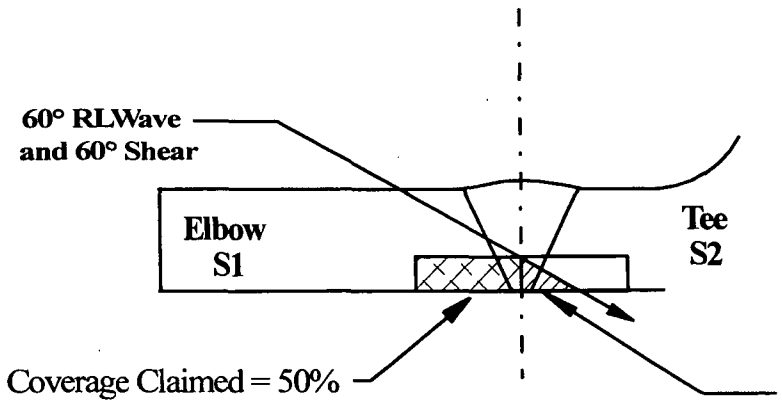
Results: Accept ☐ Reject ☑ Info ☐

Percent Of Coverage Obtained > 90%: No - 77.0% Reviewed Previous Data: Yes

Examiner Level III-N Eaton, Jay A.	Signature	Date 5/12/2008	Reviewer Gary Moss	Signature	Date 5/18/08
Examiner Level II-N Ellis, Ken	Signature	Date 5/12/2008	Site Review N/A	Signature	Date
Other Level N/A N/A	Signature	Date 5/12/2008	ANII Review	Signature	Date 5-21-08

ASH 8/11/08

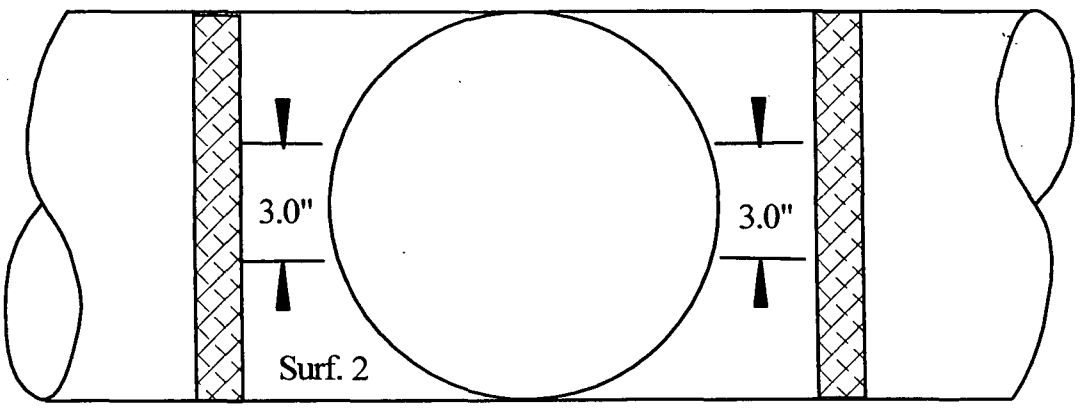
Item No. C1.C5.21.0002 **Weld No.1NI11-9**



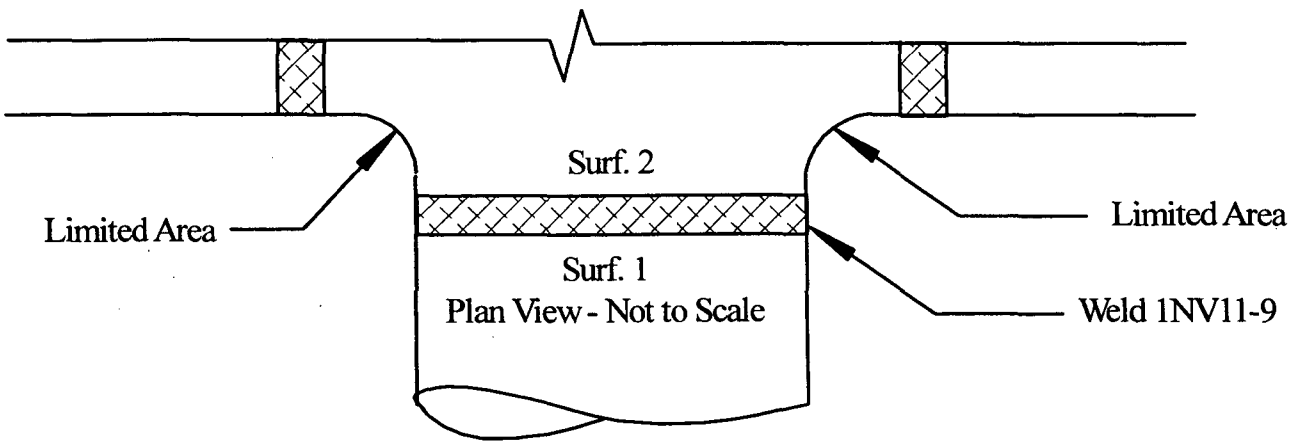
Scale : 1" = 1"

No Coverage Claimed
Supplemental coverage
with 60° RL Wave Only
See Note:

Note: 60° RL scan not included in percentage coverage due to requirements of 10CFR50.55a(b)(2)(xv)(A)(1). Best effort scan with 60° RL obtained 13.1% coverage in one axial direction.



Side View - Not to Scale



Limited 3" in throat area each side of Tee for a total of 6" on Surface 2. Limited area from Lo + 2.1" to Lo + 5.1" and from Lo + 9.3" to Lo + 12.3".

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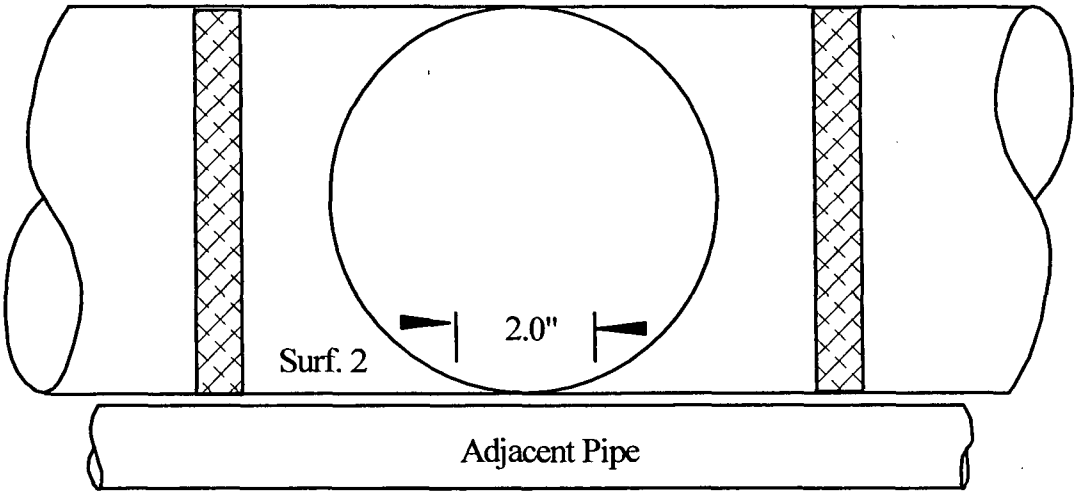
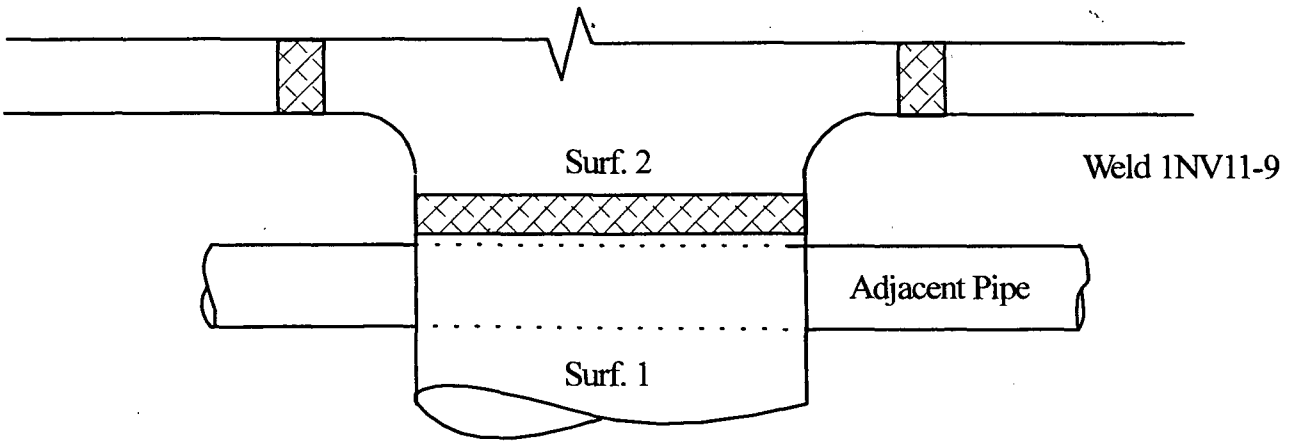
Item No. C1.C5.21.0002 **Weld No.1NI11-9**



Side View - Not to Scale



Plan View - Not to Scale

Limited 2" due to adjacent pipe on Surface 1 side of the weld. Limited area from Lo + 6.1" to Lo + 8.1".

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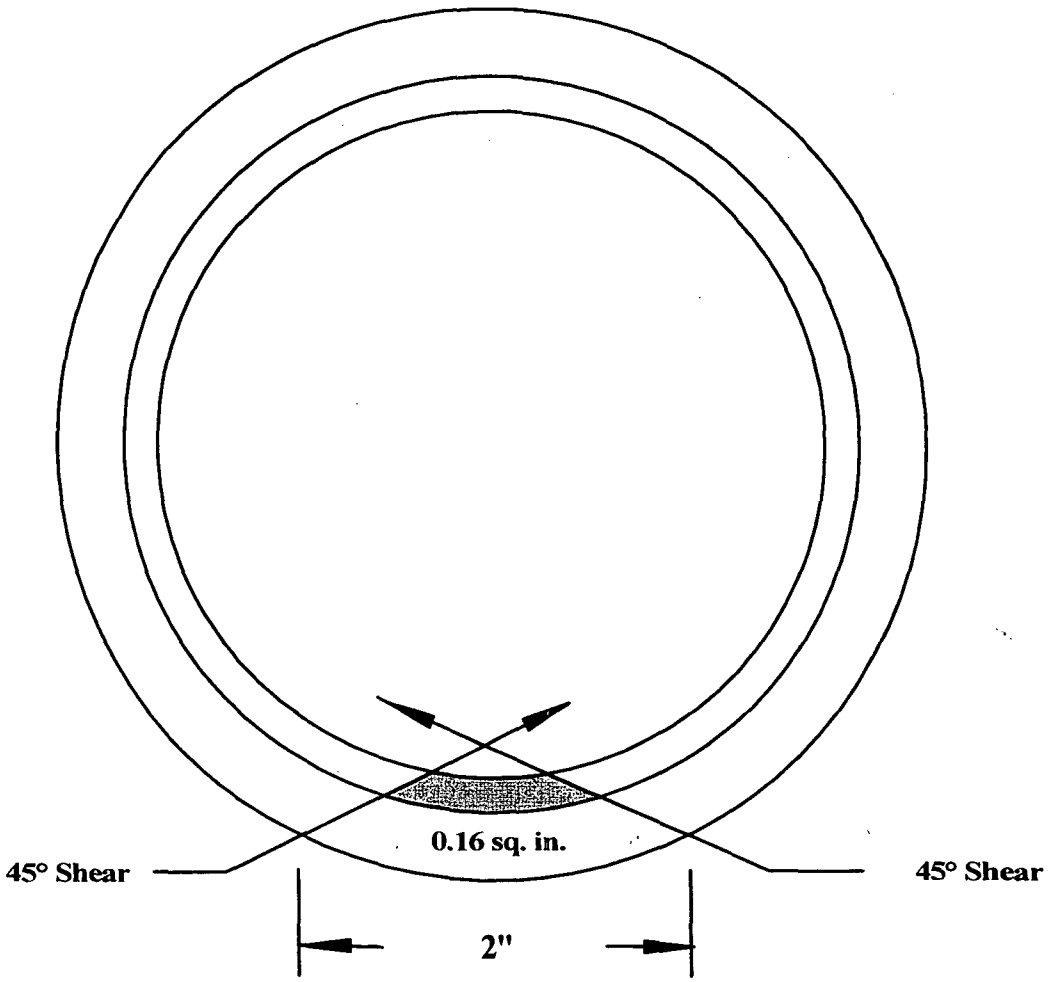
Scale : 1" = 1"



Circ. Scan limitation due to adjacent pipe

Total inspection volume = 2.3 sq. in. x 1.1" x 1.8" = 2.3 cu. in.

Volume not examined = 0.16 sq. in. x 1.1" = 0.18 cu. in.

Total volume examined circ. scan from Surface 1
= 100 - (0.18 / 2.3 x 100) = 92.2%.

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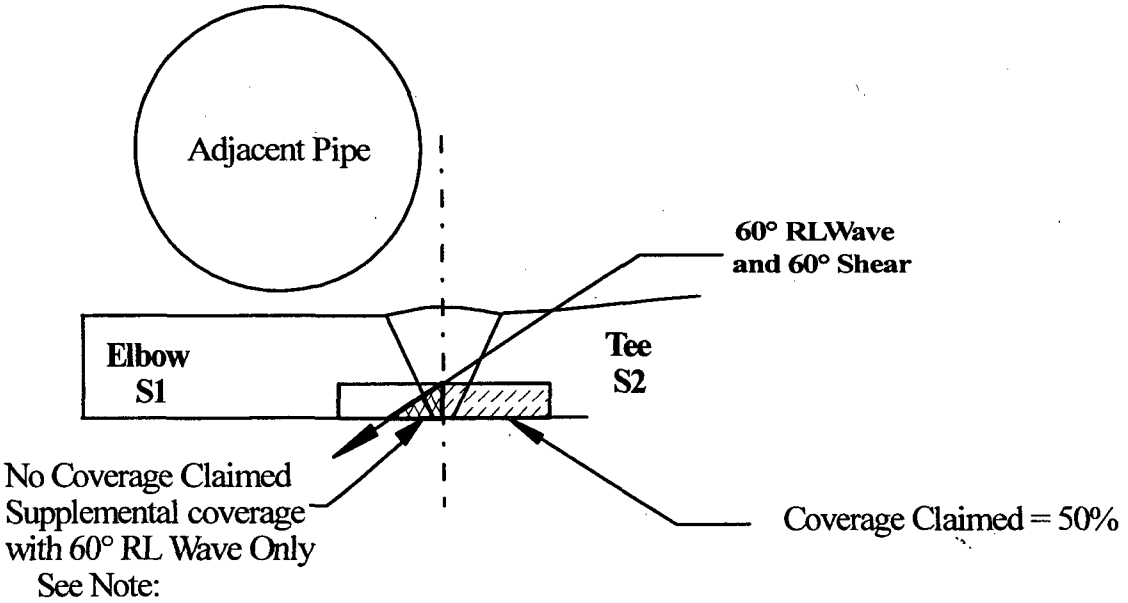
Item No. C1.C5.21.0002 **Weld No.1NI11-9**

Scale : 1" = 1"



Note: 60° RL scan not included in percentage coverage due to requirements of 10CFR50.55a(b)(2)(xv)(A)(1). Best effort scan with 60° RL obtained 12.1% coverage in one axial direction.

Limited due to adjacent pipe on the surface 1 side of the weld.. Limited area from Lo + 6.1" to Lo + 8.1".

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% Coverage Calculations

Item No. : C1.C5.21.0002 **Weld No. : 1NI11-9**

Pipe Ø = **4.5"**

"t" = **0.531"**

Weld Length = **14.2"**

Limited scan on Surface 2 due to the throat of the tee for 6" of the weld length .

Limited scan on Surface 1 due to adjacent pipe for 2" of the weld length .

% of Length at throat of Tee = 6 / 14.2 x 100 = 42.2%.

% of Length atadjacent pipe = 2 / 14.2 x 100 = 14.1%.

% of Length examined 100% = 100 - 14.1 - 42.2 = 43.7%.

Aggregate Coverage Calculation

S1 = Pipe	**43.7 %**	(43.7% of the Length x 100% of the Volume)
S1 = Pipe	**21.1 %**	(42.2% of the Length x 50% of the Volume)
S1 = Pipe	**0 %**	(14.1% of the Length x 0% of the Volume)
Total S1	**64.8 %**	
S2 = Tee	**43.7 %**	(43.7% of the Length x 100% of the Volume)
S2 = Tee	**0 %**	(42.2% of the Length x 0% of the Volume)
	7.1 %	(14.1% of the Length x 50% of the Volume)
Total S2	**50.8 %**	
S1 S3 & S4	**92.2 %**	(92.2% of the Volume)
S2 S3 & S4	**100 %**	(100% of the Volume)

Total = 307.8 ÷ 4 = 77.0% Aggregate Coverage

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